RELATIONSHIPS BETWEEN METALINGUISTIC AND SPELLING DEVELOPMENT ACROSS LANGUAGES: EVIDENCE FROM ENGLISH AND HEBREW

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ABSTRACT

Metalinguistic awareness is transferable between oral and written forms of language, and between different languages. Recent research has established a connection between monolingual children's grammatical awareness and their morphological spelling knowledge. Studies of bilingual children have shown that phonological awareness and alphabetic knowledge transfer across languages, even if the languages are dissimilar and are written with different scripts. This study investigates transfer of grammatical awareness and morphological spelling knowledge across dissimilar languages and scripts.

In spoken language, children learn not only surface-level language 'facts' specific to that language (e.g. vocabulary) but also deeper-level grammatical principles (e.g. morphological and syntactic relationships), which govern other languages. Similarly, literacy requires surface-level knowledge of a specific script (e.g. letters and their sound values), and knowledge of the principle underlying that script (e.g. that alphabets represent phonology and morphology), which governs other scripts of the same type.

I propose that transfer across languages occurs at the level of grammatical awareness but not at the level of vocabulary. The hypothesis was tested in English-speaking children (6-11 years) learning Hebrew as a second language. In **Study 1**, Hebrew learners were given oral measures of vocabulary and grammatical awareness, and measures of morphological spelling knowledge. Grammatical awareness and morphological spelling knowledge were significantly correlated across languages, but vocabulary was not. In **Study 2**, awareness of conceptually similar aspects of English and Hebrew morphology was measured in oral language and spelling. These were significantly correlated across languages. In both studies, Hebrew learners with high levels of Hebrew scored significantly higher than English-speaking monolinguals on grammatical and spelling measures.

I conclude that grammatical awareness and morphological spelling knowledge are transferable across languages and scripts, and that learning a second language can benefit specific aspects of metalinguistic and spelling development.

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INTRODUCTION

In this study, it is proposed that children who know more than one language can use their knowledge of underlying linguistic concepts for both languages. The claim is that even when a child's two languages appear dissimilar, they may share certain underlying principles, in spite of different specific rules governing their formation. As children develop their knowledge of these principles, they may be able to use this knowledge in both languages.

The possibility that children can use linguistic knowledge for both their languages depends on the way in which first language knowledge is represented. Are the specific structures and distinctions of the first language we learn represented, or is there representation of a more abstract kind of linguistic knowledge, which is applicable to other languages?

These two hypotheses lead to different predictions for learning a second language. Under the first hypothesis, the learner will approach a second language entirely in the light of structures and distinctions that he or she knows from the first language. Where these are the same in both languages, the learner will be able to transfer what she or he already knows from the first language to the second. Where they are different, however, there will be no transfer, or alternatively interference will occur because transfer will result in an incorrect application of first language knowledge to the second language. For example, native speakers of languages which distinguish between the phonemes /l/ and /r/ have no difficulty in distinguishing between these sounds when speaking English as a second language. On the other hand, native speakers of languages which do not make this distinction (for example, Chinese and Japanese) have considerable difficulty distinguishing between these two sounds when pronouncing English words. No transfer of the distinction can occur from the first language to English because in the first language it does not exist.

This hypothesis of second-language acquisition, that is, that transfer can only occur

where two languages make the same distinctions or form a particular structure in a very similar way, predicts that such transfer will occur most in languages which are closely related and share many similar features, while for languages which are very different, first language knowledge will be of little or no use in learning the second language. To take the example of written language, under this hypothesis we would expect that an English learner of written French, which shares the same alphabet as English (though different orthographic rules), would have an advantage over an English learner of written Hebrew, which uses a different alphabet, is written from right to left, and represents consonants and vowels separately. The English learner of French will be able to transfer knowledge of the letters and some of the sound values where these are identical in both languages. Where the sound values of particular letters and combinations of letters are different, the new rules need to be mastered and until then knowledge of English rules may interfere with the French. Nevertheless the English reader comes to French well-equipped to begin reading. The Hebrew learner, on the other hand, has to learn a whole new set of unfamiliar letters and letter-sound correspondences, as well as the unfamiliar system for representing consonants and vowels and of reading from right to left. Therefore if this hypothesis is correct, we would not expect transfer from written English to written Hebrew to occur, because they use different systems of symbols.

Under the second hypothesis, the fact that a feature of language may be formed in different ways in the two languages does not necessarily mean that no positive transfer of knowledge can occur. Under this hypothesis, the surface differences between two languages are less important than the principles that underlie them. Awareness or knowledge of such linguistic principles, as opposed to the ability merely to produce correct language forms, has been called metalinguistic awareness, or metalinguistic knowledge. Although definitions of 'metalinguistic' have varied in the degree to which they require this knowledge to be explicit, the general meaning is that language is understood to be a system of rules which can be analysed and manipulated. It is this kind of understanding which may be transferable from language to language. For example, the alphabetic principle, namely that each

symbol represents a sound, is identical in the Roman and the Hebrew alphabets despite different sets of symbols and different rules governing these symbols. Thus under this hypothesis, if one can read one alphabet, one should be able to transfer this knowledge of how alphabets work to the second alphabet and learn to read it without great difficulty. Research in several bilingual and biliterate contexts, including Arabic and French (Wagner, Spratt and Ezzaki, 1989), Portuguese and English (da Fontoura and Siegel, 1991), and Hebrew and English (Geva, Wade-Woolley and Shany, 1993), has indeed shown that children can transfer knowledge of the alphabetic principle from one language to another.

Both of these views of second language learning make some intuitive sense, yet neither by itself entirely explains the relationship between a learner's first and second languages. The picture must be more complex than this. It is possible that each hypothesis is correct, but for different aspects of language learning. The possibility of transfer may depend on the level of language in question. At a surface level, differences between languages may result in a lack of transfer, or interference, and cause difficulty. At this level, the details of the two language systems must be learned separately where they are different. At a metalinguistic level on the other hand, transfer may occur where a principle is similar in both languages, and result in facilitation.

Until now, transfer in only one direction has been discussed: from the first to the second language. At first sight it seems obvious that children who speak one language at home, and do not learn a second language until they go to school, will only transfer knowledge in this direction, since the first language is the one which is more developed. However, knowing how to speak the first language does not necessarily mean that the child has yet developed explicit knowledge of how the language system works. It is possible that when children who are still developing metalinguistic awareness in the first language learn a second, they gain certain metalinguistic insights about the second language before having similar insights about the first. This is particularly likely if an aspect of language is more obviously

marked in the second language than in the first. This knowledge may then be transferable from the second to the first language. If children can do this, then we would expect learning a second language to advance first language metalinguistic development, and to give these children an advantage over children exposed to only one language, on tasks which demand metalinguistic awareness.

One such task is learning to read and write. In order to read, and to represent their spoken language in writing, children need to reflect more explicitly on their language as an object for analysis than they had to in order to speak. When children first begin to write in an alphabetic orthography, they have to become explicitly aware of the individual phonemes of their language and to make the connection between these phonemes and letters. One result of this awareness in the early stages of literacy development is phonetic spelling. However, in the English orthography, children need to learn much more about the language than this letter-sound principle as they progress, because much of the complexity of English orthography is governed by morphology and not phonology. The correct spelling of some morphemes is dictated by their grammatical status rather than by the way they sound. For example, the spelling of the morpheme '-ed' at the end of past tense regular verbs cannot be predicted by the way it sounds. It can sound like /d/, /t/ or /id/ but not /ed/. The '-ed' ending distinguishes verbs from non-verbs (and regular verbs from irregular verbs) as well as indicating past tense. Thus in order to consistently spell the endings of regular past-tense verbs but not other kinds of similar sounding words with '-ed, children must understand something of the concept of word class (parts of speech) and tense. Another example of the connection between grammar and spelling is the apostrophe denoting possession. 'The girl's drink' and 'the girls drink' sound identical, but mean quite different things. In order to know that the former must be spelled with an apostrophe and the latter must not, it is necessary to understand something about the possessive and to be able to distinguish it from the non-possessive plural. Morphology is also important for spelling English affixes, and stems of semantically related words which do not sound similar. The words 'know' and 'knowledge', for example, cannot be correctly

spelled using a phonological strategy, and neither is the similarity in their spellings apparent in the way they sound. Rather, they share spelling of the morpheme 'know' because they have the same root.

Such morphological and morpho-syntactic aspects of written English can take children some years to master (Nunes, Bryant and Bindman, in press a). If transfer of metalinguistic level grammatical knowledge can occur between languages, then children learning about similar grammatical concepts (such as tense, parts of speech, roots, and possession) in a second language should be able to apply them to the first. This could make learning to spell such morphemes easier for children learning a second language than for children who are only exposed to English.

The central aim of this study is to determine what kinds of linguistic knowledge children can transfer from one language to another, and what the consequences of such transfer may be for metalinguistic and spelling development. The two languages to be investigated are English and Hebrew. I propose that what can transfer is dependent on the level of language in question. Knowledge of surface level aspects of language such as vocabulary should not transfer between two such different languages, because this kind of knowledge is specific to each language. At a metalinguistic level, however, children should be able to transfer their knowledge of shared principles across languages despite surface differences in the way each language marks them. The possibility that such transfer could benefit metalinguistic and spelling development is also investigated. Since morphological information plays an important role in both English spelling and in spoken and written Hebrew, the focus of the study will be on metalinguistic awareness of morphology.

Two possible constraints on transfer of metalinguistic knowledge are also considered. First, the kind of metalinguistic insights the child can gain in his or her second language may depend on the purpose for which the language is taught, and the way in which it is taught. Learning a spoken language for communication, and

learning a classical, written language for religious purposes may provide different opportunities for learning about morphology, and thus may have different effects on first language morphological awareness. In some British Jewish schools, Hebrew is taught principally as the written language of prayer and religious text, while in other schools it is taught as a modern, spoken language as well.

Another condition for transfer may be the child's level of proficiency in the second language. It is possible that transfer will only occur once the child has attained a high level of proficiency.

The first two chapters of the thesis review the studies in the literature which provide the background to the present study. Chapter One addresses the connection between metalinguistic awareness and the development of literacy skills within one language. The main focus is on recent studies which have investigated the connection between grammatical awareness and children's progress in reading and spelling. In Chapter Two, studies investigating transfer of linguistic and metalinguistic knowledge across two or more languages and orthographies are discussed. Chapter Three introduces the reader to the Hebrew language, and briefly outlines its historical development, some Jewish practices involving Hebrew, Hebrew education in British Jewish primary schools, the Hebrew script, and some characteristics of the language which are relevant to the present study. In the remaining chapters, the present study is described and discussed.

CHAPTER ONE

THE CONNECTION BETWEEN METALINGUISTIC AND LITERACY DEVELOPMENT

1.1. Introduction

Learning to read and write involves developing a more explicit awareness of how language works as a system than is necessary for speaking and for understanding oral language. When speaking, for example, we do not need to be aware that our words can be broken down into their constituent sounds; instead, our main concern is to convey meaning. In order to learn to read and write an alphabetic orthography, on the other hand, requires attention to the small units of sounds (phonemes) which are represented by letters. More generally, becoming literate requires reflection upon language as an object or system, and analysing and manipulating the units of that system, as opposed to the less conscious production of correct forms of spoken language. This ability to reflect upon language as a system has been called metalinguistic awareness. Definitions of metalinguistic awareness differ in the extent to which they require linguistic knowledge to be explicit or conscious (see Gombert, 1992 for a review). For the purposes of this study, metalinguistic awareness is defined as the ability to intentionally analyse, manipulate and control language knowledge (Gombert 1992).

1.2. Phonological awareness and literacy development

Learning to read and write necessitates conscious knowledge and intentional control of various different aspects of language (Gombert 1992). The bulk of the research on the connection between literacy development and metalinguistic awareness has so far concentrated on the early stages of learning to read and write in alphabetic scripts, and

the importance of the role of phonological awareness in this early development. Frith (1985) has called this period of reading and spelling development the 'alphabetic' stage, during which the child learns about the relationships between letters and the sounds of his or her language, and spells words the way they sound. A large number of studies over the last decade and a half have established a connection between children's ability to segment words into their constituent sounds and their progress in reading and spelling. This research has shown that children have to be able to analyse the sounds that make up words in order to begin to read and write, and that awareness of these sounds is a contributory factor to their success. It has also been found that children who have trouble learning to read are often insensitive to the component sounds in words and syllables, and that teaching awareness of these sounds and their connection to alphabetic letters and combinations of letters can improve children's reading (see Goswami and Bryant, 1990 for a review).

Much less attention has been paid to aspects of metalinguistic awareness which may be important in the later stages of learning to read and write, once the child has mastered the connection between sounds and letters. In an alphabetic orthography such as English, while phonological awareness is clearly important, its usefulness is constrained by the large number of words which are phonologically irregular. The child needs to learn more about how his or her language works than the way it sounds, in order to progress in reading and to master conventional spelling. In Frith's (1985) model of reading and spelling acquisition, this later stage of mastery of the complexities of orthography beyond phonological representation is called the 'orthographic' stage. However, while there is now a great deal of evidence for an alphabetic stage, linked to the development of phonological awareness, much less is known about the developmental processes involved in this later orthographic stage. In recent years, a few studies have begun to address these, and have established a connection between children's metalinguistic awareness of grammar and their progress in reading and spelling.

1.3. Grammatical awareness and literacy development

1.3.1. Syntactic awareness

Most of the studies which have investigated the role of grammatical awareness in children's reading and spelling progress have been concerned with children's sensitivity to the structure of sentences, or 'syntactic awareness'. The view underlying this research is that reading is a 'psycholinguistic guessing game' (Goodman 1982) in which children use semantic and syntactic context to predict unknown or difficult words (Nunes, in press b). For example, Tunmer, Nesdale and Wright (1987) hypothesised that syntactic awareness is causally related to learning to read, because the use of syntactic context would help children to identify new words, and thereby also help them to translate the letters of these new words into phonological form.This use of context to help identify words would increase speed and automaticity in reading and free cognitive resources for comprehension. In their study, Tunmer et al used a reading-level match design to compare syntactic awareness in 30 good and 30 poor monolingual readers. Fourth-grade poor readers were matched with second-grade good readers, to minimize the differences between good and poor readers in terms of their exposure to print. They were individually matched for reading ability as measured by a test comprising real word recognition, pseudo-word naming, reading fluency, and reading comprehension, and roughly matched for verbal ability as measured by the PPVT vocabulary test. The children were given two tasks designed to measure their syntactic awareness, defined as the child's ability to reflect upon and to manipulate aspects of the internal grammatical structure of sentences. The first was an oral cloze task containing 32 sentences, each of which had one word missing which the child had to supply. The second task was oral correction task, in which the child had to correct 18 ungrammatical sentences of four words in length which had either word order or morpheme violations.

The results showed that the good, younger readers performed significantly better on both syntactic awareness tasks than the older, poor readers. Tunmer et al. conclude

that the older, poor readers were developmentally delayed in syntactic awareness and that this delay may have retarded their reading development. They suggest that syntactic awareness is causally related to learning to read. However, Gombert (1992) and Bowey (1994) have pointed out that the kinds of task used in this study to measure syntactic awareness are not actually measures of syntactic awareness in a pure sense, as they make semantic as well as syntactic demands. Thus the study tells us that there is a connection between some combination of syntactic and semantic awareness and children's ability to use syntactic and semantic context, but it is not possible to know from this research to what extent grammatical awareness per se is important.

Rego and Bryant (1993) acknowledged that what they measured was some combination of syntactic and semantic awareness, using similar tasks to those of Tunmer et al. In a longitudinal study of children in their first year of school, their aim was to assess the comparative contributions of phonological and syntactic and semantic skills to children's reading and spelling. They predicted that both phonological skills and syntactic and semantic skills would play a role but would contribute to different aspects of reading and spelling development. Specifically, they predicted that measures of phonological awareness taken before the children learned to read would be related to their use of the alphabetic code later on, while measures of syntactic and semantic awareness prior to reading would be related to the children's later ability to use context to help them read unknown words. 57 children were seen at the beginning of the first year of school (mean age 5 years 6 months), before they could read, and again 5 months later. Prior to the first session, the children were given the WPPSI IQ test. In the first session the children were given two tests of phonological awareness: firstly, a phoneme oddity task in which the child heard 4 words, 3 of which began or ended with the same phoneme and one which did not, and had to decide which word was the 'odd-one-out', and secondly, a phoneme tapping task in which the child heard a word of two, three or four phonemes and had to tap out the number of phonemes in the word.

In this session the children were also given three measures of syntactic and semantic awareness: an oral cloze task, a sentence completion task and a sentence anagram task. In the oral cloze task, the sentences together made up a story, while the sentence completion task comprised separate sentences. All the tasks were introduced to the child by a dog or a lion puppet, who sometimes 'forgot' to say a word in a sentence (oral cloze and sentence completion tasks) or 'mixed up' his words (sentence anagram task). The child had to supply the missing word or tell the puppet the correct way to say his sentences. In this session, the children were also given the Schonell test of single word reading and a test of verbal memory.

In the second session, the children were given an invented spelling task to examine mastery of the alphabetic code, and a measure of ability to use context to read unfamiliar words (contextual facilitation). This was done by taking the first consecutive ten words the child failed to read on the Schonell single word reading task, and giving them to the child to read embedded in meaningful sentences. In this way a measure of the number of words the child could successfully read in context, which she or he had not been able to read without context, was obtained.

The data were analysed using fixed order multiple regressions with either phonological skills or syntactic and semantic skills in session one as predictors, and either invented spelling or contextual facilitation in session two as outcome measures. The first four steps of the regression were the control measures age, IQ, vocabulary and verbal memory. The results showed that, as expected, performance on both of the phonological tasks in session one significantly predicted use of the alphabetic code in the invented spelling task in session two, but not success on the contextual facilitation task. Conversely, performance on all three of the syntactic tasks significantly predicted contextual facilitation, but not use of the alphabetic code in the invented spelling. These results were in spite of the stringent controls for age, IQ, verbal ability and verbal memory.

Thus Rego and Bryant showed that syntactic and semantic skills determine how well

children use context to decipher difficult words, while phonological skills make a quite independent contribution to a different aspect of literacy acquisition: use of the alphabetic code to represent sounds. Both are important for reading, but contribute to different aspects of the complex process of learning to read.

The two studies described above demonstrate that some combination of syntactic and semantic awareness play an important role in at least one aspect of learning to read: the use of context to decode unfamiliar words. What is not clear from this line of research is a) to what extent there is a connection between syntactic awareness and literacy development independently of semantic awareness, and b) whether grammatical awareness plays a role in the development of aspects of literacy other than the use of context to 'guess' difficult words in reading. In the next section, research investigating the role of another aspect of grammatical awareness, that is, morphological or morphosyntactic awareness, will be described in relation to the development of children's reading and spelling skills.

1.3.2. Morphological and morpho-syntactic awareness

The fact that many words in 'deep' orthographies such as English or French are not spelled the way that they sound does not mean that they are represented completely unsystematically. Instead, the spellings of these words often reflect morphology, or a combination of morphology and syntax, rather than phonology. For example, the spellings of the words 'know' and 'knowledge' are not predictable from phonology, but they are spelled similarly because they have a common root. The spelling of the morpheme 'know' is preserved in other words with the same stem, even if the phonology is not preserved (as in 'knowledge').

Some other morphemes indicate the grammatical status of a word, as opposed to its phonology. They represent a combination of morphology and syntax. An example in English is the 'ed' ending on regular past tense verbs. The 'ed' is pronounced as /t/ in

'laughed', /d/ in 'killed', and /id/ in 'wanted', but never as /ed/, at least not in modern English. The 'ed' ending distinguishes past tense regular verbs from irregular verbs ending in the same sounds (for example 'left', 'told') and from non-verbs ending in these sounds (for example 'except', 'field'). Another example of such a morpheme, though representing a far smaller grammatical category, is the 'wh' at the beginning of interrogatives (for example, 'what', 'who'). These are spelled with a 'wh' at the beginning because of their status as question words. How and when do children master these aspects of spelling which are dependent on grammar rather than phonology, and how is this mastery related to their awareness of the grammar of their language?

So far, there are only a few studies which have investigated the development of morphological representation in spelling. Levin and Korat (1993), for example, investigated representation of phonological, semantic and morphological structure in the emergent writing and reading of 64 Israeli preschoolers (aged four to six years). The children were asked to write pairs of Hebrew nouns, chosen to represent differences along three linguistic dimensions: phonology (length of the word in syllables), semantic content (singularity vs. plurality) and morphological complexity (mono- vs. bimorphemic words), and to read back what they had written. Representation of two inflectional morphemes marked by suffixes was analysed: plurality and feminine gender. Levin and Korat predicted that if preschoolers represented only the phonological structure of words, then they would write the longer sounding word in each pair with more signs, irrespective of meaning or the number of morphemes, and would judge the longer-sounding word to be the one written longer. If they represented the semantic content only, then they would write the word which denoted more or bigger objects with more signs, irrespective of sound length or number of morphemes, and judge it to be the one written longer. If they took the number of morphemes into account, then they would represent bimorphemic words with more signs than monomorphemic words, irrespective of semantic or phonological content, and judge these words to be written longer. They might alternatively take all three linguistic dimensions into account. Four kinds of word pairs

were chosen to test the above predictions, each manifesting congruence or incongruence between the phonological, semantic and morphological variations between the nouns. In the first category, 'plurality', there was congruence between all three of these variations; the longer-sounding word (phonology) represented more objects (semantic) and contained more morphemes (e.g. *etz/etzim* [tree/trees]). In the second category, 'collection', there was congruence between the phonological and semantic factors. The longer-sounding word represented more or bigger objects, and both words consisted of one morpheme (e.g. *etz/ ya'ar* [tree/forest]). In the third category, 'inverse collection', there was incongruence between phonological and semantic factors: the longer-sounding word denoted less objects, and both words consisted of one morpheme (e.g. *perach/zer* [flower/bouquet]). In the fourth category, 'gender', there was congruence between phonological and morphological structure: the longer-sounding word contained two morphemes due to the feminine suffix, while the shorter-sounding one contained one morpheme (e.g. *pil/pila* [elephant/she-elephant]).

Results showed that kindergartners (aged 5-6 years) showed a predominantly phonological orientation, while nursery children (aged 4-5 years) showed a mixed phonological-semantic orientation. Sensitivity to morphology was examined by contrasting the children's writings (which of the words in each pair was written longer) in the 'plurality' and 'collection' categories. In the plurality category, phonological, semantic and morphological cues coincided, whereas in the collection category, phonological and semantic cues coincided but no morphological difference was involved. Levin and Korat found a close to significant effect of category, suggesting that to some extent, the children represented morphological structure over and above phonological and semantic factors. This slight effect of morphology was supported by the spontaneous comments of some of the children about their writings of the two inflectional morphemes studied (plurality and feminine gender). However, only two children explicitly and repeatedly referred to morphological structure, for example, one of these children explained that a particular letter (H) had to be added for girls. This letter has no sound value, showing that the child grasped the suffix (H) as a morpheme for gender and not as standing for a particular sound, and the child even

overgeneralised this letter H to a feminine noun which has a different but common feminine suffix (YT). A further eighteen children made comments referring to the feminine or plural suffixes, although they did not explicitly note their function as a morpheme. When the children's recognition of the words they had produced was analysed for sensitivity to morphology (by comparing the number of correct judgements on the plurality and collection categories), there was no significant effect of category. The authors conclude that there is no effect of morphological structure on word recognition in this age group.

The study by Levin and Korat shows that even before formal literacy tuition has begun, a few preschoolers take morphology into account in their invented spellings, though they take phonology and semantics into account to a far greater extent. This study, however, was concerned only with emergent writing in very young children and not with the development of conventional morphological spelling in the orthographic stage which occurs later, once alphabetic representation of phonology has been mastered. There are a few studies which have looked at the development of morphological spelling in older children in the orthographic stage, once formal school literacy tuition has begun.

Nunes Carraher (1985) carried out a study of Brazilian schoolchildren's spellings of Portuguese morphemes which had two different possible spellings depending on the grammatical status of the word, but which sounded the same (for example the suffixes 'ice' and 'isse', the first of which is a derivational morpheme used in abstract nouns, and the second an inflectional morpheme for the subjunctive). She used a pseudoword technique in which children were asked to spell non-existing combinations of real stems and suffixes. Nunes Carraher found that younger children tended to fix on one spelling for the two morphemes and use it irrespective of the grammatical status of the pseudo-word, while older children tended to spell the morphemes appropriately, taking account of the grammatical category. The older children were thus able to use morphological information in their spellings but younger children were not.

Beers and Beers (1992) investigated children's spelling of English inflectional morphology. They wanted to know whether children of different ages systematically used morphological endings and whether the types and frequency of errors they made differed as they got older. They gave 116 U.S. children in first to sixth grade pseudowords to spell which were inflected for plural, past tense, and progessive '-ing'. Children were shown the spelling of the base (root) morpheme. Their spellings of the inflections were then classified according to whether the endings were spelled prephonetically, phonetically or correctly. Beers and Beers found that the children were systematic in the way they spelled the endings of the pseudowords, with younger children spelling them phonetically and older children consistently using morphological endings. Beers and Beers' use of the '-ing' suffix in their task unfortunately does not tell us for sure that its mastery reflects morphological understanding, because it is hard to see how else the children would spell it even when they are spelling phonologically, once they have learned the sound represented by the letter combination 'ng'. In fact, examination of the data reveals that even first graders made very few errors in spelling the '-ing' suffix. Nevertheless, in the case of the plural 's' and the past tense 'ed' their study shows evidence of an increase in morphological as opposed to phonological spelling, with age and schooling.

Totereau, Thevenin and Fayol (in press) extended Beers and Beers' work in their one-year longitudinal study of French six to ten year olds' acquisition of the written plural marker. They looked at children's understanding and production of the plural marker in written verbs as well as in nouns. In French, the plural for nouns and for verbs is rarely pronounced but is marked in the written form, for example 'il joue' (he plays) and 'ils jouent' (they play) are pronounced identically, as are 'chien' (dog) and 'chiens' (dogs). In the comprehension task, the child was shown two pictures, one showing a singular object, person or action, and the other showing the plural version. The child had to match a written word or phrase with the correct picture. In the production task, the child was shown one picture of a singular or plural object, person or action, was told a word or phrase describing the picture, and was asked to write it down. Totereau et al. found that the younger children had difficulty with the

morphologically based spellings. Later they began to process number markers in the comprehension task but did not use them in the production task. They seemed to be able to distinguish between singular and plural when two opposing pictures were presented (comprehension task), but not to be able to produce it in their writing when no conflicting situation was presented (production task). Only by the third grade of school were the children able to produce the plural markers correctly and systematically for both nouns and verbs.

The studies described above, while showing a progression with age from phonetic to morphological spelling, do not tell us how children make this progress to morphological spelling or how this progress is related to the development of grammatical awareness in oral language. Recently, however, a few studies have begun to address these questions.

Fowler and Liberman (1995) investigated the relationship between children's morphological awareness and their reading and spelling. They gave 48 seven to nine-year-olds two oral morphology production tasks. In the first task, the child had to produce the derived form of six base words by adding a common suffix. The base form was presented, and then a sentence was spoken by the tester in which the final word, the derived form, was missing (e.g Four. The big racehorse came in _____). The child had to supply the missing word. In the second task, the opposite transformation had to be performed: the base form had to be produced from the derived word (e.g. Fourth. When he counted the puppies, there were _____). In half of the items, the base form was phonologically unchanged by the suffix (e.g. four-fourth), and in half it was phonologically changed by the suffix (e.g. courage-courageous). The children were also given standardized tests of receptive vocabulary (PPVT-R), reading (word recognition and nonsense word decoding subtests of the Woodcock-Johnson Psycho-Educational Battery) and spelling (Test of Written Spelling, Larsen & Hammill, 1976). The results showed that scores on the morphological production tasks were significantly correlated with age, vocabulary, reading and spelling. Fixed-order hierarchical multiple regression analyses showed

that when even when age and vocabulary were controlled in the first and second steps, morphological production significantly predicted word recognition and spelling.

This study shows that there is a link between morphological awareness and spelling. However, the task used to evaluate spelling level was a general one, and did not look specifically at morphological spelling strategies. Furthermore, the criticism mentioned in an earlier section that cloze tasks confound semantic and grammatical demands (Gombert, 1992; Bowey, 1994) also applies to the sentence completion task Fowler and Liberman used. The child could have been using semantic knowledge rather than explicit morphological awareness to solve the task. Measures of morphological awareness are needed which do not also make these kind of semantic demands.

Smith (1987), reported in Derwing, Smith and Wiebe (1995) carried out an exploratory study to investigate the relation between morpheme recognition and spelling in 96 4th to 7th grade Canadian children. In the morpheme recognition task, the children were presented with 11 pairs of words, some of which shared the same root (e.g create - creature), and some of which did not (e.g.table - vegetable). The children were then asked whether they thought that the derived form of each word pair 'came from' the base form, and to explain why they thought so. In the spelling task, the children were asked to write the word pairs. The spelling tests for derived and base forms were given in separate sessions. For each pair, children who were consistent in their spellings of shared roots (e.g. know-knowledge; no-nolage) were compared with children who spelled the two roots inconsistently (e.g. know - nolage) for performance on the morpheme recognition task. Chi-square analyses showed an association between morpheme recognition and spelling performance (consistent vs inconsistent spelling) for most of the word pairs.

While both of the studies described above provide some evidence that there is a link between children's awareness of morphological relations in oral language and their spelling, they can not tell us how children make the transition from phonetic to morphological spelling. Does increased awareness of grammatical relations in spoken

language result in morphological spelling, or is it by noticing the phonological exceptions in spelling that children become explicitly aware of the grammar of their language? In a recent large-scale longitudinal study over three years, we (Nunes, Bryant, & Bindman, 1996, in press a, in press b; Bryant, Nunes & Bindman, in press b, in press c) investigated the relationship between children's growing grammatical awareness and their morphological spellings. We wanted to know how and when English children make the progression from phonetic to morphological spelling, and how this progression is related to their awareness of grammar. We had two alternative hypotheses about how children make this progression. The first was that children learn to use morphological spellings by noticing the phonological exceptions in written language and using their existing grammatical knowledge to find the explanations for these exceptions (an explanation which is internal to the learning of reading and spelling). The second hypothesis was that a morphological spelling strategy is the result of a developing grammatical awareness (an explanation which rests on a factor which is external to reading and spelling).

One main focus of the study was children's spelling of the 'ed' ending on past tense regular verbs. In total, 363 children aged six to eleven years, from four Oxford and four London primary schools, took part in the study. At the beginning of the study, they were six, seven and eight years old. In the first session, the children were given 37 words to spell, each given in the context of a sentence. 30 of these words were chosen to investigate the children's understanding of the 'ed' morpheme, and the other seven words were interrogatives. The 30 words relating to 'ed' ended either with the sound /d/ or /t/. They were further subdivided into the following three categories: past tense regular verbs ending in 'ed' (for example, 'laughed'), past tense irregular verbs (for example, 'left'), and non-verbs (for example, 'soft').

The children were also given three oral grammatical awareness tasks. These tasks were designed to test the children's grammatical as distinct from their semantic awareness. Specifically, we wanted to know how aware the children were of the distinctions between different parts of speech, and between the past and present tense, because

these were the aspects of grammatical understanding we expected to be most related to understanding of the correct use of 'ed' in spelling. Two of the tasks used an analogy technique, introduced to the child by two puppets. In the sentence analogy task, the first puppet 'said' a sentence involving, for example, a present tense verb (such as 'Tom helps Mary'), and the second puppet then said the same sentence but changing the verb to past tense ('Tom helped Mary'). Then the first puppet said an analogous sentence (for example, 'John kicks the ball') and the child had to tell the second puppet what he should say ('John kicked the ball'). The word analogy task was similar except that single words were involved instead of sentences, and the transformations the child had to make did not just involve past and present tense. Other transformations included for example, adjective to noun, noun to past tense verb, and verb to noun. These two tasks were designed to measure the child's explicit grammatical awareness. The third grammatical task was designed to measure implicit awareness, and used a technique developed by Berko (1958) involving pseudo-words. The child was shown a picture of a person doing something and given a description of the picture, using a pseudo-word in place of a verb, noun or adjective. This pseudo-word was given in two different forms in the description, and then an incomplete sentence was presented which the child had to complete using the correct form of the pseudo-word (for example, 'This is a person who knows how to mab. He is mabbing along the street. Yesterday he did the same thing. Yesterday he _____').

The children were also given a shortened version of the WISC-III verbal and performance tests, and the Schonell standardised tests of single word reading and spelling. The '-ed' spelling and oral grammatical awareness tasks were given again seven months and twenty months after the first session. Over the course of the study the age range covered was from six to nearly twelve years.

Both cross-sectional analyses comparing children with each other in each session, and longitudinal analyses of each child's progress over time showed an increase in the correct use of the 'ed' morpheme on regular past tense verbs, with age. In a more detailed analysis, we looked at the number of times children used 'ed' on each of the

three kinds of words given: past tense regular verbs, irregular past tense verbs, and non-verbs. On this basis, a five stage developmental model was developed to describe the sequence of acquisition of morphological spelling. In each of the three sessions described above, the children were assigned by computer to one of the five stages according to the way they spelled the endings. In the first stage were children who did not use any consistent strategy for spelling the word endings. We called this the pre-phonetic stage. In the second stage were children who consistently used a phonetic strategy to spell the endings, that is they used 'd' or 't' to represent the final sound on at least five of the ten past tense regular verbs, and put no more than two 'ed' endings on any of the words. This was the phonetic stage. In the third stage were children who put 'ed' on some words but did not recognize its grammatical significance. In this stage were children who overgeneralised the 'ed' ending to non-verbs such as 'soft'. The criterion for this stage was that the child should write at least three 'ed' endings and that one or more of these should be an overgeneralisation to a non-verb. Children assigned to the fourth and fifth stages were those who used the 'ed' ending consistently and recognised its grammatical significance. Thus these children restricted their use of 'ed' to past tense verbs. Stage four children, however, generalised the ending to irregular verbs whereas stage five children wrote 'ed' only on the past tense regular verbs. The criterion for both stages was that the child should produce the 'ed' ending at least three times but only on past tense verbs.

This five-stage model successfully accounted for more than 90% of the children in each session, and the average age and average reading age of the children in each stage was consistently higher than children at a less advanced stage according to the model. Longitudinally, the data showed that in subsequent sessions, the majority of children either stayed at the same stage or progressed to a higher stage in the model, with few backsliders (between 9% and 10% of the total number of children). It was concluded that there is a developmental sequence in which most children acquire the spelling of the 'ed' morpheme, in which children at first spell phonetically, then begin to use morphological strategy but without understanding its grammatical function, and later still grasp its grammatical significance and restrict it to past tense verbs.

How, then, do children come to make this progression? Taken alone, the evidence for the developmental model lends support to the internal hypothesis: that children first spell phonologically and gradually learn about the exceptions. It does not, however, exclude the possibility of the external hypothesis being correct, or the possibility that there is an interaction of internal and external factors. To examine the external hypothesis, that is, that it is children's grammatical awareness which determines their morphological spelling, the relationships between grammatical awareness as measured by the oral tasks, and spelling of the 'ed' morpheme were examined. Since the stages in the spelling model could not be treated as a linear, continuous variable, Discriminant Function analysis was used to see how well performance on the grammatical awareness tasks predicted membership of the five stage groups, once the extraneous variables age and IQ had been controlled. In each analysis, three steps were entered in fixed order: the first two steps were always the control measures age and IQ. The third step was the grammatical awareness score, and the outcome measure was stage group membership. Separate analyses were carried out for each of the three grammatical awareness tasks.

Within the first testing session, both the Sentence Analogy and Word Analogy tasks significantly predicted stage group membership, while Productive Morphology did not. The Sentence and Word Analogy tasks in this first session continued to predict stage group membership in the session which took place seven months later, and the Sentence Analogy was still a significant predictor of group membership in the session which took place twenty months after the first session. Thus there was a close relationship between scores on the tasks designed to measure explicit grammatical awareness and the spelling stages to which the children were assigned, both at the same time as the grammatical tasks were carried out, and seven months later. The Sentence Analogy task was predictive of spelling stage over nearly two years. In each case, these relationships were in spite of controlling for differences in age and IQ.

As well as the relationships between grammatical awareness and the stages in the spelling model, a further series of analyses was carried out in which the outcome

measure was a continuous variable: the number of times the child used the conventional 'ed' ending on past tense regular verbs, out of a total possible score of ten. This time, fixed-order multiple regression analysis was used, and, as with the Discriminant Function analyses, the first two steps in each analysis were always age and IQ as control measures, and the third step was one of the grammatical awareness tasks.

Within the first testing session, all three grammatical awareness tasks significantly predicted correct use of 'ed' on regular verbs, with the explicit measures (Sentence and Word Analogy tasks) predicting the most variance (5.1% and 2.6% respectively, $p<.001$, after the controls for age and IQ). These two tasks, given in the first session, but not the implicit pseudo-word task, also continued to significantly predict the number of 'ed' endings on past tense regular verbs in the two later sessions, seven and twenty months after the first session. This seems to suggest that it is grammatical awareness which determines children's later learning of the 'ed' spelling pattern. However, it is still possible that the causal relationship is the other way around, because many of the children were already using some 'ed' spellings in the first session. So, there is still the possibility that it is through learning the 'ed' spelling pattern that children become aware of the grammatical rationale. To control for this possibility, a further series of regression analyses were carried out in which the number of correctly spelled 'ed's on regular verbs in the first session was entered as a predictor variable. Thus, in these analyses, the first two steps were age and IQ, the third step was the number of correct 'ed's in the first session, and the fourth step was grammatical awareness (sentence or word analogy). The outcome measure was the number of correctly spelled 'ed's in the two later sessions.

The results were that despite this stringent control for correct 'ed' spelling in the first session, the Word Analogy task continued to predict the number of correct 'ed's seven months later, but the Sentence Analogy task did not survive the control. Neither task significantly predicted correct 'ed' spelling twenty months later. Nevertheless, the significant result for the Word Analogy suggests that grammatical awareness is

probably an important causal factor at least in the short term of seven months.

To test the possibility that there is an interaction between internal and external factors, the regression described above, with Word Analogy as the fourth step, was repeated but this time including an interaction term expressing the interaction between word analogy and 'ed' spelling scores as the fifth and final step. This interaction made a significant contribution to the variance in 'ed' spelling scores seven months later, providing evidence that these two aspects of children's learning, grammatical awareness and earlier spelling, work together in an interactive way.

In summary, the results of the study show, that between the ages of about six and eleven, children progress from a phonetic to a morphological strategy in spelling, and that this progression is linked to their developing grammatical awareness. There is evidence that the causal relationships between grammatical awareness and learning to spell morphemes work in both directions: learning to spell helps children to become aware of grammar and at the same time grammatical awareness helps children to spell morphemes. Thus learning about grammar and learning to spell are intimately connected, with each kind of knowledge enhancing the other.

Two recent studies have investigated the development of children's knowledge of another instance of a grammatically determined spelling pattern: the apostrophe to denote possession. The apostrophe in the -'s or -s' ending for possessives is a 'pure' instance of grammar, because it does not represent any sound. For example, the boat's sail and the boats sail have very different meanings, distinguishable only by the inclusion or lack of apostrophe, the distinction between the two being a grammatical one. Bryant, Devine, Ledward and Nunes (in press a) plotted the ability of 9 to 12 year olds to use apostrophes in possessives, and not to use them in non-possessive plurals. They carried out two intervention studies to find out if the child's use of apostrophes could be changed. In the first, they looked at the results of a short intervention on the children's use of apostrophes, and in the second, the children's explicit awareness of the relevant grammatical distinctions was also measured, and related to the children's use

of apostrophes before and after a successful intervention programme. 75 children from a London primary school took part in Study 1, from three year groups (Years 5, 6 and 7). The children were given a pre-intervention task and an identical post-intervention task which measured their ability to put apostrophes on possessive nouns but not on non-possessive nouns. In the intervention period, children in each Year group were divided into three intervention groups: (i) an experimental group, taught to use apostrophes with possessive but not non-possessive nouns; (ii) a taught control group, who were given the same amount of attention and linguistic experience as the experimental group, but were given no instruction about apostrophes: they were given the same material and in the same way, but taught to distinguish between homophones on the basis of their meaning; (iii) an untaught control group, who were given no instruction during the intervention period. The three groups were matched for spelling age as determined by the Schonell Graded Word Spelling Test B. Each of the experimental and taught control groups were taught as a group within each year, and the post-test was carried out one day later. The pre-intervention task, given to all children, consisted of 16 written sentences, each with a blank space indicating a missing word. Children were asked to write in the missing word, which, along with the whole sentence, was spoken aloud by the tester. Eight of the missing words were possessives ending in "-'s", for example, "the cup's handle has come off", and the other eight were plural nouns ending in "-s", for example, "The cups are empty". The meaning of each missing word was clear from the context of the sentence. Sentences were presented in a randomized, but constant order to all children. No explicit instruction was given to the children that the task involved apostrophes.

On another day, the experimental and taught control groups were given one 30 minute long period of tuition. In the tuition session given to the experimental group, the researcher discussed the apostrophe with the children, and that it can be used to show ownership. The children were then shown a series of ten pictures, each accompanied by a dictated sentence containing a key noun which was either a possessive or a plural (for example, "the market's fruit stall sells pears"). Two word cards were then shown, one showing the key noun in plural form (e.g. markets) and the other showing it as a

possessive (e.g. market's). The children were asked to decide which of the two cards showed the correct spelling of the key word. If a child in the group gave a correct answer, s/he was asked to explain it. If this was correct, the tester said so, and repeated the explanation. If it was incorrect, the tester gave a clear explanation and then gave the next sentence.

The taught control group were given the same 10 sentences, but this time the children had to choose between two homophones (for example, "pears" and "pairs"), and no apostrophes were involved.

Post-intervention, all 75 of the children were given the same task as during the pre-intervention period. The results showed that in both the pre- and the post-intervention, all the children wrote the key word with either an "-s" or an "-'s" at the end. The words were coded as correct if they were written with apostrophe for the possessive items, and in correct if written without, and vice-versa for the plural nouns.

Pre-intervention scores showed that in all the Year groups, the children had considerable difficulty in using the apostrophe appropriately. Year 5 children, who had not yet had formal school instruction about apostrophes used them very rarely, and assigned them to plurals as often as they did to possessives. The two older Year groups used apostrophe more often, and did use them more often with possessives than with plurals, but still often omitted them from possessives or wrongly put them on plurals. The post-intervention results showed that the experimental group who were in the older two Year groups benefited from the intervention, in that they put more apostrophes on possessives than in the pretest, and that they benefited more than did children in either the taught or the untaught control groups. However, their spellings of plural words did not improve, so while the intervention improved appropriate use of apostrophe, it did not decrease inappropriate use. It was concluded that the use of apostrophe for possessive nouns and not for non-possessive plural nouns is a source of great difficulty for this age-group, and that even a short intervention was successful in improving children's apostrophe use. It was not known, however, whether this

intervention was successful because it made the children more aware of the distinction between possessives and plurals, or whether the improvement was due to the children beginning to understand, as a result of the intervention, that this distinction which they already knew was indicated by the apostrophe.

In order to determine this, in Study 2 Bryant et al monitored the effects of intervention on the children's grammatical awareness as well as their use of apostrophes. This study set out to replicate the findings of the first intervention study, but also included a measure of the children's explicit awareness of the difference between plural non-possessive nouns and singular possessive nouns. 42 children in Years 5 and 6 (aged 9 to 11 years, and from a school in a different city) were divided into the same three training groups as in Study 1, and were given the same tasks as described for Study 1, except that eight new sentences were added in which the key word needed an apostrophe because it contained a contraction (for example, "What's your name?"). The children were also given two oral metalinguistic tasks designed to measure explicit awareness of possessive words and their distinction from non-possessive plural words. In the first task, an 'oddity' task, the tester read aloud three sentences, each containing a key word. One of these key words was a possessive and the other two were plurals, or vice-versa, for example, "Aeroplanes fly high", "Dogs are dirty", and "Mary's house is big". The child's task was to decide which sentence was the odd one out. In the second task, an 'analogy' task, the child had to transform a sentence involving ownership into a genitive phrase, or vice-versa, in analogy to a pair of sentences given by the tester (for example, "Mary has a red bicycle"... "Mary's red bicycle"; Bill has a blue book"..."Bill's blue book"). These tasks were given to answer two questions: firstly whether, pre-intervention, there is a significant connection between the children's ability to use apostrophes appropriately and their performance on metalinguistic tasks, and secondly, whether an improvement in the experimental group is accompanied by an improvement in performance on these tasks.

The pre-intervention scores for spelling of plurals and possessives were similar to those in Study 1, confirming considerable difficulty in this age group with the appropriate

use of apostrophe to denote possession. Post-intervention, children in the experimental group in both Year groups improved in their use of apostrophe for possessives, while children in the two control groups did not. The plural scores improved in Year 6 but not in Year 5.

An examination of the relationships between performance on the metalinguistic tasks and use of apostrophe showed a significant correlation (r=.49) between the children's performance on the analogy task and their use of apostrophe for possessive words, but not between performance on the oddity task and the score for possessives, and not between either of the two tasks and the plural score. Both tasks were correlated with the use of apostrophe for contraction. However, since these significant correlations could have been a result of a correlation between the children's possessive scores and their spelling age (as measured by the Schonell test), fixed-order multiple regressions were carried out in which age and spelling age were controlled in the first and second steps. The relationship between the analogy task and the children's use of apostrophe in possessives remained significant even after these controls, but neither task remained significantly related to the children's use of apostrophe for contractions. Bryant et al conclude that there is a link between children's use of apostrophes to denote possession and their explicit (metalinguistic) awareness of the distinction between possessives and other words.

Results of the intervention showed that although there was an improvement in scores on the metalinguistic tasks, this was similar for all three groups of children. It was therefore concluded that this improvement was probably due to a practice effect, and that improvement in spelling apostrophes did not have any effect on the children's awareness of grammar.

These results suggest that children's difficulties with the apostrophe to denote possession is due in part to a lack of grammatical awareness of the possessive case. The lack of improvement in performance on the metalinguistic tasks with improved use of apostrophe on possessives makes it unlikely that, alternatively, learning about

apostrophe improves awareness of the possessive case. However, as Bryant et al point out, further intervention studies, in which children's metalinguistic awareness of the possessive was improved, would be needed to establish the direction of such a causal relationship.

The other study (Bryant, Nunes, & Bindman, 1997)which has examined the relation between children's awareness of grammatical distinctions and their use of apostrophe to denote possession formed part of the large-scale longitudinal study described earlier. It was hypothesized that the connection between children's grammatical awareness and their morphological spelling would be a specific one; that is, that grammatical awareness would be a better predictor of children's learning the conventional spellings for morphemes than would phonological awareness, which has been shown to be connected in a specific way to children's learning of letter-sound relations (Rego & Bryant, 1993). This hypothesis contrasts with an earlier hypothesis, put forward by Bowey and Patel (1988), who claimed that linguistic awareness in general is related to children's progress with reading in general.

It was therefore predicted that children's grammatical awareness would predict later learning of the correct use of apostrophe, but phonological awareness would not. Children taking part in this study were given a Word Analogy task (described in an earlier section) in the first session and in a subsequent session seven months later. They were also given an oral test of phonological awareness in this subsequent session. This was a phoneme oddity task in which the child heard four words in each trial, three of which began with the same phoneme (half of the trials) or ended with the same phoneme (half of the trials) and one of which did not, and the child had to identify which word was the odd one out. In an even later session, 27 months after the beginning of the study, the children from the Oxford schools (n=152), who were by this time in Years 4, 5 and 6 (ages 8 to 11 years), were given an apostrophe spelling task similar to that given in the study by Bryant et al (in press a) described above. The children were asked to write in a missing word in each of 14 written sentences, which were read aloud by the tester. Seven of these words were possessives and required

apostrophes (e.g "the dog's tail is wagging"), and a further seven were non-possessive plurals and therefore did not (e.g. "the dogs are barking"). The same words were used in these two categories, to make sure the lists were comparable. Children were told that the task was to see whether they knew when and when not to use apostrophes. The youngest group of children, those in Year 4, had not yet received formal tuition at school on the use of apostrophe, while the children in Years 5 and 6 had.

The results showed that the children had great difficulty knowing when to use the apostrophe appropriately. An error analysis revealed that the vast majority of errors were omitting to put apostrophe in possessive words, and misplacing them in non-possessive plurals. A measure was calculated of the children's success with the same words in their possessive and non-possessive plural forms ('discrimination' score). One point was given for each pair of words in which the child put an apostrophe on the possessive but not the non-possessive form, with a maximum possible score of seven. To test the hypothesis that grammatical awareness would predict later success with apostrophes while phonological awareness would not, a series of fixed-order multiple regression analyses was carried out, in which the first three steps were age, IQ, and the child's standardised score on the Schonell reading test. This was to ensure that any relationship between metalinguistic awareness and success on the apostrophe task was not due to differences on these extraneous variables. The fourth and final step in each analysis was either phonological awareness or grammatical awareness. The outcome measure was the apostrophe 'discrimination' score.

The results of these regressions showed that scores on the Word Analogy task, as given in both the first and second sessions, both significantly predicted later success with apostrophes, in spite of the stringent controls for differences in age, IQ and general reading level. The phoneme oddity tasks (both beginning sounds and end sounds) on the other hand, were not related to scores on the apostrophe task. These results are in spite of the fact that the gap between first carrying out the grammatical task and the apostrophe spelling task (28 months) was much longer than that between the carrying out of the phonological awareness tasks and the apostrophe task (17

months).

It was concluded that there is a specific and long-lasting connection between children's grammatical awareness and their later success in learning how to use apostrophes. However, while the longitudinal results seem to suggest that grammatical awareness has a causal effect on later success with spelling apostrophes, we can not tell from this study whether the causal direction of the relationship might also be the other way round. It is possible that learning about apostrophes improves children's awareness of grammatical distinctions, as well as grammatical awareness improving success with apostrophe. The nature of this relationship could be examined in more detail by further longitudinal research and/or by intervention studies. These studies could examine the relationships between metalinguistic grammatical tasks which specifically test awareness of the possessive case, such as those described in the study by Bryant et al (in press a), and success with apostrophe. It may be that even stronger longitudinal predictions could be made than in this study, since the Word Analogy grammatical task used here involved transformations between parts of speech and between past and present tenses, but did not include any items examining awareness of possessives.

1.4. Conclusions

In this chapter it has been shown that there is a link between children's grammatical awareness and their progress in reading and writing, once they have mastered the relation between phonology and alphabetic representation. Most recently, research has shown a connection between morphological awareness and spelling, in children who have knowledge of one language.

How might the picture be different for children who have knowledge of more than one language? If children can transfer explicit awareness of grammar between their two languages, and if this can enhance their grammatical awareness of the first language, then might learning a second language in turn also help them to spell words whose

written forms have a grammatical basis? In Chapter Two, evidence for the ability of children with knowledge of more than one language to transfer metalinguistic knowledge from one language to the other, and the possible consequences for literacy development, will be reviewed.

CHAPTER TWO

TRANSFER OF LINGUISTIC AND LITERACY KNOWLEDGE ACROSS LANGUAGES

2.1. Introduction

In the introduction to this thesis, two hypotheses of first language acquisition were raised which have different consequences for second language acquisition. Under the first hypothesis, transfer of linguistic knowledge from one language to the other can only occur where specific structures and distinctions are similar in the two languages. Under the second hypothesis, transfer can occur even when the two languages appear dissimilar.

The first was put forward by Lado (1957) and was called the Contrastive Analysis Hypothesis. Differences between particular features of a learner's first and second languages were believed to lead to difficulty in L2 acquisition, because L1 knowledge would interfere with the L2. Many studies carried out in the 1960s compared pairs of languages to pinpoint the areas of difference which, according to the theory, would cause L2 learners to make errors (see Ellis, 1994, p307). However, later studies (e.g. Dulay & Burt, 1974a; Jackson & Whitnam, 1971) showed that contrastive analyses did not in fact account for or predict the errors which L2 learners really made.

Much more recently, Elman, Bates, Johnson, Karmiloff-Smith, Parisi and Plunkett (1997) have proposed that young infants can initially discriminate between all speech sounds which are relevant to all human languages, but as they get older, this capacity is progressively lost until only those sounds relevant to the native tongue are retained. For example, Japanese children gradually lose sensitivity to the /l/-/r/ distinction, because this is not a contrast in the Japanese language. This hypothesis implies that once the ability to make a particular discrimination is lost in the native language, the speaker will have difficulty in making it in a second language. Linguistic knowledge

will not be transferable from the native language to the second language where it exists in the second but not the native language.

Other researchers have focused on identifying the precise conditions under which transfer between languages is likely to occur or not occur (Ellis, 1994). One of these conditions or constraints is the level of language in question. At a surface level (for example, the sound system, the lexicon, and specific orthographic features) transfer has been found to be dependent on the degree of similarity or difference between languages. Where there is dissimilarity, transfer can result in interference. In this case, knowledge of one language is unhelpful for learning a second language. These surface-level features are specific to each language and must be mastered separately for each language. At a metalinguistic level, on the other hand, positive transfer has been found even between languages which differ greatly at a surface level. In this case, knowledge in one language or orthography can facilitate acquisition of another. In the next section, evidence for the language-specific nature of surface level knowledge will be briefly outlined. The third section of this chapter reviews studies which have investigated transfer of metalinguistic level knowledge between languages. The fourth section examines the evidence for cross-language transfer of literacy knowledge. The fifth and sixth sections deal with the narrower questions of whether transfer of metalinguistic knowledge depends on the way in which the second language is learned, and on the importance of the level of second language proficiency attained.

2.2. Transfer of surface-level linguistic knowledge

A number of studies have investigated transfer of surface-level knowledge, and the role of the difference between languages. For example, Purcell and Suter (1980) asked 14 native speakers of English to rate the English pronunciation accuracy of 61 non-native speakers on a subjective scale. The first languages of the nonnative speakers were Thai, Japanese, Arabic and Persian. They found that the judges' ratings of the subjects' pronunciation accuracy were highly intercorrelated, and that they rated the

Thai and Japanese speakers as less accurate than the speakers of Arabic and Persian. It seems that the greater the difference between the native language and L2, the less accurate the L2 pronunciation, although further study of a larger sample of languages would be needed to verify this.

Similarly, vocabulary learning has been found to be facilitated when L1 and L2 are similar. For example, Sjoholm (1976) found that Swedish learners of L2 English were better at learning vocabulary than Finnish learners of English, and attributed this to Swedish being more closely related than Finnish to English. Verhoeven (1994) investigated the relationship between L1 and L2 vocabulary in 98 six-year-olds whose L1 was Turkish and L2 was Dutch. He tested both receptive and productive vocabulary in each language. Using LISREL analysis in a longitudinal design, the results showed almost no interdependence between L1 and L2 lexical knowledge in any of the three phases of the study. Thus there is evidence that in dissimilar languages, vocabulary learning is independent for and specific to each language.

This independence has also been found for certain aspects of literacy acquisition. Geva and Siegel (1994) looked at transfer of cognitive skills and orthographic knowledge in children who were learning to read in English and in Hebrew concurrently. They tested the hypothesis that the development of reading skills in the two orthographies would vary as a function of 'orthographic depth', that is, characteristics specific to each orthography. Hebrew, when written with diacritic marks for vowels, is a 'shallow' orthography: there is a simple one-to-one correspondence between letters and sounds. English, on the other hand, is a 'deep' orthography: although it generally abides by the alphabetic principle, the relationships between letters and sounds are more complex. Geva and Siegel tested memory, word recognition and pseudoword recognition (a measure of decoding skill) in 245 children in grades 1 to 5. The children did both English and Hebrew versions of the tests. Geva and Siegel found that children could read more accurately in Hebrew, even though this was their second language. It took the children longer to master English word recognition and pseudoword decoding in the more complex English orthography than

it did in 'shallow' Hebrew. Though memory was a significant predictor of accurate reading skills irrespective of orthography, the errors children made in decoding were orthography-specific. Geva and Siegel concluded that while underlying cognitive skills (such as memory) play a significant role in the development of basic reading skills in both languages, script dependent processes are also important, and ease of acquisition depends in part on orthographic depth. At this surface level of literacy acquisition, that is, the mastery of specific characteristics of each orthography, L1 and L2 development are independent.

2.2.1. Conclusions

In this section we have seen that there is evidence from a number of sources that for various aspects of surface-level knowledge, transfer either does not appear to occur, or its occurrence causes interference. For these aspects of language, knowledge gained in one language does not help when learning another.

2.3. Transfer of metalinguistic-level knowledge

The hypothesis that despite surface level differences between languages, deeper level knowledge is transferable between languages, was put forward by Cummins (1979) as the 'linguistic interdependence hypothesis'. Since then, several investigators have researched this hypothesis in detail. In particular, attention has been paid to the metalinguistic abilities of bilingual children, and the effect of these metalinguistic abilities on literacy acquisition. These studies tend to use one of two kinds of design. One is to examine the relationships between various metalinguistic skills across children's two languages (within-subjects), and the other is to compare bilingual with monolingual children (between-subjects) to find out if knowing more than one language can hasten the development of metalinguistic awareness. The rationale for this prediction is that if there is linguistic interdependence, bilingual children will be

able to apply metalinguistic knowledge gained through one language to their other language, giving them an advantage over children who have only one language through which to learn metalinguistic concepts. A further possibility is that having two languages to compare and contrast may in itself help to bring implicit linguistic knowledge to an explicit (metalinguistic) level, and this explicit knowledge could then be used in both languages. In the next two subsections, studies which have concentrated on the aspects of metalinguistic awareness which have been shown to play a role in the development of literacy (see Chapter One) will be reviewed.

2.3.1. Phonological awareness

A few studies have set out to examine whether the ability to discriminate small components of spoken language is transferable between languages, and whether bilingual children perform better than monolinguals on tasks which require analysis and manipulation of these sounds. Verhoeven (1994) tested 98 six to eight year old children who spoke Turkish (L1) and Dutch (L2), on phoneme discrimination tasks in each language. Children had to judge whether pairs of words which differed in one phoneme were 'the same' or 'different'. Using LISREL analysis, Verhoeven found moderate interdependence between the two languages on this task. He concluded that metalinguistic skills such as these could be transferred between a child's two languages. However, according to Gombert (1992) metalinguistic-level phonological awareness involves 'identifying the phonological components in linguistic units and intentionally manipulating them'. In the phoneme discrimination task, children did not have to intentionally manipulate phonemes, just perceive them. Thus while there is evidence of interdependence between languages in the ability to discriminate phonemes, we still do not know from this study to what extent metalinguistic skill as defined by Gombert, and which has been shown to play an important role in literacy development, can be transferred across languages.

Durgonoglu, Nagy and Hancin-Bhatt (1993) measured phonological awareness in

Spanish (L1) and word and pseudoword reading in English (L2) in 31 first graders. Their phonological awareness tasks focused on phoneme, syllable and onset-rime units. The children were asked to segment words into these sound units, to blend isolated sounds into words, and to match pairs of words which began or ended with the same same sound or had the same sound in the middle. Durgonoglu et al. found that the children's level of Spanish phonological awareness predicted English word and pseudoword reading, tasks which require phonological analysis. They also measured word recognition in Spanish, and this too predicted performance on the English reading tasks. Since they did not measure phonological awareness in English, however, we do not know to what extent there is direct transfer of phonological awareness per se, as opposed to transfer of literacy skills which involve some phonological analysis. Durgonoglu et al. do report, though, that in some pilot work, they found a correlation of .76 between Spanish (L1) and English (L2) phonological awareness measures in second-grade children.

However, Gowing (1993) did not find a similar correlation. In her study she tested phonological awareness in both languages. She gave 30 bilingual seven to nine-year-old children oral phoneme oddity tasks in English and Italian. The task required children to analyse the beginning and end sounds of sets of simple words. The child was told a set of three words, two of which began (or ended) with the same sound and one which began (or ended) with a different sound. The child's task was to say which word was the 'odd one out'. Gowing found no cross-language correlation between performance on this task in English and Italian. Thus the ability to discriminate the component sounds of words in one language does not necessarily appear to transfer to the other language. Gowing suggested that the phonemic systems of English and Italian were too different for transfer of this kind of knowledge to occur from one language to the other. However, if this explanation is correct it is surprising, given the finding of Durgonoglu et al. of a correlation between Spanish and English, since it seems unlikely that the phonemic systems of Italian and English are so much more different from each other than the systems of Spanish and English that transfer cannot occur.

Gowing's result also conflicts with the findings of Rubin and Turner (1989). They hypothesised that children who could explicitly analyse the syllabic and phonemic structure of their second language would transfer this ability to their first language, and this would make children aware of the phonemic structure of their first language earlier than children who were only exposed to one language.They compared a group of 16 children in Grade 1 of a French total immersion programme (in which English-speaking children are taught entirely in French) with 16 children in a standard English-only programme, on an English syllable and phoneme deletion task, which was a modified version of the Auditory Analysis Test (Rosner & Simon, 1971). They found that the immersion children were more proficient at this task than their English-programme peers, and concluded that second language learning enhances metalinguistic awareness. In a later study, Rubin et al (1991) compared three groups of 15 first graders in partial French immersion, partial Hebrew immersion, and standard English programmes on the same syllable and phoneme deletion task. They were interested in whether phonemic awareness would be enhanced by second language learning even when exposure to the second language was more limited (partial immersion programmes teach children in their second language for approximately half the school day).They found that both French and Hebrew immersion groups of children were more proficient than their English programme peers on the syllable and phoneme deletion tasks, and concluded that even limited second language exposure can increase a child's metalinguistic awareness. This enhancement demonstrated in both the total and partial immersion studies suggests that the children were able to transfer phonological awareness from the second to the first language. However, this between-subjects design does not allow us to see if children are transferring phonological awareness in oral language per se across languages, or whether the bilingual advantage may be a result of transfer of alphabetic knowledge across languages. If, within languages, phonological awareness and alphabetic knowledge enhance each other, and transfer occurs at the level of alphabetic knowledge, then phonemic awareness in L1 would, indirectly, be enhanced. The possibility of transfer of alphabetic knowledge will be discussed in a later section.

2.3.1.1. Conclusions

As we have seen in the above section, there is some evidence for transfer of phonological awareness across languages, although this is not entirely clear-cut. On the one hand, Verhoeven (1994) has found transfer between Turkish and Dutch in the ability to discriminate phonemes. However, his tasks did not require children to manipulate phonemes. Pilot work by Durgonoglu found a high correlation between Spanish and English phonological awareness, and their main study showed that Spanish phonological awareness predicted performance on English reading tasks which involve phonological analysis. Gowing, on the other hand, found no transfer of phonemic awareness between Italian and English on a phoneme oddity task. The other studies reviewed found a bilingual advantage on tasks measuring phonological skills, but the design of these studies does not permit us to see to what extent this transfer is direct, and to what extent it occurs via growing literacy knowledge. However, in some cases at least, the ability to analyse the component sounds of spoken languages does appear to be a transferable skill.

2.3.2. Grammatical awareness

In parallel with the currently available research on literacy acquisition in one language, less is known about transfer between languages of the metalinguistic skills which are important in later literacy development, such as grammatical awareness. There are only a handful of studies which have looked at grammatical awareness in bilingual children. In these studies, grammatical awareness has been measured at the level of sentences rather than words. They have concentrated on children's ability to judge, correct or complete sentences for syntactic or morpho-syntactic acceptability. For example, da Fontoura and Siegel (1991) tested the linguistic interdependence hypothesis by examining syntactic awareness, phonological processing and working memory in a group of 37 bilingual Canadian English-Portuguese speaking children aged nine to twelve years. All children spoke Portuguese at home, and came from low

socioeconomic backgrounds. Children were instructed in English at school, but also had about half an hour of instruction in Portuguese reading and writing in a Heritage Program within the school. To measure syntactic awareness or 'grammatical sensitivity' they gave the children an oral cloze task in each language. The English task used was devised by Siegel and Ryan (1988), and consisted of 20 orally presented sentences, each of which had one word missing. The missing words varied in their syntactic function. Children were instructed to fill in the missing word, for example "Jane _____ her sister ran up the hill". The Portuguese task was adapted from the English version. Da Fontoura and Siegel found a significant correlation ($r=.63$) between performance on the English and Portuguese versions of the task. They conclude that syntactic awareness in the two languages is interdependent. However, we do not know from their study to what extent the cross-language correlation between the tasks is genuinely due to transfer of grammatical awareness and what may be due to age or other aspects of language ability, since they did not control for these in their analyses. Thus while there is evidence of interdependence, we do not know exactly what lies behind this interdependence. A further interesting finding of the study was that the oral cloze tasks were correlated with word and pseudoword reading tasks in the same but not the other language (r was between .33 and .35; $p<.05$), and with memory within and between languages. Da Fontoura and Siegel conclude that relationships between reading and syntactic awareness may be language-specific.

Geva and Siegel (1994) and Geva (1995) used similar oral cloze tasks to measure syntactic awareness in their studies of English-speaking children learning Hebrew as a second language, at bilingual English-Hebrew day schools in Canada. At these schools, half the day is spent on the standard English programme, and the other half is devoted to instruction of Hebrew language and Jewish cultural subjects (taught in Hebrew). A Hebrew oral cloze task was devised which was parallel to the Siegel and Ryan (1988) English task, with content and vocabulary based on the Hebrew curriculum. 91 normally achieving children in grades 2 to 5 were tested. A correlation of .46 ($p<.001$) was found between the English and the Hebrew tasks. Thus children

who were better able to identify the semantic and syntactic function of the missing words in English were also better able to do so in Hebrew, even though they were less proficient in Hebrew, and despite the dissimilarity between the two languages. In a further analysis, Geva (1995) partialled out the variance due to non-verbal ability, as measured by the Raven's Colored Progressive Matrices. The correlation between the oral cloze tasks in the two languages was almost unaffected by this partialling out ($r=.44$; $p<.001$). Thus underlying differences in non-verbal ability did not explain the correlation between syntactic skills in English and Hebrew, adding to the evidence for linguistic interdependence. Even so, because only nonverbal ability was partialled out, we do not know to what extent the correlation may be due to general verbal ability, as opposed to specifically grammatical awareness. In addition, we do not know to what extent the correlation can be explained by age, as this was not partialled out. Furthermore, as mentioned in Chapter One, Gombert (1992) has pointed out that cloze type tasks do not provide a pure measure of grammatical awareness, as semantic as well as syntactic and morpho-syntactic knowledge can be used to solve the task. In order to test transfer of grammatical as opposed to semantic awareness, a different kind of task would be needed which does not make semantic demands.

A rather different type of measure of grammatical awareness was used by Verhoeven (1994). 98 six-year-old Turkish children living in the Netherlands were given sentence imitation tasks in Turkish and in Dutch. In these tasks 24 sentences, in which a variety of grammatical morphemes and syntactic structures occurred, were presented orally, and the child was asked to repeat each sentence, one by one. Children did the tasks on three occasions: at the beginning of Grade 1, at the end of Grade 1, and at the end of Grade 2 (ages 6, 7 and 8). LISREL analysis showed that at the first testing session, there was a significant relationship between Turkish and Dutch performance (standardised path coefficient .25), but at the later two sessions, there was no significant relationship (standardised path coefficients .15 and .11 respectively). Verhoeven suggests that the significant result found at session one can be explained in terms of individual differences in short-term memory capacity, since sentence imitation tasks make a heavy demand on working memory. He concludes therefore

that at the level of syntax, cross-language transfer is limited. This finding conflicts with the findings of interdependence in the studies outlined above. However, Verhoeven did not expressly set out to measure metalinguistic level knowledge of grammar. While oral cloze tasks require that children produce a word, taking account of grammatical (and semantic) context, producing the correct part of speech and inflecting appropriately, sentence imitation tasks do not require that children intentionally analyse or manipulate syntax or morphology, merely reproduce it. The two types of task may be measuring morpho-syntactic skill at two different levels of language: the oral-cloze at a metalinguistic level, and the sentence imitation at the level of specific knowledge in each language. If this is true, it could explain the lack of interdependence on this task between Turkish and Dutch, which at a surface level are very dissimilar languages.

Other studies looking at grammatical awareness in bilingual children have used grammaticality judgement tasks. For example, Bialystok (1987) conducted 3 studies, each involving about 120 children, approximately half of whom were bilingual. Each study had a between-subjects design. In studies 1 and 2, children were in Kindergarten, Grade 1 and Grade 3 (5, 7 and 9 years old respectively). In study 1, the bilingual children came from homes in which English was not spoken, and there were a variety of home languages. In study 2, the bilingual children were English-speaking and were enrolled in French immersion programmes. In study 3, the children were in Grades 2 and 3 (8 and 9 years old), and again, there were a variety of native languages amongst the bilinguals. Bialystok compared the performance of the bilingual children with the monolingual children in the same grade. Children were asked to judge or correct sentences for their syntactic acceptability, irrespective of meaningfulness. This instruction was explained by a puppet, who told the children to tell him if 'he said the sentence the right way' and that it was 'fun to be silly', to indicate to the child that only grammaticality and not meaning was to be judged. There were four types of judgements: meaningful sentences which were grammatical, meaningful sentences which were ungrammatical, meaningless sentences which were grammatical, and meaningless sentences which were ungrammatical. An example of a grammatical,

meaningful sentence was 'Why is the dog barking so loudly?'. A meaningful but ungrammatical sentence was, for example, 'Why the dog is barking so loudly?'. A meaningless but grammatical sentence would be 'Why is the cat barking so loudly?', while a meaningless and ungrammatical sentence would be 'Why the cat is barking so loudly?'.

Metalinguistic awareness was conceptualised as comprising two components: analysis of linguistic knowledge, and control of linguistic processing (Bialystok & Ryan, 1985). Analysis of linguistic knowledge was defined as "the ability to construct explicit representations of linguistic knowledge", while control of linguistic processes was "the ability to control linguistic processes by intentionally selecting and applying knowledge to arrive at a solution". Bialystok hypothesised that bilingualism would promote control of linguistic processing, but not analysis of linguistic knowledge, because the experience of differentiating between two languages involves control but not necessarily explicit analysis of language. She further hypothesised that biliteracy, on the other hand, would promote analysis of linguistic knowledge, because written language makes explicit linguistic principles which are not necessarily evident in spoken language.

In the task, a high demand for control of linguistic processing was operationalised in terms of solving the problem under conflicting conditions, that is, when grammaticality was incongruent with meaningfulness. A high demand for analysis of linguistic knowledge was operationalised in terms of correcting grammatical structure and of detecting ungrammatical, as opposed to grammatical, sentences. The sentences demanding the highest level of control were purported to be those which were grammatically correct but not meaningful, because the child must attend to the correct grammaticality while ignoring the anomolous meaning. Bialystok found that bilingual children in all three studies judged these items more accurately than did monolingual children. The sentences requiring the greatest levels of analysis of linguistic knowledge were purported to be those which were meaningful but not grammatical. The assumption underlying this was that the intact meaning does not create much

distraction, so the problem is to have enough analysed knowledge to recognise the grammatical error.

In studies 1 and 3, the results showed that monolingual children were better at judging this type of item than bilingual children. Bialystok points out that this may have been because the bilingual children were doing the task in their second language, although this had not seemed to affect their performance on the high control items. In study 2, in which children were doing the task in their first language, and were also biliterate in English and French, monolingual and bilingual children performed similarly on these items. Bialystok concludes that on some metalinguistic tasks (involving high levels of control), bilingualism exerts a facilitating effect, while on others (involving high levels of analysis), it may cause disadvantage. Biliteracy, however, may have the effect of increasing level of analysis of knowledge relative to bilingual children who are not biliterate, and possibly also relative to some monolingual children.

There are several problems with this study. One problem lies in the nature of the tasks Bialystok used to measure grammatical awareness. Firstly, grammaticality judgement and correction tasks have been criticized as tests of metalinguistic awareness. Gombert (1992, p.189) suggests that these tasks do not make metalinguistic (i.e. conscious) demands but rather 'epilinguistic' (unconscious) ones. Detecting ungrammatical utterances, he suggests, may depend on two factors: firstly, the child's awareness that the utterance is dissonant, and secondly, the child's inability to understand the utterance, that is, "the impossibility of retrieving from memory a linguistic organization which is capable of activating a representation in a context comparable to the present one". Thus for Gombert, grammaticality judgement tasks do not necessarily require metalinguistic awareness in order to be successfully carried out.

Furthermore, Carlisle and Nomanbhoy (1993) have pointed out that judgement tasks in which the child has to give a yes/no answer do not allow us to know if the results reflect problems understanding the task, and/or a tendency to respond with one

answer more than the other. It is not possible from the judgement scores to tell what the children were thinking or what they knew about the sentences they were judging. A further problem, as with the cloze tasks used by other researchers, is that it is impossible to tell to what extent the ability to correct is due to grammatical as opposed to semantic awareness.

An additional criticism of these tasks is that it is questionable to what extent giving children meaningless sentences to judge really measures their grammatical awareness, given that their actual experience of language is not of meaningless constructions but rather the opposite. The instruction 'it is fun to be silly' may not be adequate to convey to the child what it is she or he is expected to do. In fact, if it is 'fun to be silly', then from the child's point of view, the sentences which were given as grammatical may have been acceptable on grounds of silliness being allowed, and not because the child did not detect the grammatical error. Furthermore, the ungrammatical sentences which Bialystok describes involve a minor word order violation, but it is not clear what other aspects of grammar are covered in the task.

A further problem with the study lies in the validity of the distinction between 'analysis' and 'control'. Menyuk (1985), cited in Gombert (1992, p.179), argues that these two dimensions of metalinguistic awareness as differentiated by Bialystok in fact cannot be independent of each other. This is because, argues Menyuk, the analysis of linguistic knowledge is a prerequisite of the control aspect of processing: the child must be aware of the structural characteristics of language before he or she can deliberately control them in linguistic processing. The converse of Menyuk's criticism could also be argued: the child must be able to control his or her processing, that is, to deliberately consider the aspects of language which are relevant for solving a given problem, in order to then be able to analyse them. In any case, in practice it seems difficult to separate out the two aspects of processing, and it is not clear to what extent it is useful to do so. Tasks such as the grammaticality judgements used in Bialystok's study, like other tasks used to measure metalinguistic awareness, seem to involve both aspects of processing rather than two separable components.

A further problem with the study lies in the variety of languages spoken by the bilingual children in Studies 1 and 3. Though for the purposes of the study these children were grouped together, this may be a heterogeneous group, making it difficult to know whether the results are due just to bilingualism.There may have been factors affecting their performance on the L2 grammatical tasks other than bilingualism per se, for example, the level of L2 proficiency, socio-economic factors, and cultural language practices. Although Bialystok acknowledges that social class and language background have been found to be relevant in determining performance on metalinguistic tasks (e.g. Cummins, 1976), no information on these variables was provided in the study and no attempt to control for them was made.

Bialystok's claim that biliteracy may have the effect of increasing level of grammatical awareness relative to bilingual monoliterate children is an interesting one. However, in this study, literacy knowledge was not measured in any of the groups, in either of the languages, so the precise role of biliteracy is still unclear. It is possible that the difference in the results of the bilingual/biliterate and bilingual/monoliterate children is due to factors other than biliteracy. It seems likely that there were socio-economic differences between the groups, since the bilingual/monoliterate children were presumably from immigrant families, whereas the bilingual/biliterate children who were enrolled in French immersion were likely to have been from more privileged backgrounds. Furthermore, the bilingual/monoliterate group were being schooled in the language of the dominant culture (i.e. English) but spoke a minority language at home, whereas the bilingual/biliterate group spoke the language of the dominant culture at home. The relative status of first and second languages has been found to be a determining factor in the positive or negative effects of bilingualism (e.g. Skutnabb-Kangas and Toukomaa, 1976). Nevertheless, Bialystok did find that the bilingual children in all the studies performed better than the monolinguals on some items (the 'high control' items) in spite of these possible social factors. Thus there is some evidence that bilingualism can enhance grammatical awareness.

To sum up, Bialystok's study gives some evidence that bilingual children can perform

better than monolingual children on certain linguistic tasks. However, future research needs to use a different kind of task than grammaticality judgement and correction. These tasks need to be meaningful to the children and to require more than a yes/no judgement, to ensure that it is clear to the child what it is she or he is required to do, and that it is really grammatical awareness that is being measured. This research also needs to use tasks which measure the child's grammatical awareness as distinct from semantic awareness. In addition, care needs to be taken to ensure as far as is possible that the differences between bilingual and monolingual groups, and biliterate and monoliterate groups, are due to bilingualism or biliteracy alone and not other factors such as the particular languages in question, or social and cultural factors.

Galambos and Goldin-Meadow (1990) used a similar type of task to Bialystok's, although they also asked children to explain the errors in sentences. They compared the performance of 32 children bilingual in Spanish and English with that of 32 monolingual Spanish speaking children and 32 monolingual English speaking children. Children in all groups came from middle class backgrounds. There were three age groups: pre-kindergarten, kindergarten and Grade 1 (ages 5, 6 and 7 respectively). The task consisted of 15 ungrammatical sentences and 15 grammatically correct 'filler' sentences. Children were instructed to note whether the constructions were correct or not, correct any errors, and explain why any errors were incorrect. These three tasks were assumed to measure three levels on a continuum of metalinguistic awareness, increasing in the extent to which they require explicit versus implicit knowledge. Galambos and Goldin-Meadow suggest that learning to differentiate between two language codes necessarily entails extensive attention to the form of language. Thus they hypothesize that the bilingual experience should enhance the development of metalinguistic abilities in young children, compared to the monolingual experience. Results showed that bilinguals noted more grammatical errors than monolinguals in Spanish (L1) and the same number in English (their L2, in which they were less proficient than monolinguals). At the level of corrections, pre-kindergarten bilingual children produced more grammar oriented-corrections for the errors they noted than monolinguals, in English and in Spanish. At this level, the monolinguals' corrections

were relatively content-oriented rather than grammar-oriented. It should be noted, however, that in each of these pre-kindergarten groups, there were only seven children. There was no difference between bilinguals and monolinguals at the level of explaining errors. Galambos and Goldin-Meadow conclude that the experience of learning two languages hastens the development of these metalinguistic skills in young children, at the level of detecting and correcting errors.

2.3.2.1. Conclusions

In this section we have seen that there is some initial evidence that some aspects of grammatical awareness may be transferable between languages, and that children with knowledge of more than one language may have an advantage over their monolingual peers on tasks which are designed to tap this awareness. However, this is an area of research which needs investigating further. There are a few problems with the kinds of research done so far. The first of these lies in the kinds of tasks used. Judgement tasks do not allow us to know what the child knows about the aspect of language they are judging. These tasks, as well as correction and cloze tasks, confound syntactic and semantic factors so that it is impossible to separate out performance reflecting grammatical and semantic awareness. A second problem is that in the studies which have found correlations between grammatical tasks across languages, no control has been made for other aspects of language ability, so that it is not possible to know to what extent the correlation is due to transfer of grammatical awareness and what may be due to general language ability.

A further limitation of the research so far is that grammatical awareness has only been investigated at the sentence (syntactic) level. Cross-language transfer of morphological knowledge has not yet been directly examined. Given the growing evidence for a role for morphological knowledge in literacy development, this is an important area for research.

2.3.3. Transfer of literacy knowledge between languages and orthographies

So far, this chapter has focused on studies which have looked at cross language transfer of the kinds of metalinguistic knowledge in oral language which are linked to literacy acquisition. However, several researchers have also examined cross-language transfer of children's literacy skills in a more direct way. The bulk of this research has investigated the skills involved in the early stages of reading and/or spelling in alphabetic scripts, with the focus on the phonological awareness needed for decoding. Transfer of the kinds of knowledge involved in the later stages of reading and spelling, such as morphology, have not yet been examined. Therefore, the studies reviewed here are those concentrating on phonological analysis and decoding in alphabetic scripts.

Wagner, Spratt and Ezzaki (1989) looked at the relationship between reading achievement in Arabic and French, in a longitudinal study of Moroccan children who spoke Berber or Moroccan Arabic as a first language. These children learned French as a second or third language. At the beginning of the study, the 166 children were in first grade, and French instruction was begun in the third grade. Regression analyses were carried out to assess the impact of various background variables (SES, Quranic preschooling, sex, language background, cognitive ability and parental literacy) and Arabic reading skills on French reading ability. The results of these analyses showed that each year of Arabic reading ability explained a significant portion of the variance in the French reading score in year 5, even when all the background variables were controlled. Further analyses examined the impact on French reading of Arabic reading subskills (letter knowledge, recognition of single words, word decoding, and reading comprehension of sentences and paragraphs). These analyses showed that of the subskills, Year 1 Arabic word decoding skill was by far the best predictor of beginning French reading ability. Arabic and French scripts, though both alphabetic, differ in their form and in reading direction. Wagner et al conclude that knowledge of alphabetic decoding can be transferred across languages even though the two orthographies differ in these ways. They also noted that while first and second literacies were correlated at the beginning of second literacy learning (at Year 3 r=.55), the magnitude of the

correlation became greater as proficiency in both literacies was gained (at Year 5 r=.64). The reason for this is not clear. It could be that transfer of literacy knowledge is not limited to alphabetic decoding, which is likely to be important only at the earlier stage of literacy learning. One possibility is that at the later stage of reading proficiency, transfer of morphological awareness occurs between the languages. However, further research is needed to explore this possibility.

Hebrew script, like Arabic, differs from the Roman script in both form and reading direction. Geva, Wade-Woolley and Shany (1993) investigated the acquisition of reading and spelling skills in a longitudinal study of 45 first and second grade Canadian children learning to read and write in English (L1) and Hebrew (L2) concurrently. They gave the children tasks measuring English vocabulary, English phoneme segmentation (Rosner & Simon, 1971), English and Hebrew phonological recognition (identifying which of two pseudowords in a stimulus pair 'sounds like a real word', for example 'joak-joap'), and Hebrew and English visual word recognition (identifying which of a pair of words is spelled correctly, for example 'rain-rane'). They also gave them tests of English and Hebrew word recognition (the English version was a standardised test), English and Hebrew pseudoword decoding, and English and Hebrew spelling. The words in the spelling tasks reflected various aspects of the English and Hebrew orthographies (such as morphological endings and long vowels in English, and irregularities in Hebrew). Geva et al found that within languages, reading and spelling tasks were highly intercorrelated (r was between .57 and .82) in the first grade, and across languages there were high correlations between Hebrew spelling and English reading measures (r was between .57 and .72). On the other hand English spelling correlated only moderately with Hebrew word recognition and pseudoword measures (.39 and .44 respectively). This result may be because the children were able to use their knowledge of the phonologically regular Hebrew orthography to help them decode English words and pseudowords. English spelling, on the other hand, requires a more complex knowledge of the English orthography than just phonological and alphabetic knowledge, and thus knowledge of the regular Hebrew orthography would be of no use to children for spelling English words. Much of the complexity of the

English orthography is due to the fact that it represents morphology as well as phonology. It is possible that knowledge of Hebrew morphology, rather than Hebrew alphabetic knowledge, would be related to these children's spelling knowledge of morphologically complex English words. This is a subject for further research.

A further finding of Geva et al's study was that in Grade 1, the English phoneme segmentation task correlated highly with word and pseudoword reading in English, and significantly but more moderately with the parallel Hebrew reading tasks. In Grade 2, the correlations between English phoneme segmentation and the English reading tasks dropped, but in Hebrew stayed about the same. Geva et al suggest that this is because in Hebrew reading (when it is written with vowel markings included), phonological skills are the key. In English, on the other hand, phonological skills are necessary but not sufficient for reading, given the complexity of the English orthography.

They also carried out regression analyses, to determine the relevant predictor variables of reading and spelling in the two languages. Stepwise regression analyses showed that in Grade 1, phonological skills (as measured by the phoneme segmentation and Phonological Recognition tasks) significantly explained the variance in those reading tasks that had a high phonological demand, that is, pseudoword decoding in both languages and word recognition in Hebrew. English word recognition was predicted by the Visual Recognition task. Geva et al suggest that this is because success in English word recognition requires not only phonological skill, but recognition of specific visual patterns. By Grade 2, Hebrew spelling and reading were predicted mainly by the Phonological Reading task, whereas English spelling and reading tasks were mainly predicted by the Visual Recognition task. However, success in the recognition of English words which are not phonologically regular is not only dependent on the recognition of specific visual patterns. As discussed in Chapter One, although English words are often not phonologically regular, this is not to say that they are not regular in other ways, such as morphology. If recognising specific visual patterns were the only way in which children could read words which were not phonologically regular, then learning to read and spell in English would be very inefficient. Given the

complexity of the English orthography and the results of Geva et al's study, it seems clear that in order to fully investigate the transfer of literacy skills across the two languages after children have grasped basic alphabetic decoding, it is necessary to look to the kinds of knowledge which are important for English spelling other than phonological skills, such as morphology.

In his longitudinal study mentioned in previous sections, Verhoeven (1994) gave word reading tasks to 98 Turkish children who were learning Dutch. 74 of the children were enrolled in Dutch (L2) submersion, with additional Turkish (L1) instruction for three hours a week. 25 children were enrolled in transition programmes where literacy was taught first in Turkish, and subsequently in Dutch as a second language. Thus for the first group of children, Verhoeven was examining transfer of literacy skills from L2 to L1, but for the second group, from L1 to L2.The word reading tasks in each language consisted of three word lists, consisting of three types of words: CVC patterns, words with consonant clusters, and bisyllabic words. The score on the task was the number of words in each list read in one minute. LISREL analysis showed that, for the children in the Dutch submersion programme, there was a high degree of transfer of reading skills acquired in Dutch to comparable skills acquired in Turkish (standardised path coefficient .86). For the children in the transitional programme, in which they learned to read in Turkish first, there was also a high degree of transfer: the coefficient was .82. Verhoeven concluded that transfer of literacy skills can occur both ways, from L1 to L2 or from L2 to L1, depending on which is learned first. This means that learning a second language may help children with certain first language skills.

Rubin and Turner (1989), in a study referred to in a previous section, compared the reading and spelling skills of 16 first grade children in French immersion programmes with 16 first grade children in standard English-only programmes in Canada. They gave them reading and spelling tasks which included orthographically regular and irregular real words, and regular non-words, in English. They hypothesised that the French immersion children would perform the same as the English-only children on all the tasks, despite having had no formal instruction in English reading and spelling,

because they would transfer their knowledge of French reading and spelling to English. They found that the groups did not differ when reading orthographically regular real words and non-words. Thus there was evidence of transfer of reading skills acquired in French, to English. English programme children, however, performed better than their French programme peers when reading orthographically irregular English words, presumably because of their greater experience of the English orthography.

In a later study, also mentioned in a previous section, Rubin et al (1991) compared the reading skills of first graders in partial French immersion, partial Hebrew immersion, and a standard English-only programme. There were 15 children in each group. The children read orthographically regular and irregular words and regular non-words in English. Rubin et al found that there was no difference between the groups in performance on the irregular word reading, but Hebrew partial immersion children performed better than either of the other two groups on non-word reading, and better than English-only children on orthographically regular real words. Thus there was evidence of transfer of literacy knowledge from Hebrew to English, despite the different alphabets. As mentioned in an earlier section, both partial immersion groups were better than the English-only controls at phoneme and syllable segmentation. This advantage did not however, result in a significant advantage over controls on the word reading tasks for the French immersion children. Therefore it is not awareness of the internal structure of spoken words alone which accounts for the Hebrew immersion children's advantage in reading, because on the phonological awareness tasks, French immersion children had done better than monolingual controls. Rubin et al offer two main explanations for the Hebrew but not the French advantage. Firstly, vowelled Hebrew is phonologically more regular than French or English, and the children may be transferring their knowledge of Hebrew reading to English. Secondly, the fact that French and English use the same alphabet but have two sets of orthographic rules may result in interference which would not occur between Hebrew and English, which use different alphabets. A further explanation may lie in the different teaching methods used in the three programmes, which were not controlled in the study. Rubin et al's second explanation, however, does not square with Rubin and Turner's (1989) result

described above, since if the different sets of French and English orthographic rules interfered with each other, then we would expect the French immersion children to have been at a disadvantage when compared with English-only children, when reading the phonologically regular English words. Instead, Rubin and Turner (1989) found that the French immersion children performed just as well as the English-only children despite their lack of instruction.

Transfer of knowledge from a more regular orthography to English has also been shown by da Fontoura and Siegel (1991). They found that reading disabled children bilingual and biliterate in English and Portuguese scored higher than monolingual English reading disabled children on English pseudoword reading and English spelling. They suggest that this might reflect a positive transfer from the more regular grapheme-phoneme conversion rules of Portuguese.

2.3.4. Conclusions

The previous section has shown that there is strong evidence for children's ability to transfer literacy skills from one language to the other in the early stages of alphabetic reading and spelling, even when the languages use different alphabetic scripts (Figure 2.1.). It seems that once children understand how one alphabet works, they can apply this knowledge to another alphabet, even if the specific features of one alphabet are very different from those of the other alphabet.

Figure 2.1. Literacy knowledge in one alphabetic orthography is transferable to another alphabetic orthography

There is also some evidence that children can transfer their phonological analysis abilities from language to language (Figure 2.2.), though this evidence is not unequivocal. A few researchers have found correlations between phonological awareness in one language and in the other, and concluded that children can transfer their awareness of how one's language can be broken down into its constituent sounds to another language. On the other hand, this correlation was not found by Gowing (1993).

Figure 2.2. Metalinguistic awareness of phonology is transferable across languages

Some researchers have also found (e.g. Durgonoglu et al., 1993) a connection between phonological awareness in one language and literacy in the other (Figure 2.3.). Thus children are apparently able to use phonological knowledge gained through one language for literacy in another language.

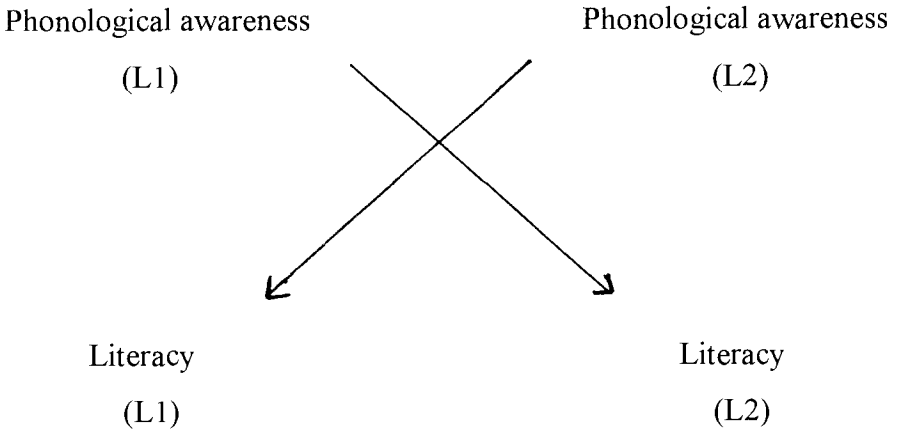

Figure 2.3. Phonological awareness in one language can be used for literacy in the other language

In previous sections of this chapter, we saw that there is preliminary evidence that children can also transfer metalinguistic knowledge of grammar between languages, and that learning a second language can improve explicit awareness of L1 grammar. Chapter One described the evidence that grammatical awareness plays an important role in children's progress in reading and spelling during what Frith (1985) has called the orthographic stage. Might the cross-language relationships observed for phonological awareness and between phonological awareness and literacy also occur for grammatical awareness, and between grammatical awareness and the aspects of reading and spelling which require grammatical knowledge? This question is the subject of the present study. In the study, I set out to determine whether children with knowledge of more than one language can transfer metalinguistic awareness of grammar across languages, and whether this can in turn aid the development of morphological awareness and morphological spelling. The focus is on whether learning a second language can improve metalinguistic awareness of grammar and spelling in the first language. Two possible constraints on cross-linguistic transfer of metalinguistic knowledge are now briefly considered: the level of L2 proficiency necessary for transfer to occur, and the effects of culture-specific language and literacy practices of the second language.

2.4. Does transfer of metalinguistic knowledge between languages depend on the level of L2 proficiency attained?

Alongside his 'linguistic interdependence' hypothesis, Cummins (1979) put forward a further hypothesis. This was called the 'threshold hypothesis' and was put forward in an attempt to explain the apparent inconsistencies in early bilingual research, some of which suggested that bilingualism had detrimental effects on academic progress, and some of which found beneficial effects. The 'threshold hypothesis' states that there may be threshold levels of linguistic competence which the bilingual child must attain in order to a) avoid cognitive disadvantages of bilingualism, and b) allow the potentially beneficial aspects of bilingualism to influence cognitive and academic functioning. The assumption is that the aspects of bilingualism which might positively influence cognitive growth are unlikely to come into effect until the child has attained a certain minimum or threshold level of competence in a second language.

The threshold hypothesis has some support from studies of the interdependence of children's metalinguistic skills. For example, Bialystok (1988) gave two metalinguistic tasks designed to tap explicit analysis of linguistic knowledge in English to 3 groups of six to seven-year-olds: 20 monolingual English-speaking children, 20 partially French-English bilingual children, and 17 fluently French-English bilingual children. She hypothesised that bilingual children who were fully competent in both languages would be more advanced than monolingual and partially bilingual children on these tasks, because only advanced knowledge of a second language would involve enough experience of analysing this L2 explicitly, and without this experience there would be nothing to transfer to L1. One of the tasks tested the children's understanding of the abstract concept of a word. The children were asked to judge whether 10 words and phrases were words or not, to justify each response, and to define a word. In the other task, children had to correct 12 sentences which had grammatical errors. Bialystok found that on the word concept task, there was no difference between the groups for the judgement problem, but for definitions, the fully bilingual group scored higher than the monolinguals. The partial bilinguals did not differ from monolinguals. On the

grammatical correction task, the fully bilingual group scored higher than the other two groups. Thus where there were differences between the groups, the fully bilingual group scored the highest and the monolingual group the lowest. For these kinds of task, whether there is a bilingual advantage or not appears to depend on the level of L2 proficiency.

Yelland, Pollard and Mercuri (1993) also used a word concept task, but they gave it to Australian children who had very limited exposure to a second language. These children had had one hour of Italian instruction a week for six months at the time of testing. The task was given to four groups of children: 14 'marginally bilingual' and 14 monolingual children in the preparatory year of school, and similar groups in the first grade. The task consisted of four kinds of word stimuli: little objects whose name was a little word (e.g. ant), little objects whose name was a big word (e.g.caterpillar), big objects whose name was a big word (e.g. hippopotamus), and big objects whose name was a little word (e.g. whale). The child was shown a picture of the object and had to decide whether the name of the object was a big word (a word which took 'a long time to say') or a little word (a word which took 'very little time to say'). This design enabled the researchers to see whether the child could separate the object's attributes and the word's attributes, that is, whether they based their judgements on word size rather than object size. Yelland et al. found that while there were no differences between marginal bilinguals and monolinguals during initial testing (when the children had only been exposed to Italian for a total of three hours), by the second time of testing, when the children had been learning Italian for six months, the marginal bilinguals performed more accurately that the monolinguals on the task. Yelland et al concluded that even minimal exposure to a second language can enhance children's metalinguistic awareness. This finding conflicts with that of Bialystok (1988), outlined above. However, it is likely that the level of L2 proficiency necessary depends on the type of metalinguistic task involved. The more demanding the task, the greater L2 proficiency would need to be in order to benefit L1 awareness. In Yelland et al's study, the task demanded only that children recognize that the name of an object is distinct from the properties of the object itself. Yelland et al. suggest that their L2 learners

could gain in word awareness merely by recognising that there are two separate language systems which can represent the same set of concepts. In Bialystok's study, the word awareness tasks were perhaps more demanding, particularly the part which asked the children to define what a word was. The grammatical tasks would certainly have made heavier demands on linguistic knowledge, and it makes sense to expect that learning a second language would only benefit this kind of L1 knowledge if the child had some understanding of the grammar of L2, in order to be able to transfer it to L1.

Two other studies have looked at the importance of L2 proficiency for transfer of metalinguistic knowledge. In a study described in an earlier section, Rubin et al (1991) found that first grade children in partial immersion programmes in French or Hebrew were better at a phonological awareness tasks and at reading phonologically regular real and nonwords than children only exposed to one language. This was in spite of their limited proficiency in L2. Galambos and Hakuta (1988) found that bilingual children with greater facility in L2 (Spanish) were more successful than children with limited L2 knowledge at detecting and correcting morphological and syntactic errors in L1 (English) sentences. It seems then, that the level of L2 proficiency required for transfer of metalinguistic knowledge does indeed depend on the type of metalinguistic knowledge in question, and the degree to which it makes demands on L2 knowledge. Word awareness and phonological awareness develop earlier than grammatical awareness, and the child does not have to have a high level of competence in L2 in order to gain these skills in that language. In the present study, the type of metalinguistic knowledge in question is grammatical, particularly morphological, knowledge. It is likely that in order for children to gain enough morphological awareness in L2 to be able to transfer it to L1, they would have to attain a reasonably high level of L2 proficiency.

2.5. Does transfer of metalinguistic knowledge depend on the purpose for which the second language is learned, and the way in which it is learned?

Almost all the available research on the effects of learning a second language on metalinguistic awareness and literacy acquisition has been concerned with the acquisition of modern languages for the purpose of communication. However, children in many cultures and minority language contexts do not learn this kind of second language, or for this purpose. Instead, some second languages are taught to children as part of their religious and cultural education. In this case the second language may not be a living, spoken language but rather a classical, written language which is rarely or never used for communication. Some examples of this kind of language use are Hebrew among Jews, Arabic in non-Arab Muslim communities, and Sanskrit among Hindus. There are almost no studies available which have investigated the effects of second language learning for religious purposes, on metalinguistic awareness.

Studies of literacy practices in different cultural contexts have shown that the effects of literacy depend on the specific ways in which that literacy is embedded in the culture and the purposes for which it is used. Scribner and Cole (1981) undertook a large-scale study of the effects of literacy or nonliteracy on thinking, amongst the Vai people in Liberia. They hypothesised that learning to read and write would necessarily make one more explicitly aware of the 'machinery' of one's language (i.e. it would improve metalinguistic awareness), because the written form of language defines or makes salient certain linguistic units that are not marked off in speech, such as words. Therefore they expected that literate Vai people would perform better on metalinguistic tasks than nonliterates. In three separate studies, they gave metalinguistic tasks to a total of 255 Vai men, who fell into the following groups: nonliterates, Vai script monoliterates, Arabic literates, and Vai-Arabic biliterates. The tasks were designed to test language objectivity (understanding the arbitrariness of linguistic labels for objects), the concept of word, word definitions, and grammatical knowledge (judging, correcting and explaining grammatical errors in spoken sentences). In general, Scribner and Cole did not find any consistent effects of literacy

as opposed to nonliteracy on metalinguistic awareness. They did, however, find that there was an effect of Vai script literacy on the ability to judge, correct and explain grammatical errors in Vai sentences. The reason for the effect of Vai script literacy but not the other kinds of literacy apparently lay in the social practices of Vai script literates. When writing or reading in Vai script, it was a common practice to 'maintain a running commentary on whether a particular piece of language was good or correct Vai'. Thus it seemed that it was not literacy background per se which affected metalinguistic awareness, but rather the social practices associated with a specific literacy.

Given Scribner and Cole's findings, it is possible that in a similar way, the effects of learning a second language on metalinguistic awareness will depend on the specific cultural uses and practices of the second language. Different second language practices may provide different opportunities for acquiring metalinguistic knowledge. In the present study, the second language in question is Hebrew, as used by British Jews. Hebrew is used in modern Jewish life both as a classical religious language, and as the revived modern language of the State of Israel. In this study, two groups of children from two different Jewish schools took part. In these schools, these two principal uses of Hebrew are practiced to different extents. In both schools, children are taught both Modern and Classical (religious) Hebrew, but in one school, Modern Hebrew is given more priority than in the other school. It is considered important that these children should learn to communicate in the modern language of Israel, as well as to use Hebrew for prayer and biblical study. In the other school, it is not considered particularly important or realistic for the children to learn to use Modern Hebrew for everyday communication (the practices of Hebrew are described in more detail in Chapters 3 and 4). What might we expect to be the different consequences for metalinguistic awareness of learning Hebrew for these two purposes?

Both groups of children in the study learn to read in Hebrew at the same time that they learn to read in English (beginning in Reception class at the age of four). In the school where mainly religious Hebrew is taught, Hebrew literacy precedes any other kind of

linguistic knowledge in Hebrew. In the other school, oral language and literacy are taught concurrently. In both schools it is considered important for children to be able to read from the prayerbook and religious texts such as the Torah (first five books of the Old Testament), as soon as they are able. However, learning to read Hebrew for this purpose does not necessarily involve the children analysing the language beyond phonological analysis of mostly incomprehensible words. This is because when Hebrew is written with vowels, the correspondence between graphemes and phonemes is almost completely predictable, at least when reading (as opposed to spelling). It is possible and indeed very common for children and adults to read Hebrew accurately and fluently without comprehension. This kind of reading is adequate for the purposes of prayer because of the set nature of prayers, and because uttering the prayers in Hebrew, the Holy Tongue, has intrinsic value. In this context, the early stages of learning religious Hebrew would probably enhance metalinguistic knowledge only in terms of promoting children's understanding of the connection between letters and sounds, and of how to blend these sounds to make words.

However, once they are biliterate, and whether also learning Hebrew as a modern language or not, the children do learn more about the Hebrew language as they progress than just how to read accurately. They are taught classical, written Hebrew for the purpose of understanding biblical and other religious texts. This involves a great deal of translation into English, particularly in the school which does not teach much Modern Hebrew. This biblical study entails learning about some aspects of Hebrew grammar as well as vocabulary. In particular, accurate translation involves paying attention to Hebrew morphology. For example, children are taught to recognise the morphemes which indicate gender, person and tense, and to use knowledge of Hebrew roots to work out the meaning of unfamiliar words which are related to known words. Thus it is reasonable to expect that religious study of written Hebrew would enhance children's metalinguistic knowledge of morphology. For the children who do not learn to speak, however, learning Hebrew would be unlikely to enhance their performance on L1 metalinguistic tasks which demand comprehension and manipulation of spoken language.

2.6. The present study - Study 1

2.6.1. Aims of Study 1

The review of the literature has revealed a gap in our current understanding of the effects of bilingualism on the development of metalinguistic awareness and literacy. So far, in parallel with the research on metalinguistic awareness and literacy development in one language, investigators have concentrated on bilingual children's phonological awareness and their ability to transfer their knowledge of the alphabetic letter-sound principle between languages. We now know from recent monolingual literature that grammatical awareness plays a significant role in children's progress in learning to read and write, once the alphabetic reading and writing have been mastered. However, very little is known about whether bilingual children can transfer grammatical awareness and morphological spelling knowledge between their languages, or about the possible effects of second-language knowledge on children's progress in reading and spelling in the orthographic stage.

There is initial evidence that children with knowledge of more than one language can transfer grammatical knowledge from one to the other, and that second-language learning can enhance grammatical awareness in the first language. However, these studies have not linked grammatical awareness to children's literacy development. The present study investigates whether children can use grammatical awareness for both their oral languages and for literacy across languages, and whether, if grammatical awareness can be transferred between languages, learning a second language enhances children's first language grammatical awareness and hastens morphological spelling development.

The research done so far on bilingual children's metalinguistic knowledge of grammar has used either grammaticality judgement and correction or oral-cloze tasks. Grammaticality judgement tasks have been criticized as tests of metalinguistic knowledge (Gombert, 1992). In addition, these tasks are designed to measure

grammatical awareness at the level of sentences and are concerned mainly with children's sensitivity to syntax. A further limitation of the kinds of tasks used so far is that they confound syntactic and semantic awareness. The present study will use, in addition to oral-cloze tasks, tasks which are designed to tap children's awareness of morphology as well as syntax, and which do not confound semantic and grammatical awareness.

The only study which has looked at the connection between children's Hebrew and English grammatical awareness is that of Geva and Siegel (1994). In this study they found a correlation between oral cloze tasks in the two languages, and concluded that grammatical awareness in the two languages is interdependent. They did not, however, partial out the effects of age and verbal IQ, so we still do not know whether there is transfer of grammatical awareness over and above these factors. In the present study, a vocabulary measure will be taken as an indicator of verbal IQ, and rather than looking at simple correlations alone, multiple regression will be used to explore the relationships between grammatical awareness measures in the two languages while controlling age and vocabulary.

Studies have so far tended to use either a within-subjects design, looking at the relationships between metalinguistic abilities across children's two languages, or a between-subjects design, comparing bilingual children with a control group of monolingual children. The present study will incorporate both kinds of design, to look both at the cross-language relationships and at whether knowing a second-language may confer any advantages.

A further gap in the current research literature is that the studies done so far have looked only at children learning modern languages for the purposes of oral communication. The present study examines the possibility of cross-language transfer of metalinguistic and literacy knowledge in a group of children who learn a second language as part of their cultural and principally religious heritage, and only some of whom learn it as an oral language. It is expected that the effects on metalinguistic

awareness of learning a second language will in part be dependent on the nature of the second language learning which the children experience, and on the level of L2 competence they attain.

2.6.2. Research questions of Study 1

The following questions were asked and hypotheses were raised:

1. Can children transfer metalinguistic knowledge, as opposed to surface level knowledge, between their languages?

Hypothesis 1.1: Because lexical knowledge is specific to each language, there will be no relationship between L1 and L2 vocabulary level.

Hypothesis 1.2: Metalinguistic-level grammatical knowledge will transfer across languages, because ability to reflect on metalinguistic properties of language is not language-specific.

2. Does the ability of L2 learners to transfer metalinguistic knowledge between their languages depend on the kind of L2 learning they experience?

Hypothesis 2: Learning to speak, read and write an L2 will have different effects on metalinguistic awareness from learning a written L2 for religious purposes.

3. Can children use morpho-syntactic knowledge in one language for morphological spelling in another language?

Hypothesis 3: If transfer of morpho-syntactic knowledge can occur between languages, and if awareness of L1 morphology in oral language is related to children's L1 morphological spelling knowledge, the L2 morpho-syntactic knowledge will also be related to children's L1 morphological spelling knowledge.

4. (i) Can the ability of L2 learners to transfer metalinguistic knowledge between languages aid metalinguistic development? (ii) Does this depend on the level of L2 attained?

Hypothesis 4.1.: Learning a second language will result in earlier development of metalinguistic knowledge than in monolingual children, because of the ability of L2 learners to transfer metalinguistic knowledge between their languages.

Hypothesis 4.2.: If metalinguistic knowledge is only raised once the child has reached a certain level of L2 competence, then only children with higher levels of L2 metalinguistic knowledge should show an advantage over monolinguals.

5. Can learning an L2 hasten morphological aspects of spelling development?

Hypothesis 5: If learning a second language can result in children developing morphological aspects of metalinguistic awareness earlier than their monolingual peers, then this may in turn help them to correctly spell L1 morphemes earlier than monolingual children do.

CHAPTER THREE

THE HEBREW LANGUAGE

This chapter briefly describes the historical development and current uses of classical and modern forms of Hebrew, its distinction from other Jewish languages, and the role of Hebrew in modern diaspora Jewish life and Jewish education. It finishes with an outline of the Hebrew writing system and explains some basic principles of Hebrew word formation.

Hebrew is a Semitic language. It is the language in which the most important Jewish holy texts are written. In its modernised form, it is the principal official language of the State of Israel. The development of Hebrew from biblical times to the present day is sketched below.

3.1. Ancient Hebrew

There are two main kinds of ancient Hebrew: Biblical Hebrew, also known as Classical Hebrew (c.1200-300 B.C.), and the later Mishnaic Hebrew, the language of the rabbis (c. 300 B.C-600 A.D.). The Mishnah is a detailed explanation of the laws written in the Torah (Bible). It was transmitted orally for centuries, but was written down in about 200 A.D. (Weinberg, 1981). Mishnaic Hebrew had developed from Biblical Hebrew, though there is some argument in the literature about whether it had naturally developed as a vernacular, or whether it was created by scholars (Spolsky & Cooper, 1991). In any case, these two kinds of Hebrew differ in some aspects of grammar, vocabulary and general style . For example, Biblical Hebrew tenses do not express a time-distinction; rather, they express the completion of an action. Mishnaic Hebrew, on the other hand, uses tense to express time. In Biblical Hebrew, possession is expressed by suffixes, whereas Mishnaic Hebrew uses an independent word to indicate possession, similar to the word 'of'. The meaning of some Biblical Hebrew words

changed in Mishnaic Hebrew, and many new words were added. In addition, a number of words which appeared in Biblical Hebrew did not appear in written records of Mishnaic Hebrew (Chomsky, 1957; Spolsky & Cooper, 1991).

Hebrew probably ceased to be used as a spoken language in Palestine in the second century A.D. (Weinberg, 1981). Aramaic, a language related to Hebrew, replaced Hebrew as the main vernacular and some holy texts were written in that language. To this day, Jewish marriage contracts and divorce documents, for example, are written in Aramaic (Spolsky & Cooper, 1991). *Lashon Kodesh*, the Jewish Holy Tongue, includes the varieties of Hebrew described above, and some Aramaic.

Even though Hebrew ceased to be spoken by most Jews, it has continued to be used for religious study and prayer for over 2,000 years. From the time of the exile of the Jews from Palestine until the present day, it has been considered important that children, especially boys, should be taught Hebrew. Without fluent reading ability, one cannot participate fully in the life of the synagogue, where the Torah (Pentateuch) and prayers are read aloud by congregants. A boy must learn to sing aloud a substantial portion of biblical text for his *barmitzvah* at age thirteen, which marks the beginning of adult male responsibility. In addition, Jewish tradition emphasises the importance of ongoing analysis, discussion and interpretation of the holy texts in their original Hebrew. Historically, Hebrew education for girls has been considered less important than for boys, though at least a minimum of knowledge was required for reading and reciting Hebrew prayers. Nowadays, young girls generally (but not always) study Hebrew alongside boys, and in some communities have a female version (though not necessarily the equivalent) of the *barmitzvah*, called *batmitzvah*. The use of ancient Hebrew in British Jewish life is discussed in more detail in a later section.

During the lengthy period that Hebrew was not used for everyday communicative purposes, it was not a completely dead language. It continued to develop as a written language, until its revival as a modern language at the end of the 19th century. It diversified into several branches and flourished in widely separated areas of the world

(Weinberg, 1981). Rabbis from different diaspora communities communicated with each other in Hebrew about religious, legal and academic matters (Keiner, 1991). In Medieval times, Hebrew underwent a period of much development. Medieval Hebrew literature includes religious and secular poetry, and prose on a diverse range of subjects, such as philosophy, astronomy, travel, medicine, bookkeeping, and entertainment, as well as religion-related texts such as commentaries on the Bible and Talmud, and codes of Jewish Law. During this era, Hebrew was influenced by many other languages, such as Arabic in the Sephardi (Oriental) world, and French and German in the Ashkenazi (European). Hebrew became secularised, and was thus able to serve as a vehicle for spreading knowledge and enlightenment (Weinberg, 1981).

3.2. Modern Hebrew

The revival of Hebrew as a vernacular began at the end of the nineteenth century, that is, about half a century before Israel became an independent state. European Zionists, who were planning the setting up of a Jewish state, battled over the question of which language should be spoken in the new country. One camp believed that the only suitable language was Yiddish, the language of everyday Ashkenazi (European) Jewish life and culture, while the other, the proponents of Hebrew, believed that a national rebirth had also to be a linguistic one (Weinberg, 1981). The idea of using Hebrew as a vernacular seemed at the time to be a ridiculous one, since a silenced language had never before been revived after 1700 years. On the other hand, Yiddish was not the language of non-European Jews, and a language was needed which would unite Jews from all over the world. In addition, to many Jews, Yiddish represented the ghetto, that is, it was the language associated with times of oppression and with 'old ways'. Hebrew represented a rejection of the diaspora, and a new life of freedom and self-respect in the ancient Jewish homeland.

The sources of the revived Modern Hebrew were Biblical Hebrew, Mishnaic Hebrew and Medieval and early Modern 19th and 20th century writings (Berman, 1985). The

grammar was basically Biblical, with some features of Mishnaic Hebrew (Weinberg, 1981). Modernising Hebrew required a great deal of inventiveness in semantics and lexicon (Ben-Rafael, 1994). Old meanings were adapted to express modern concepts. Many new words were invented, where possible applying Hebrew word-patterns and existing consonantal roots to create words which had not occurred in that form before. International words were incorporated either without Hebraicisation, or with the addition of Hebrew morphemes or superimposition of Hebrew word patterns. For example, the international word 'telephone' was imported into Hebrew as *telefon* (טלפון). The masculine plural morpheme *-im* (-ים)could then be added to make the word *telefonim* (טלפונים), 'telephones' . The Hebrew verb 'to telephone' was created by imposing the existing Hebrew rules for verb-formation and conjugation, resulting in, for example, the infinitive *letalfen* (לטלפן), 'to telephone'.

3.3. Other Jewish languages - a note

While Hebrew, the language of the Jewish Holy Scriptures, has always been central to traditional Jewish life and culture, it should not be confused with other Jewish languages such as Yiddish. In the diaspora many everyday Jewish languages developed which fused Hebrew with the local language (Fishman, 1981, cited in Ben-Rafael, 1994), and were spoken in the home and in the community. Thus in the diaspora of the past Jews often had some knowledge of at least three languages: Hebrew for religion; a Jewish vernacular for the home and community; and the local language, for communication with non-Jews.

The main Jewish languages which were still 'living' at the beginning of this century were Yiddish, which has an essentially German character but also borrows from Hebrew, Greek, Latin, Polish and Russian (Geipel, 1982), Judeo-Arabic, and Ladino/Judezhmo (Judeo-Spanish). These languages are still spoken today, but by very small numbers of Jews. Yiddish was spoken by eleven million people in 1939 (Goldsmith 1987, cited in Ben-Rafael 1994), but this number was greatly reduced by

the Nazi holocaust during World War II. By the 1980s there were only about 250,000 fluent speakers, who are mostly Ultra-Orthodox. Some groups of Ultra-Orthodox Ashkenazi Jews (Jews of European or Russian origin) speak Yiddish for the everyday, because they believe that Hebrew, as the Holy Tongue (*Lashon Kodesh)* should not be used for profane purposes.

3.4. The use of Hebrew in British Jewish life

Glinert (1993) has called Hebrew, as used by British Jews, a 'quasilect'. He defines a quasilect as a language which is used for

> " salient cultural purposes, with the following features: a) users are unable to use it for open-ended active linguistic communication; b) users are unable to use it for open-ended receptive linguistic communication; and typically c) users do not know of this variety being currently used as a normal language; d) users know of this variety having once been used as a normal language."

Other examples of quasilects are Arabic in non-Arab Muslim communities, Sanskrit among Hindus, Latin among Catholics, and Classical Greek among Cypriot emigres.

The use of Hebrew in British Jewish life varies slightly according to membership of ethnoreligious subgroupings. Glinert defines seven main groupings, in terms of synagogue membership: Ultraorthodox, 'middle-of-the-road' Orthodox, Sephardi Orthodox, Masorti, Reform, Liberal, and unaffiliated. The 'middle-of-the-road' Orthodox synagogues conduct all their prayer services almost exclusively in Hebrew. These services consist of a set of fixed texts with no spontaneous prayers. The schools described in the present study belong to this 'middle-of-the-road' Orthodox tradition, so the practices of the remaining groupings will not be described here.

In the Orthodox tradition, Hebrew is the main language of Jewish worship. That is, in addition to synagogue prayer and recitation of the Torah, Hebrew is used in recitation of prayers in the home, for example the Grace after Meals service, prayers at bedtime

and on waking up, blessings before religious acts and eating, the sanctification of the sabbath, and blessings for travelling and sighting of natural phenomena such as rainbows. Also in Hebrew, in the home, are festival recitations and songs, notably the reading of the Passover Hagaddah. However, while Hebrew is the language of prayer and thus a basic ability to read and recite Hebrew is necessary for Jewish life, particularly synagogue life, it is not strictly necessary to have a high level of Hebrew comprehension. The prayer-book used by the 'middle-of-the-road' Orthodox synagogues has an English translation of the Hebrew texts on the facing page. However, reciting the Hebrew does not leave time to refer much to the English, except during prayers which are chanted by a leader and followed silently by the individual worshipper from his or her own text. Due to the phonological regularity of the Hebrew script and by rote memorisation, it is possible (and probably more common than not) to be an active religious participant without much real comprehension of Hebrew.

3.5. Hebrew in Jewish primary schools

Despite the fact that many, if not most, synagogue worshippers do not have much knowledge of Hebrew beyond basic reading ability and memorised prayers, Jewish day schools, where Hebrew and Jewish studies are taught for up to three hours a day, attempt to impart a deeper and broader knowledge of Hebrew than that which is strictly necessary for participation in synagogue services. As well as prayers, children study biblical and other important religious texts in Hebrew, and learn to translate them into English. In addition, schools which have a Zionist outlook teach Modern Hebrew (*Ivrit*) as a language of everyday communication. Some of these schools teach Hebrew using the system *Ivrit b'Ivrit* (Hebrew in Hebrew), which involves speaking to the children exclusively in Hebrew during both modern Hebrew and religious studies lessons, as well as in assemblies and all other non-secular activities. In other schools modern Hebrew is not spoken other than within the lesson times allocated to the study of modern Hebrew. In these schools, Hebrew texts are studied in religious studies lessons via translation into English.

3.6. The Hebrew script

Hebrew is written with an alphabet which is read from right to left.The Hebrew alphabet differs from the Roman alphabet in that consonants and vowels are written separately. Consonants are represented by letters, and vowels are represented by tiny diacritic marks (dots and lines). These vowel diacritics generally appear below the consonant which goes before it, but can also appear above it or inside it. For example, the consonant /m/ (מ) plus the vowel /ah/ (ַ) appear together as מַ and are pronounced together as /mah/.

Classical texts are usually printed with diacritics. However, Modern Hebrew printed text for experienced readers, for example in newspapers and books, is usually printed without diacritics. Experienced readers do not need diacritics to know exactly how to pronounce words. Adequate information is usually provided by consonants and the semantic and grammatical context. Diacritics may be printed, however, for particular unfamiliar words where pronunciation may be in doubt (such as uncommon foreign loan words). Texts produced for young children and second language learners are usually printed with diacritic marks, to aid pronunciation. When writing Hebrew by hand, however, they are rarely added.

Certain consonants can sometimes act as vowels. For example, the letter *vav* (ו), on its own, has the sound /v/ as in **v**ery. When it has a dot above it (וֹ), it becomes /o/ as in the French **eau**. When *vav* has a dot inside it (וּ), it becomes /oo/ as in r**oo**t.

Diacritric marks can aid other aspects of pronunciation apart from vowel sounds. For example, the letter *shin* or *sin* (ש) is pronounced /sh/ as in **sh**ip when it has a dot at the top right (שׁ), but /s/ as in **s**eat when the dot is at the top left (שׂ). The letter *bet* or *vet* (ב) is pronounced /b/ when it has a dot inside it (בּ), and /v/ when it has no dot (ב).

Some consonants have a final form. This form is only used when the letter appears at the end of a word. For example, the letter *mem* is written as מ at the beginning of the

word *mayim* (מים), and ם at the end of it (מים).

There are two ways of writing Hebrew consonants, upper and lower case, or 'block' and cursive. In general, block is used for printed text, while cursive is used for handwriting. One or the other form is used throughout a piece of writing; that is, they cannot be mixed within words in the way that Roman upper case and lower case letters can.

The Hebrew alphabet and vowel system are displayed in Table 3.1. The pronunciation shown is that of Modern Hebrew. This is similar to the pronunciation traditionally used by Sephardi (Oriental) Jews. Ashkenazi (European) Jews traditionally pronounce certain letters and vowels differently from this. For example, the letter *taf* (ת) is pronounced /s/ instead of /t/, and the vowel /o/ (ו) is sometimes pronounced /oy/ as in b**oy**. In British synagogues, either the Modern/Sephardi or the traditional Ashkenazi kind of pronunciation can be used. Children who go to Jewish schools are exposed to both kinds of pronunciation and are usually able to read using either.

3.7. Hebrew word-formation

The processes by which words are formed in Hebrew, and other Semitic languages such as Arabic, are quite different to those of English. The derivational and inflectional morphology of Hebrew are briefly sketched below.

All verbs, and most nouns and adjectives, are made up of a root combined with a word-pattern. The root, which consists of a 'skeleton' of usually three consonants, forms the semantic core of all words which are formed from it. Unlike the English base-word or stem, the Hebrew root cannot stand alone as a word itself. It must have a word-pattern mounted on it in order to have a specific meaning. This word-pattern can be made up of prefixes, suffixes and infixes. For example, the root ק.ש.ר (*k.sh.r*) has the core meaning 'connection'. When the word pattern *-e-e-* is mounted on the root,

Table 3.1 The Hebrew alphabet (aleph-bet)

Consonant	Final form	Name	Pronunciation
א		aleph	glottal stop, no English representation
ב, בּ		bet, vet	as in **b**ig, **v**ery
ג		gimel	as in **g**ate
ד		dalet	as in **d**oor
ה		he	as in **h**ope
ו		vav	as in **v**ery
ז		zayin	as in **z**eal
ח		chet	as in Scottish lo**ch**
ט		tet	as in **t**ake
י		yod	as in **y**oung
כ, כּ	ך	kaf, chaf	as in **k**eep, Scottish lo**ch**
ל		lamed	as in **l**ittle
מ	ם	mem	as in **m**eat
נ	ן	nun	as in **n**othing
ס		samech	as in **s**eat
ע		ayin	glottal stop, no English representation
פ, פּ	ף	pe, fe	as in **p**ay, **f**air
צ	ץ	tsa-de	as in ca**ts**
ק		kof	as in **k**eep
ר		resh	as in **r**eal
שׁ, שׂ		shin, sin	as in **sh**ip, **s**eat
ת		tav	as in **t**ake

Vowel diacritics

ְ	'sheva' or 'schwa' - not pronounced, or, with certain consonants, as in **a**fraid
ֱ	as in the French **été**
ֲ	as in the French **été**
ִ	when below the consonant: as in h**ea**t; when above the consonant: as in French **eau**
ַ	as in the German M**a**nn
ָ	as in the German M**a**nn
ֻ	as in r**oo**t

Consonants which can act as vowels

וֹ	as in French **eau**
וּ	as in r**oo**t
יִ	as in h**ea**t

the resulting word is קשר (***kesher***), which means 'knot'. Mounting the word pattern *t--o-et* makes the word תקשורת *tikshoret*, which means 'communication' (Bentin & Frost, 1995). Many other words can be formed from this root. The connection between words which share the same root can vary in the degree to which it is transparent. Words which in English have no obvious connection to each other may be closely related in Hebrew in their sharing of a root. For example, the Hebrew words 'guide' (מדריך), 'pavement' (מדרכה), and 'passport' (דרכון) all share the root *d.r.ch* (ד.ר.כ), which refers to the concept of 'road' or 'way'.

Word-patterns, which are mounted on roots, are of two kinds: verbal and nominal. There are seven types of verbal word-patterns, called *binyanim* (conjugations). Three of these are active patterns, three are passive, and one is reflexive. Different *binyanim* can be mounted on the same root, giving the resulting words varying degrees of activeness or passiveness, or making them reflexive. For example, the root which refers to 'dressing' can have an active, a passive or a reflexive verbal-pattern mounted on it, resulting in the words for 'to dress someone' (active), 'to be dressed by someone' (passive) and 'to get oneself dressed' (reflexive).

Nominal word-patterns are called *mishkalim* ('weights'). There are about three dozen of these and they are less systematic than verbal patterns. Some nominal word-patterns consist of vowels only, and since these are represented by diacritic marks and not letters, the orthographic integrity of the root is preserved in these words. Other patterns, on the other hand, contain vowel letters which are infixed between the root-consonants, thus interrupting the root (Bentin & Frost, 1995).

Once a word has been formed by the derivational processes described above, it usually requires the addition of prefixes and/or suffixes, and often a vowel change inside the word, for its inflection. This inflectional system is much richer and more complicated than in English. Verbs must be inflected for person, gender, number and tense. Nouns and adjectives are inflected for gender and number. Nouns can also be inflected for possessive, locative, and a construct which applies to compound words (Bentin &

Frost, 1995; see below for further discussion of possessive marking).

The inflection of verbs is very systematic and in each tense, the person is marked by prefixes and/or suffixes. Nouns are either masculine or feminine, or when living things, have both masculine and feminine forms. Gender in the noun is marked by addition of a suffix to the masculine form, but sometimes this also results in an internal vowel change. For example, the word for 'boy' is *yeled* (ילד). In the feminine form, 'girl,' it becomes *yaldah* (ילדה). As well as the addition of the feminine suffix (ה) /ah/, the first vowel /e/ changes to /a/. Definiteness in the noun is marked by the prefix *ha* (ה), equivalent to 'the'.

The possessive case is formed by adding suffixes (possessive pronouns) which vary according to person. In formal language, these are added to nouns, for example, the word 'house' is *bayit* (בית). 'My house' is *beiti* (ביתי), 'your house' (masculine) *beitecha* (ביתך), 'our house' *beiteinu* (ביתנו). In colloquial Modern Hebrew, this possessive suffix is often added to the word 'of' *(shel),* instead, so that, for example, 'my house' would be expressed as *ha-bayit sheli* (literally, 'the house of me'). Possession can also be expressed by means of a compound-like noun construct in which the first of two nouns (usually inflected) is the possessed and the second is the possessor. The inflection of the first noun replaces the possessive particle 'of' (*shel*), as in, for example, *beyt holim* rather than *bayit shel holim* (hospital; literally, 'house of sick people') (Bentin & Frost, 1995).

In this chapter, the historical development, current practices and some of the linguistic features of Hebrew have been very briefly summarised. It has been shown that Hebrew plays an integral role in traditional Jewish life and Jewish education. In the present study, the possibility that learning Hebrew may benefit children's first language and literacy development is investigated.

CHAPTER FOUR

METHOD OF STUDY 1

4.1. Design

The study had a mixed within-subjects between-subjects design. It aimed to answer the research questions in two main ways:

(i) by examining the relationships between Hebrew and English performance on tests of vocabulary, morpho-syntactic awareness and morphological spelling, by a group of children learning Hebrew as a second language (within-subjects), and

(ii) by comparing performance of Hebrew learners and monolingual children on tests of English morpho-syntactic awareness and morphological spelling (between-subjects).

Using the first method, the relationships between the children's first and second languages could be examined. Significant positive relationships between performance in one language and in the other would suggest transfer of knowledge between languages.

The second method was used to see whether learning a second language would make children aware earlier than monolingual children of the grammatical properties of their first language, and whether this would also make them better at spelling first language morphemes. If these children are able to transfer metalinguistic knowledge between their two languages, then this may give them an advantage over children who do not have another language as an extra source of learning.

The group of Hebrew learners was sampled from two Jewish day schools, which both taught Classical Hebrew for religious purposes, but differed in their emphasis on Modern Hebrew. Thus relationships between grammatical awareness in English and in

Hebrew were examined in children exposed to two kinds of Hebrew curriculum.

For the bilingual-monolingual comparisons, a group of children was selected from a large sample of monolingual children tested as part of the longitudinal study by Nunes, Bryant and Bindman (1996; in press a,b; Bryant, Nunes & Bindman, 1997; in press b,c). For each comparison, the group of monolingual children was matched with the group of Hebrew learners for age (mean and variance), and level of English vocabulary was statistically controlled.

4.2 Subjects

116 children learning Hebrew as a second language were selected for participation in the study from two state-funded Jewish day schools in North London. 56 children at School 1 were tested, and 60 at School 2. At School 1, the children are taught Modern and Classical Hebrew, for a total of approximately 7.5 hours per week. At School 2, children are taught Classical Hebrew for approximately 3 hours per week, and Modern Hebrew for less than one hour per week.

The monolingual controls were selected from the sample of 365 children taking part in the longitudinal study. These children came from four primary schools in London and four in Oxford. In the course of the longitudinal study they were given tests of grammatical awareness and spelling which were similar to the tests given to the Hebrew learners.

The age range of the entire sample was 6 to 11 years. In the Jewish schools, children in two slightly different age ranges were selected. In School 1, children were selected from National Curriculum Years 2 to 5 inclusive, while in School 2, children were in Years 3 to 6. This was because the general level of Hebrew in School 1 was higher than in School 2, so it was decided to include younger children from that school in the sample.

In all the schools mentioned above, children were selected for testing by choosing every second child from the class register within each school year. However, children were excluded if they held a local authority statement of special needs, or if the class teacher had recommended them for assessment by a psychologist for a statement. In the Jewish schools, children were only included who, according to the class teacher and the child him or herself, did not regularly speak Hebrew at home with parents. An approximately equal number of boys and girls were chosen.

4.2.1. Matching Hebrew learners with monolingual children

For each English task on which the Hebrew learners and monolinguals were to be compared, all the monolingual children from the sample of 365 who had carried out the task in question, and whose ages fell within the same range as those of the Hebrew learners who had carried out the same task, were identified. In order to ensure a good match between the two groups of children, it was also considered important that the groups should have approximately the same mean age and variance. Therefore, each time the matching procedure was carried out, a t-test for independent samples and Levene's test for similarity of variances were carried out. If the two groups differed significantly in their mean age and/or variance, the distributions of age in the two groups were inspected. The range of ages selected was adjusted according to the nature of the difference in the distributions, until there were no significant differences between the mean ages and variances in age in the two groups of children, while ensuring that the ages still fell within approximately the same range in the two groups. The matching procedure for each bilingual-monolingual comparison carried out is described in more detail in Chapter 5.

4.3. The schools

4.3.1. General description of the Jewish day schools

Both schools have a strictly orthodox code of behaviour and religious practice. About half an hour is spent every morning singing and reciting morning prayers aloud in Hebrew, with the aid of a *siddur* (standard prayer book). Morning prayers are said either in the classroom or in the hall at assembly. In the classroom, one girl and one boy are selected to lead the class in prayer, while in assembly a whole class may be chosen to lead the school. Girls and boys usually pray together; however, certain lines of prayer are only for one sex or the other. On the first day of each Hebrew month, and on certain minor festivals which are not school holidays (such as *Purim*), special prayers are added to the usual morning prayers. On Fridays, an additional prayer period takes place in the afternoon, in preparation for the sabbath. A few boys are chosen to read and sing from the Torah in front of the whole school community, and two girls are chosen to light sabbath candles and recite a blessing. The *kiddush*, or blessing to welcome the sabbath, and festive sabbath songs are sung by the whole school. As well as serving as a school celebration of the coming in of the sabbath, these periods serve as a kind of rehearsal for the traditional Jewish practices which are carried out at home and/or in the synagogue, and which the children will be expected to perform 'for real' after the age of batmitzvah (12) or barmitzvah (13). Such 'rehearsals' are also carried out before each Jewish festival, and in the case of major festivals such as the Passover, may be extended over a period of weeks.

Daily, set prayers are also said routinely on eating and drinking, on ritual washing of hands before meals, and after lunch (Grace after Meals). In total these additional prayers take up approximately another 25 minutes of the school day.

On entering and leaving rooms in the school children and teachers often kiss the tips of their fingers and touch the *mezuzah* (encased prayer-scroll attached to every doorframe). Children wear school uniform, which for boys includes a *kippah* (skullcap)

and *tzitzit* (fringed undergarment). Teachers wear modest dress. Some married women, and all female married Jewish Studies teachers, cover their hair with a hat, scarf or *scheitel* (wig).

Some children in each school have Israeli parents, or one Israeli parent. In addition, many children have close relatives in Israel. Many of the children have been to visit Israel at least once, often going on major Jewish holidays such as Passover.

Both schools, besides being religious schools, are Zionist in outlook, reflecting the majority view of mainstream British Jewry. This Zionism is a religious as well as a political (nationalist) ideology, and is bound up with the idea of *Eretz Yisrael* (The Land of Israel) as the spiritual and physical homeland of the Jews. Children are taught about the founding of modern Israel, its achievements and geography, and celebrate Israel Independence Day along with traditional Jewish festivals. Israel's existence as a modern state is seen as a symbol of Jewish survival and strength, post-Holocaust. Though there is a range of political (and religious) opinions on the actions of current and past governments of Israel, the state's existence is generally the source of much pride in the mainstream orthodox Jewish community. The teaching of Modern Hebrew, the language of Israeli Jews, is an expression of solidarity with Israel, as well as a practical advantage for those children who may in the future fulfil the Zionist ideal and 'make *aliyah*' (literally, 'go up' to Israel), that is, settle there. Many young Jewish people spend some time in Israel, sometimes for advanced religious study, even if they do not end up living there permanently.

There are two main differences between the schools, as far as this study is concerned. School 1 has a slightly longer day, and allocates more of the school timetable to the teaching of Hebrew. Children spend considerably more time learning Modern Hebrew than in School 2. While the schools place differing degrees of emphasis on the study of Modern Hebrew, this is largely due to a different view of what aspects of Hebrew should be prioritised given the overloaded timetable (both schools also teach the National Curriculum in the hours allotted to secular study), rather than to a difference

in attitude to Modern Hebrew.

The second difference is that while the teaching of English in School 1 is quite similar to that in the monolingual schools, with relatively little formal teaching of grammar, School 2 places importance on explicit grammar training. From the age of about seven, children spend a part of their English lessons doing grammar exercises from a textbook. School 2 has large classes, but also a reputation for high academic achievement in English, with the early part of the final year spent training many of the children to pass the entrance examinations for selective nondenominational secondary schools. The two schools are described in more detail in the next section.

4.3.2. School 1

The school is in a middle-class suburb of north London with a large orthodox Jewish population. Many children live within walking distance of the school and go to the same synagogues and youth clubs as each other. The teachers are all Jewish and many also belong to the same orthodox community as the children. Among the children are many siblings, cousins and other relatives, and teachers' children, giving the school a tight-knit feel.

Secular studies are taught by the main class teacher. For approximately two hours per day, each class is taught Modern Hebrew and *limmudei kodesh* (Jewish studies), including the study of religious texts, by an Israeli teacher. One afternoon a week the children also have a religious studies lesson after school hours, and some children may also go to religious Hebrew Sunday school. Within school, as much as is possible, the teacher speaks to the children in Hebrew during these lessons, including when studying texts, although she or he may use English when the children do not understand. Part of the Hebrew curriculum is taught using a scheme called Tal-Sela, developed in Canada for children in Jewish schools. This scheme integrates instruction in the modern language of Israel with the language of the classical texts, and features stories from

everyday Jewish life in Canada and Israel, the festivals, the bible, folklore and traditions.

4.3.3. School 2

The school is in a suburb of north-west London that no longer has a large Jewish population. Most of the children are driven to school by car from other north London suburbs.The children come from a rather more diverse range of Jewish communities than School 1, and while choosing an orthodox Jewish education for their children, parents vary in their degree of religious observance.

Unlike at School 1, the teachers of Hebrew and *limmudei kodesh* (Jewish studies) are not all Israeli.The children are taught Jewish studies for approximately half an hour per day. However, unlike at School 1, the language of instruction is mainly English, even while studying Hebrew texts. For one hour per week, the children are taught Modern Hebrew by a British teacher who has learnt Hebrew as a second language. In Jewish Studies lessons, some teachers use quite traditional methods to teach the Hebrew texts and their translation.The children are expected to memorise portions of Classical Hebrew text. For example, when studying a new Hebrew text, children are provided with a photocopy of the text, divided up into short phrases, with each phrase accompanied by its English translation. Children must learn the translation of each phrase for homework. When they come to read the text in class, they take turns to translate a part of the text, aloud, without looking at the English. While the teacher may ask what a particular word means, the child can generally succeed in this task by remembering the correct translation for each whole phrase. While this method may not enable the children to analyse the Hebrew with much accuracy, it should be noted that the teacher's principal aim in these lessons is to teach the children Jewish religious knowledge via the text, rather than to produce Hebrew constructions of their own. Given this aim, there is not enough time to concentrate on every detail of the Hebrew language involved in the text. Nevertheless, it is considered important for the children to study these texts in the original *Lashon Kodesh* (the Holy Tongue) and not

in translation alone. Underlying this, at least with respect to *Chumash* (bible), is the orthodox belief that the Hebrew text is the word of God. Furthermore, the meaning of the original text is frequently not clear-cut. Throughout the ages the rabbis have given their interpretations (and interpretations of these interpretations), and some of these are discussed in lessons. The subtleties of these different possible meanings would often be lost by studying a translation alone.

Besides memorising, the children are taught some aspects of Hebrew grammar with the aim that they should at least be able to attempt to translate unseen text. For example, they are taught the principle of the three-consonant root, and to guess or work out the meaning of an unfamiliar word which shares the root of a word they already know. They are taught to recognise the meanings of particular common morphemes, such as those indicating possession, person, gender, and grammatical status of a word (for example, infinitive of a verb). In Modern Hebrew, they learn to form the past and present tense, and by the end of Year 6, the future tense.

4.3.4. The monolingual schools

The schools from which the group of monolingual children were selected had pupils from a diversity of social classes and ethnic backgrounds. All the children selected for the longitudinal study spoke only English at home.

There is some teaching of grammar in these schools, though this is not strongly emphasised and does not take the form of the formal written grammar exercises like those done in the Jewish School 2. By Years 5 and 6, most children know and understand the terms past and present tense, and noun, adjective and verb.

4.4. Procedure

Hebrew learners and monolingual control children were given the following English tasks:

(i) WISC-III Vocabulary subtest

Morpho-syntactic awareness tasks

(ii) Oral Cloze

(iii) Row Completion

(iv) Word Analogy (except Year 2)

(v) Sentence Analogy

Spelling (except Year 6)

(vi) Spelling of past tense verbs and nonverbs ending in a /t/ sound

(vii) Consistency in spelling root morphemes

Hebrew learners also carried out the following Hebrew tasks:

(ix) Hebrew test of Receptive Vocabulary

(x) Hebrew Oral Cloze

(xi) Hebrew Roots task

The English Oral Cloze, Row Completion, and spelling tasks carried out by monolingual control children were identical to those carried out by the Hebrew learners. However, the Sentence Analogy and Word Analogy tasks were different in a few items. To compare the performance of the Hebrew learners and the monolingual children, scores on only those items of these tests that were identical were selected.

4.4.1. General testing procedure

All the children except those from schools in Oxford, were tested by the author. Testing of the monolingual children took place between January 1993 and April 1994. Testing of the Hebrew learners was carried out between January and May 1995. The researcher was introduced to each class by the class teacher, and in many cases spent some time in the classroom observing lessons or helping children with classwork. Thus she was a familiar figure, particularly for the monolingual children who were visited every term. At the start of each testing session, a few minutes were spent in general conversation with the child, to put him or her at ease. The grammatical awareness tasks were introduced to the child as 'word games'. The researcher told the child that she would write down some of the things the child said, to help her remember them later. The child was assured that this was not a test and that no mark would be shown to his or her teacher[1].

4.4.2. Testing of the Hebrew learners

Children in Years 2 to 4 inclusive were tested in two separate sessions. In the first session, the child carried out all the English tasks, and in the second session, all the Hebrew tasks. The English session lasted from 30 to 45 minutes. The Hebrew session lasted 20 to 30 minutes. Sessions were conducted between one and five days apart. Since children in Years 5 and 6 generally did all the tasks more quickly and could concentrate for longer periods, English and Hebrew sessions were combined to form one session. The English tasks were done first, followed by the Hebrew. The combined session lasted between 35 and 50 minutes in total. The order of presentation of the tasks was the same for all children, so that any order effects would be equal across children. The order of tasks was as follows:

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[1]A written report describing the aims and general results of Study 1 was later sent to the Jewish schools and distributed amongst the teachers (see Appendix VII).

English Session

1. Spelling wordlist A
2. WISC-III Vocabulary
3. Sentence Analogy
4. Row Completion
5. Word Analogy
6. Spelling wordlist B

Hebrew Session

1. Hebrew Vocabulary test
2. Hebrew Oral Cloze
3. Hebrew Roots

Children were taken individually to the quietest available place away from the classroom. In both Jewish schools there was a lack of available space in which to work. In School 1, the testing place was a table immediately outside the classrooms in an open-plan library area. Classroom doors were kept closed as much as possible to reduce noise. Occasionally other children or teachers came into the library area to work quietly or to fetch things from their bags or coats. When the noise level or other distraction was judged to be too high for the child being tested to concentrate fully, testing was stopped and continued later. In School 2, various testing areas were used: an open-plan library area, a woodwork room, the assembly hall, and an empty classroom. Occasionally the tester and child were asked to change rooms during the testing session; however, each testing area was generally very quiet.

All the tasks including the Hebrew tasks were introduced in English. During pilot work, it was found that in order for the child to fully understand the instructions for the Hebrew tasks, and for the child's self-confidence, it was necessary to explain each task in English before any Hebrew was introduced.

4.4.3. Testing of the monolingual children

In the monolingual schools, a quiet room was available and testing was carried out generally undisturbed. Children were tested individually on the morpho-syntactic awareness tasks, and in groups of four to six children on the spelling tasks. When tested in groups, each child sat at a separate table from which he or she could not see neighbouring children's work.

In each phase of the longitudinal study in which the monolingual children were tested, other tasks not included in the present study were carried out during the same session as the tasks described here. Each session, however, lasted no more than half an hour.

4.5. Measures

4.5.1. English measures

4.5.1.1. WISC-III Vocabulary

Rationale

This task was given as a measure of language-specific surface level knowledge of English. It was also used as a control measure of verbal ability in statistical analyses.

For the matched comparisons of the Hebrew learners and the monolinguals, considerable effort was made to obtain information on socio-economic background for each child. However, it was not possible to obtain this information for a large proportion of the children (schools were not able to provide detailed information, and approximately 50% of parents did not return a questionnaire requesting information about their educational and occupational background). Socio-economic status (SES) has been found to be strongly correlated with receptive and productive vocabulary, and overall IQ (for example, Walker, Greenwood, Hart, & Carta, 1994). Therefore it was

decided that controlling for differences between Hebrew learners and monolinguals in their scores on the WISC-III Vocabulary test would in effect also control partially for socio-economic differences.

The test is a subtest of the Wechsler Intelligence Scale for Children, third revision. It consists of a scale of 30 words, arranged in ascending order of difficulty. The child is asked to explain what each word means, with the question "What is a -----" or "What does-----mean?" When four consecutive items are failed, testing is stopped. Each response is scored 0, 1 or 2, according to the degree of understanding of the word shown by the child's response. A total score is calculated which is then converted to a standardised score which takes into account the age of the child.

4.5.1.2. English Oral Cloze

Rationale

This task was devised by Siegel and Ryan (1988), and was the same as that used by da Fontoura and Siegel (1991), Geva and Siegel (1994) and Geva (1995). The aim was to test the child's ability to use syntactic, morphological and semantic information in order to complete sentences which had one word missing.

Design

The test had 15 trials and two additional practice trials (see Appendix I). Each item was a sentence with one word missing from it, for example *"The boy ------ down and hurt his knees"*. The spot of the missing word was marked by a knock on the table. The missing words consisted of four nouns, two adjectives, one preposition, two conjunctions, two interrogatives and four verbs.

Procedure

The researcher presented the sentences to the child orally. The child was told "I'm going to say a sentence, but one word in the sentence is missing. When I get to the missing word, I'm going to knock on the table like this. Listen carefully and see if you can guess what the missing word is." The two practice sentences were given and correction provided if necessary. If the child gave more than one word for any item of the test, s/he was told "Only one word is missing. Try to tell me one word that fits". Sentences were presented in the same order for all children. Practice trials were not scored.

4.5.1.3. Row Completion

Rationale

This task was designed by Nunes, Bryant and Bindman for the longitudinal study.The aim of the task was to test the child's awareness of the distinctions between different word classes (parts of speech).

Design

The test had eight trials (see Appendix I). Each trial consisted of a set of four common words that all belonged to one of the following word classes: nouns, adjectives, verbs, pronouns and possessives, for example, *bus, house, stone, shop*. Two additional words were then shown to the child, one of which also belonged to that word class, for example *bag, fall*. The child had to decide which of the two words best completed the row.

Materials

Each word was handwritten in clear, lower case letters on a 5 x 3" lined index card.

Procedure

The child was told "I'm going to make a row of words which all go together, like this". The researcher then laid four word cards on the table in front of the child, to make the

following row: *we, she, he, they.* The researcher explained "These words are all like each other in some way. They all belong together." Then she put the two additional words *you* and *yours* underneath the row. The child was told "Here are two more words. One of these two words belongs with all the words in the row" (underlined words were emphasised, and a finger swept across all the words in the row). "Can you decide which one of the words goes best with all the words in the row and finishes it off?". The researcher pointed to the space at the end of the row where the child had to place their chosen word, to finish off the row. If the child made an incorrect choice, no correction was given. The above trial was given first, as piloting had shown it was the row children found the easiest to complete correctly. Sets of words in the remaining trials were presented in random order by shuffling the pack. Individual word cards were also shuffled within each set. For the first three correct answers the child gave, s/he was asked to justify the choice of word. If the child's answer showed that s/he was basing the choice on only one of the words in the row, s/he was reminded "The word you choose must go with *all* the words in the row". This reminder was given only once. If the child's answer showed that s/he was basing his or her choice on the letters in the words, the researcher said "Try to think of another way these words all belong together". Again, this prompt was given only once. Encouragement was given by the researcher with comments such as "Mm-hmm" or "You're doing fine" irrespective of the child's answer. The researcher made no further comments. The child's response, including his or her justifications for the first three correct choices, was noted on a piece of paper hidden from the child's view.

4.5.1.4. Word Analogy task

Rationale

This task was designed by Nunes, Bryant and Bindman for the longitudinal study. The aim of the task was to test the child's explicit awareness of morphology in spoken language. The analogy method was used in order to avoid the confounding of morphological and semantic abilities which occurs in cloze tasks.

Design

The test consisted of one example and eight test trials (see Appendix I). Each trial presented one pair of related words such as *work, worker*. The first word of a different but analogous pair was then given, and the child had to work out the word that should complete the pair, for example *write, writer*. The version of this task given to control children was different in two items.

Procedure

The task was presented to the child orally. For the example item, the child was told: "I'm going to say a word, and then I'm going to say another word which is a bit like it. For example, *work, worker*. How are those two words like each other and how are they different?" The similarities and differences were discussed with the child. If the child commented on the similarity in the letters, they were told "In this game we're not really thinking about the letters in the words". Next, the child was told "Now I'm going to say another word. Can you tell me the word that should go with it, in the same way as *work* and *worker* went together? If *work* goes with *worker*, then *write* goes with...?" As the researcher said the word *write*, she made a writing motion with her (left) hand to show that the word was *write* and not *right*. Correction was given on this example item, but no help was given for the remainder of the test.

4.5.1.5. Sentence Analogy task

Rationale

This task was designed by Nunes, Bryant and Bindman for the longitudinal study. The aim of the task was to test children's awareness of the relations between verbs in various tenses, particularly past and present.

Design

There were two slightly different versions of this task, one given to monolingual children and the other given to the Hebrew learners (see Appendix I). Both versions

had eight trials. Five trials were identical in the two versions. In the monolingual group version, the tense changes the child was required to make were either simple past to present, or present to simple past. This was because a central focus of the monolingual longitudinal study was to chart the development of the use of the regular past tense morpheme 'ed' in the children's spelling, and to see how this related to the child's awareness of past and present tense in spoken language. However, for the Hebrew learners, the focus of interest was a more general sensitivity to tense which could possibly result from the study of Hebrew. Thus in the final three items, tense changes other than simple past and present were used, that is, present to continuous past, to future, and to pluperfect.

Materials

For the testing of the monolinguals, two soft toy dogs were used to play the 'game' and for the Hebrew learners, two rubber finger puppets shaped like comic monsters.

Procedure

The child was introduced to the soft toy dogs or the finger puppets and told their names. S/he was told: "We're going to play a game with Fritz and Brian/Yossi and Dudi (names of dogs/finger puppets). First Yossi's going to a say a sentence, and then Dudi's going to say a sentence that is a little bit different. Listen very carefully and see if you can tell the difference." The researcher then spoke the first pair of sentences as if she were the puppets. In this trial, Yossi says *"David helps Sarah"*, then Dudi says *"David helped Sarah"*. The child was asked if s/he had heard how Dudi changed the sentence to make it a little bit different, and what the difference was. If the child answered incorrectly, the sentences were repeated, emphasizing the words *helps* and *helped*. If the child could not hear the difference even after several repetitions, testing was stopped. If s/he heard the difference, the child was told "Now Yossi's going to say another sentence. But this time, you're going to tell Dudi what he should say. He has to change Yossi's sentence in <u>exactly the same way</u> as he changed it the first time." The first of the analogous pair of sentences was then spoken: *"David sees Sarah"*. The correct response was *"David saw Sarah"*. The child's first response was noted on the

test sheet and scored. However, correction was given if necessary on this item. The procedure for the remaining items was as above, but no corrections were given.

4.5.1.6. Spelling tasks

General procedure

The word lists from each of the spelling tasks described below were mixed up and the final list divided into two lists of approximately equal length (wordlist A and wordlist B). Word pairs from the task assessing consistency in spelling morphemes were split, with one of the pair appearing in Spelling A and the other appearing in Spelling B (see Appendix I). The child was given a sheet of A4 lined paper and told: "I'm going to say a word, then I'm going to say the word in a sentence, and then I'm going to say the word again so you can make sure you've heard it right. Write the word down as best you can. Some of the words sound a bit silly. If you're not sure how to spell a word, have a guess. Write each word on a separate line, in a list going down the page".

Spelling of past tense verbs and non-verbs ending in a /t/ sound

Rationale

This test was adapted from Nunes, Bryant and Bindman. The aim was to assess whether the child understood that the 'ed' ending belonged only on past tense regular verbs, and not on past tense irregular verbs or nonverbs which end in the same sound. Using this spelling correctly involves being able to distinguish past tense and different parts of speech.

Design

3 categories of words ending with a /t/ sound were chosen: regular past-tense verbs such as kissed (5 words), irregular past-tense verbs such as sent (5 words), and

nonverbs such as except (4 words) (see Appendix I).

Consistency in spelling root morphemes

Rationale

This task was adapted from one designed for the longitudinal study by Nunes, Bryant and Bindman. The aim was to test children's awareness that word pairs which are related in meaning are likely to share spelling in one morpheme (the stem), even if they do not sound exactly alike. For example, the words *know* and *knowledge* are spelled the same in the stem, even though they do not sound alike, because they are semantically related. In order to check that the children were actually making the connection between the meanings and spellings of the words in each pair and not just spelling the words by rote memory, nonsense words as well as real words were used.

Design

There were 10 pairs of words in this task (see Appendix I). In each pair, the correct spelling of the shared morpheme was phonologically irregular in some way, so that the child could not spell it only by sound. In 6 of the pairs, one of the words was a nonsense word. 5 of these were fictional dinosaur names, whose stems were real words which contained a 'trick' letter (i.e. a phonological irregularity), for example *knotosaurus*. The word which formed the stem of the dinosaur name was the second word of the pair (*knot*). The other nonsense word pair was *specialness, special.* Although *specialness* is a plausible word with the regular *-ness* ending, it does not appear in the dictionary. The other 4 word pairs consisted of real words only, for example *magic, magician*; *strong, strength*.

Materials

To make clear the semantic link between each fictional dinosaur's name and its pair word, the child was shown a cartoon picture of each dinosaur (see Appendix I). For example, a *knotosaurus* was a brontosaurus-like creature with a knot in its neck.

Procedure

The five dinosaur names were presented at the beginning of the spelling wordlist B. The child was told "I'm going to show you some pictures of some very unusual dinosaurs. You probably won't have heard of them before. I'll tell you each dinosaur's name. Have a guess how to spell its name and write it down." The child was shown the dinosaur pictures one at a time and told each dinosaur's name. Children who wanted to guess the dinosaur's name before being told were allowed to do so, and were corrected if necessary. Each dinosaur's name was repeated once, or more if the child requested it. Spelling of all the other words was introduced as described above in the general procedure for spelling.

4.5.2. Hebrew measures

4.5.2.1. Test of Hebrew Receptive Vocabulary

Rationale

This test was devised by the researcher especially for the present study. The aim was to measure language-specific surface level knowledge of Hebrew.

The test was devised by the researcher because no standardized measure of Hebrew vocabulary could be found which was appropriate for Jewish children learning Hebrew in the diaspora. An Israeli Hebrew version of the American Peabody Picture Vocabulary Test exists which is standardised for Israeli children learning Hebrew as their first language. However, it was decided that this test was not appropriate for Jewish children outside Israel who were learning Hebrew as a religious as well as a modern language. In fact, the Hebrew version of the Peabody did not reflect the British children's religious Hebrew curriculum or their Israeli Hebrew curriculum. Words which were at the easy end of the scale on the test for children learning Hebrew as a first language, did not seem to be the same words which would be easy for second language learners.

Pilot version of the test

Initially, a pilot Hebrew vocabulary test was devised by the researcher which aimed to be appropriate for the children in the present study. The task of finding a suitable pool of items for the test was difficult because across the two Jewish schools, and even within them, there was no one set text, group of texts, or systematic curriculum from which items could be selected. The sources of much of the Hebrew the children learn are *tefilah* (prayers), *Chumash* (the biblical five books of Moses) and other religious texts such as ancient Oral Torah: the *Mishna* (a body of legal rulings on Jewish life) and the *Midrash* (commentary on the bible). Which text is studied at any particular time is largely decided by the individual Hebrew teacher and may not have been covered at the same age by another class or in another school. The exception to this is during the few weeks leading up to each Jewish festival, when the appropriate biblical or traditional text is studied and discussed so that the children understand the meaning and significance of the coming holiday and its customs. Before Passover, for example, the children spend much of their Hebrew and Jewish Studies lessons learning the story of the Exodus, and the text and meaning of the *Haggadah* (the traditional book read during the family *seder* meal). However, a wider variety of vocabulary items was required for this test than just those relevant to Jewish festivals.

Despite these difficulties, an attempt was made to devise an adequate pilot test. This consisted of 45 words selected according to three categories: 1) Modern Hebrew 2) religion, culture and festivals and 3) biblical and prayer Hebrew (15 words in each category). In practice there can be substantial overlap between these categories since Hebrew is one language but with some separation of lexicon and syntax between the modern and the classical. For example, the word 'slaves' could appear in all three categories, since it occurs in the Bible, Modern Hebrew, and a Passover song. Nevertheless the categories were created to try and include all sources of the children's vocabulary. The Modern Hebrew words were selected from the first 45 words on the Hebrew version of the Peabody (PPVT) test. The words in the other two categories were selected by the researcher as ones children in Jewish schools were likely to encounter. The format of the test was similar to that of the PPVT and the British

Picture Vocabulary Scale (Dunn & Dunn, 1982), in which the child has to select one of four pictures which best depicts a given word. The test was piloted on 17 children from a different Jewish school, not participating in the main study. However, the test was not satisfactory in several ways. Validity of the test was uncertain because of the impossibility of systematically selecting items from the curriculum which reflected the range of vocabulary learnt by children in different classes and across different Jewish schools. Seven items on the test had zero variance because all the children answered them correctly. In addition, the items taken from the Israeli version of the Peabody test were indeed not appropriate as a vocabulary measure for Jewish children in the diaspora. Even the easiest items on the test (for example, *sail, freckles*) were not words which these children knew. In conclusion, an improved version of the test was required.

Final version of the test

For the improved test, items were selected from a wordlist of 1,234 basic Hebrew words of high frequency in modern and traditional Hebrew, relevant to Jewish school life in the diaspora and constructed by Rivlin (1994). This wordlist was compiled by asking over 100 teachers of early Hebrew in Jewish day schools in North and South America, Europe, South Africa and Australia to rate which first 150, 300, 400, 500, 700, 800 and 1000 words they thought most important for children in diaspora Jewish schools to learn. The wordlist had the advantage of being ordered in seven levels of increasing difficulty, and included words from modern and biblical Hebrew, as well as festivals and Jewish culture.

Selection of items

From each of the seven levels in the wordlist, 3 modern words and 3 biblical/religious words were chosen with the help of an experienced Hebrew teacher. As discussed for the pilot test, there is in reality an overlap between these categories. Thus in the modern category, only items which were quite clearly modern (i.e. children who know no modern Hebrew would not know) were chosen, for example: *car, icecream, to ring, newspaper, tap, sofa*. In the biblical/religious category, words were chosen

which, although occurring in modern Hebrew too, were unlikely to put children who learn mainly religious Hebrew at a disadvantage, for example: *saying, to light, prays, five, moon, mountain, ark, wicked.* The total number of items was 42. A list of the final items is shown in Appendix I.

Materials

Each page of the test showed four black and white line drawings. Where possible, these drawings were copied from the British Picture Vocabulary Scale (BPVS). When appropriate pictures could not be found in the BPVS, they were drawn by the researcher or copied from pictures from a resources library for Jewish teachers. The pages were presented in an A4 ring binder.

Procedure

The Hebrew words were recorded onto audiocassette by a native Hebrew speaker, a teacher at one of the schools. The child was told : "On each page you're going to see four pictures. At the same time, you're going to hear a Hebrew word on the tape recorder. Look carefully at <u>all</u> the pictures and then point to the picture which goes best with the Hebrew word. If you're not sure, have a guess." Children were encouraged to turn the page when they had made their choice, to aid smooth running of the test. The tester recorded the child's response on a form hidden from the child's view. The child's response for each item was scored 1 for correct and 0 for incorrect.

4.5.2.2. Hebrew Oral Cloze task

Rationale

The Hebrew oral cloze task was adapted from the task used by Geva and Siegel (1994). The aim of the test was to test the child's ability to use syntactic, morphological and semantic information in order to complete Hebrew sentences which had one word missing. The missing words covered various word classes, inflected for person, plurality, tense, and/or gender. Because the children were doing this test in

their second language, performance also depended on their level of Hebrew vocabulary. In order to use their grammatical knowledge to complete the sentence, they first had to understand the sentence.

Design

The original test by Geva and Siegel was designed for children in Jewish day schools in Canada, where more time is allocated to the teaching of spoken Modern Hebrew than in British Jewish schools. This test consisted of 20 sentences with one word missing from each. Four of these sentences concerned Jewish culture or festivals, for example, *"On Shabbat I go to the synagogue"* The remainder were sentences about everyday situations, for example *"In the morning I drink milk"*. Many of the sentences required the child to have a fairly extensive command of Modern Hebrew. For the British children in the present study, then, this test was not appropriate for the children who study religious texts, but who learn to speak only a little Modern Hebrew. Therefore, for the present study, 10 Modern Hebrew items from Geva's test were used, and 10 new ones were devised to take the children's religious Hebrew into account. These new sentences were taken or adapted from the Bible, prayers, or commandments, or were invented by the researcher using vocabulary which appears frequently in religious study (for example, *God, Torah, commanded us, righteous man*). In order not to test just rote memory of the sentences, the original word order of very familiar sentences was changed. For example, the line *"In the beginning God created the heavens and the earth"* is highly familiar because it appears in a prayer. This sentence was changed to *"In the beginning God created the earth and the heavens"*. A list of the 20 sentences of the adapted test, and their English translations, are shown in Appendix I.

Procedure

The task was presented orally. The sentences were recorded on audiocassette by a native Israeli Hebrew speaker, who was also an experienced Hebrew teacher at one of the schools. The spot of the missing word was marked by the sound of a knock on the table.The child was reminded of the procedure of the English test, instructed to listen

carefully to each sentence, and to guess what the missing word was. If the child wanted, the sentence was repeated by the researcher.

Each response was scored 1 for correct and 0 for incorrect. To be scored correct, the response had to be grammatically correct. Thus it had to be correctly inflected for gender, plurality, person and tense, as appropriate.

4.5.2.3. Hebrew Roots task

Rationale

This task was designed especially for the present study. The aim was to assess whether or not children understood the concept of the *shoresh* (three-consonant Hebrew root) and whether or not they could extract this root from written Hebrew words. One feature of Hebrew roots, like in English, is that if two words have very similar meaning, they are likely to share part of their spelling. In Hebrew words, these shared root letters can be at the beginning of the word, but alternatively they may be in other positions. In both words, however, they must be in the same order. Two words which sound the same, but have one or more different letters (homophones) cannot be highly related in meaning.

To extract a shared root from a written Hebrew word, the child must understand the principles above, and know that roots normally have three letters. Vowel diacritics are unimportant when searching for the root, because while they affect the way a word is pronounced, they have nothing to do with its root meaning. In addition, the child needs to be able to distinguish the root letters from letters or morphemes that indicate aspects of the word's meaning other than the root meaning, for example the final morphemes *-im* and *-ot* (ים- and ות-), which mark plurality (and gender), the final letter *hay* (ה) , which marks the feminine, and the initial morpheme *l-* (ל), which indicates the infinitive of a verb.

Design

The test had three practice trials and eight test trials. In each test trial, the child was shown a stimulus word, and below it, four additional words. The child's task was to choose which of these four words shared the root with the stimulus word. The three of these four words which did not share the root with the stimulus word, were distractors. These distractors were chosen to check whether the child really understood the idea of the root and could extract it, or whether they would base their choice on features of the words other than the root.

Each distractor had one or two of the following non-root features in common with the stimulus word: it rhymed, was a homophone, shared vowels, shared root letters but in mixed-up order, had less than three letters altogether, had two but not three shared root letters, shared prefixes or suffixes, or began with the same three letters but these were not the root.

The word which was the correct response, that is, had the same root as the stimulus word, could have the root in a number of possible positions. The three root letters could appear at the beginning of the word (three trials) or they could appear in other positions. For example, the correct pair to the stimulus word *shemesh* (שמש; sun) was *shimshiya* (שמשיה; parasol). These words shared the root *sh.m.sh* (ש.מ.ש) , with these letters appearing at the beginning of both words. On the other hand, the correct pair to the stimulus word *ledaber* (לדבר; to speak) was *dibur* (דיבור; speech). The shared root of these two words is *d.b.r* (ד.ב.ר). These letters occupy different positions in the two words.

A different combination of distractor type was used in each trial, so that each distractor type was used three times, except for the final type (first three letters the same, but not the root) which was used only once.

Examples of the trials, with different types of distractor, are shown in Figure 4.1. The remaining items are shown in Appendix I.

1.

קְרִיאָה (stimulus)
"kriya"

לִקְרוֹא	רֵיקָה	קְרִיעָה	כְּתִיבָה
"likro"	"reika"	"kriya"	"ktiva"
(correct: shares root ק.ר.א)	(some of the same consonants, but different order)	(homophone)	(same vowels)

2.

מְאַבֶּדֶת (stimulus)
"me'abedet"

מְעַבֶּדֶת	אִיבְּדוּ	בַּד	מַתָּנוֹת
"me'abedet"	"ibdu"	"bad"	"matanot"
(homophone)	(correct: shares root א.ב.ד)	(less than 3 root letters)	(same prefix and suffix)

Figure 4.1. Two examples of trials in the Hebrew Roots task

Materials

The words were typed in large, bold, Hebrew block (capital) letters with vowel diacritics. The child's responses were recorded onto audiocassette.

Procedure

The three example items were presented first, and feedback given. In these example items, the child had to choose between only two possible answers. The child was told "Look at this word here (tester points to stimulus word). What does it say?" The child read the word *sefer* (סֵפֶר). If s/he could not read it, the tester read it aloud. She then said "Now look here, underneath (points), and you can see two more words: *yeled* (יֶלֶד) and *sifriya* (סִפְרִיָה). One of these two words means something very like *sefer* (סֵפֶר). Which one do you think it could be?". If the child answered correctly, s/he was asked to justify his or her answer. In the first and second examples, the English translation of each word was printed next to the Hebrew word (here: *book*; then *boy*, *library*). This was to make clear to the child what was meant by a word that 'means something very like' another. The child could correctly justify his or her response in two main ways, for example, "Books are in libraries", and "They both have *samech*, *fay* and *resh* (the root letters ס.פ.ר) in them". S/he could also base the response on the similar sounds of the words *sefer* and *sifriya* . However, if this response was given, the other two ways in which the words were similar were pointed out, because in later trials, the strategy of 'similar sounds' could result in an incorrect response. If the child gave only one of the two main possible kinds of response, i.e. either the shared letters or the shared meaning, then the other way that the words were similar was pointed out. English translations were not provided after the first two example trials. This was because the aim of the task was to assess the child's ability to extract the Hebrew root, and not to choose the paired root purely by the similarity of the translated English meanings. Procedure was similar for the test trials, except that the researcher pointed out that there were now four words to choose from. If children mentioned 'roots' or '*shoresh*' during testing, they were asked to explain at the end of testing what they knew about roots. These explanations were recorded on tape.

CHAPTER FIVE

RESULTS OF STUDY 1

The first section of this chapter describes univariate statistics for each of the tasks used in the study, for the sample of Hebrew learners. In the later sections, the research questions are addressed and the evidence for each hypothesis is examined. Relevant statistics relating to the monolingual children with whom the Hebrew learners were compared are given in the sections describing the results of these comparisons.

5.1. Description of the sample and measures

5.1.1. The sample of Hebrew learners

In the sample of 116 Hebrew learners there were 63 boys and 53 girls. A chi-square test showed that this difference was not statistically significant. Table 5.1. shows the mean age (in years and months) of the Hebrew learners by school and National Curriculum Year.

Table 5.1. Mean age (years and months) and SD (months) of Hebrew learners by school and National Curriculum Year

	Year					Total N
	2	3	4	5	6	
School 1	7:1 (4)	7:11 (2.3)	8:10 (4.8)	9:10 (3.6)	-	n=56
	n=15	n=15	n=15	n=11		
School 2	-	8:1 (3.5)	9:1 (4.2)	10:1 (3.3)	11:2 (3.6)	n=60
		n=15	n=15	n=15	n=15	
						N=116

The children from School 2 were slightly older in each Year than School 1 children because they were tested later in the school term.

5.1.2. English measures

5.1.2.1. English Oral Cloze

The distribution of scores is shown in Appendix II. The task was easy for the majority of children. 76% of all children scored 13, 14 or 15 (15 was the maximum score). Only 8 % of children scored less than 9. Thus a close to ceiling effect was observed. There was no significant difference between the mean scores of children from School 1 and children from School 2 (Years 3-5 only).

5.1.2.2. Word Analogy task

The distribution of scores is shown in Appendix II. The majority of scores lay at the lower end of the distribution. 49% of children scored 2 or less, and no child scored the maximum of 8. Though the mean scores ascended by Year (see table, Appendix II), this was still a challenging task even in Years 5 and 6.

There was no significant difference between the mean scores of children from School 1 and children from School 2 (Years 3-5).

5.1.2.3. Sentence Analogy task

The distribution of scores is shown in Appendix II. The maximum score was 8, and the mean score was 4.9 (*SD* 2.03). Although the distribution was approximately normal, it was slightly skewed towards the higher scores. When the mean scores of School 1 and

School 2 children in Years 3 to 5 inclusive were compared, it was found that children from School 2 scored significantly higher (t=2.37; d.f.=84; p=.02). The distributions of scores for the separate schools are also shown in Appendix II.

5.1.2.4. Row Completion

There were 8 items on the Rows task, but for each item, there was a 0.5 probability of choosing the correct word. Thus the child could get a total score of 4 or so, just by guessing. As an alternative to the total score, therefore, the number of correct justifications was used in the analyses. To score a point the child had to choose correctly which of two words completed the row, and give a grammatical justification for this choice (for example, *"they're all verbs"*, or *"these are all things you do"*). The mean numbers of grammatical justifications for correct answers (maximum total 4) by Year are shown in Appendix II. There was no significant difference in the mean scores of children in School 1 and School 2.

5.1.2.5. Spelling tasks

5.1.2.5.1. Use of 'ed' on regular past tense verbs

Two methods were used to score this task The first was simply to give one point for each past tense regular verb spelled with 'ed' at the end (maximum score 5). The distribution of the total scores using this method are shown in Appendix II.

The second method was to assign children to one of 5 ordered stages, depending on the way they spelled the endings of the regular and irregular past-tense verbs and non-verbs, which all ended with the sound /t/. This method was based on the stage analysis used by Nunes, Bryant and Bindman in the longitudinal study. Children at Stage One were *pre-phonetic* spellers, that is, they failed to spell the endings of the words

consistently in any way. They spelled less than five words altogether with the letter /t/ at the end. The second stage was the *phonetic* stage, in which children spelled five or more irregular verbs and nonverbs with a 't' at the end, two or more regular verbs with a 't' and used 'ed' only once or not at all on any of the words. In the third stage children made *generalisations and overgeneralisations*, that is, they put 'ed' on irregular verbs and on non-verbs. Children were assigned to this stage if they had used five or more 't' endings on irregular verbs and non-verbs, and one or more 'ed's on each of the three kinds of words (regular verbs, irregular verbs, and non-verbs). At Stage Four, children realised the grammatical significance of 'ed' but still put it on irregular verbs, that is, still made *generalisations*. They used five or more 't' endings on irregular verbs and nonverbs, and one or more 'ed's on regular verbs and on irregular verbs, but did not put any 'ed's on non-verbs. In the fifth and *final* stage, children had mastered the correct use of 'ed', and only put it on regular verbs, and not on irregular verbs or non-verbs. Again, they used five or more 't' endings on irregular verbs and non-verbs, and one or more 'ed's on regular verbs, but no 'ed's on irregular verbs or non-verbs.

The numbers of children falling into each of these five categories are shown in Appendix II.

Using either of these scoring methods, it can be seen from the distributions that there is a ceiling effect. 61% of children put 'ed' on all 5 of the regular verbs, and a further 16% put 'ed' on four of them. Similarly, 72% of children fell into Stage 5, while a further 12% fell into Stage 4. It would appear then that in general these children had mastered the correct use of 'ed' and the task was too easy, even though in the longitudinal study the task had been appropriate for this age range.

Since both scoring methods yielded similar results, it was decided to use only one of the methods, the number of 'ed' endings used on regular verbs, in later analyses. However, the lack of variability in the scores on this task means that it is unlikely to show high correlations with other tasks in these analyses.

Children in School 2 (Years 3, 4 and 5) spelled significantly more regular verbs with 'ed' (mean 4.6, *SD* 0.9) than did children of the same Years from School 1 (mean 4.0; *SD* 1.5; t=2.33, d.f.=64.01, p=.02).

5.1.2.5.2. Consistency in spelling root morphemes

The distribution of scores on this task is shown in Appendix II. The mean score was 7 (*SD* 2.24) with maximum possible score 10. The mean scores of children in Years 3 to 5 were compared across the two schools. Children in School 2 spelled more pairs of word stems consistently (mean 7.7, *SD* 1.8) than did children in School 1 (mean 6.8, *SD* 2.3) (t=2.05, d.f.=81, p=.043). The distributions of scores in each school are shown in Appendix II.

5.1.3. Hebrew measures

5.1.3.1. Hebrew Vocabulary

Cronbach's alpha for the test was 0.84. Thus the test was found to have an acceptable level of reliability (Mehrens & Lehmann, 1978).

The distribution of scores on this task is shown in Appendix II. Scores were approximately normally distributed. The maximum possible score was 42. The mean score was 26.8 (*SD* 4.9), and scores ranged between 10 and 41.

The distributions were also examined separately for each school (Appendix II), because the Hebrew curricula in the two schools were different. The mean score of children in School 1 was 31 (*SD* 5.3) and in School 2 was 22.9 (*SD* 4.8). This difference was significant (t=8.64, d.f.=114, p<.001). Thus children from School 1 knew more Hebrew words than did children in School 2, even though the School 1

sample included younger children.

5.1.3.2. Hebrew Oral Cloze task

Cronbach's alpha for the test was 0.85, an acceptable level of reliability (Mehrens and Lehmann, 1978).

The distribution of scores is shown in Appendix II. The distribution was approximately normal, but skewed towards the lower scores. In addition, although the maximum possible score on this test was 20, the highest score actually attained was 16. The mean score was 6.3 (*SD* 4.02). The distribution of scores was also examined for each school separately (see Appendix II), because of the different Hebrew curricula in the two schools. Children from School 1 performed better on this test (mean 8.1; *SD* 4.19) than children from School 2 (mean 4.7; *SD* 3.08), despite being younger on average. A t-test for unequal variances showed this difference to be significant ($t=4.93$; d.f. 100.57; $p<.001$).

5.1.3.3. Hebrew Roots task

Two methods of scoring were used for this task, one strict and one lenient. The strict scoring method gave one point for each item if a) the child chose the correct Hebrew word, and b) in the justification for this choice, the child demonstrated that s/he was searching for 3 common letters between the stimulus and the chosen word.The lenient scoring method gave one point for each item if the child demonstrated using a 3 letter strategy, even if this did not result in a correct choice.The distributions of total scores on the task, using both scoring methods, are shown in Appendix II. One child from School 2 did not complete the task.

Using the strict scoring method, the overall mean score was 2.9 (SD 2.22) out of a maximum possible score of 8. An examination of the means showed that scores

increased by school Year (see Table 5.2). A oneway ANOVA showed a significant effect of Year on knowledge of Hebrew roots ($F=11.52$; d.f.= 4,110; $p<.001$).

Using the lenient scoring method, the overall mean score was 3.8 (*SD* 2.6). Mean scores increased by Year (see Table 2), and the effect of school year on use of a 3 letter strategy was significant, $F(4,110)=11.33$, $p<0.001$).

Table 5.2. Mean scores (SD) on the Hebrew Roots task by school year

Year	$\bar{x}$ (strict)	$\bar{x}$ (lenient)	n
2	1.6 (0.9)	2.3 (1.4)	15
3	1.7 (1.5)	2.5 (1.9)	30
4	2.6 (2.0)	3.3 (2.4)	29
5	4.0 (2.5)	5.0 (2.8)	26
6	4.9 (1.9)	6.5 (2.3)	15

Using the strict criterion, children did not demonstrate much success on the task until Year 5. However, the 'lenient' scores show that by about Year 4 children were beginning to look for a 3 letter root. In the statistical analyses which follow in later sections of this chapter, the 'strict' scores are used, because this seemed to provide a more stringent measure of root knowledge.

Despite the fact that in School 2 less time is spent on Hebrew than in School 1, there were no differences between schools in the children's Hebrew Roots scores in each of Years 3, 4 and 5. Children in School 2 do therefore know as much about this aspect of written Hebrew morphology as School 1 children do, despite learning less spoken Hebrew.

5.2. The research questions

5.2.1. Can children transfer metalinguistic knowledge, as opposed to surface level knowledge, between their languages?

It was hypothesised that because lexical knowledge is specific to each language, there would be no relationship between L1 and L2 vocabulary level. Therefore it was expected that there would be no correlation between number of Hebrew words correct and number of English words correct on the two vocabulary tests.

It was further hypothesised that metalinguistic-level grammatical knowledge would transfer across languages, because the ability to reflect on this aspect of language is hypothesised to be generalisable across languages. It was expected that Hebrew grammatical knowledge would (i) correlate with English grammatical knowledge, and (ii) significantly predict English grammatical knowledge even when age and English vocabulary level were partialled out.

In addition it was hypothesised that L2 vocabulary would not be related to L1 metalinguistic awareness, because transfer would only occur between metalinguistic aspects of knowledge in the two languages, and not other, non-metalinguistic aspects. Therefore it was predicted that Hebrew vocabulary level would not correlate with performance on the English grammatical tasks.

The intercorrelations of Hebrew and English vocabulary and grammatical measures are given in Table 5.3.

In Table 5.3 it can be seen that there was no correlation between Hebrew Vocabulary and English Vocabulary (WISC-III raw score). Pearson's r was .07. Thus there was no evidence of transfer of vocabulary knowledge between languages.

As expected, Hebrew Vocabulary did not correlate significantly with any of the English

grammatical measures. The Hebrew Oral-Cloze task, however, correlated significantly with all the English grammatical measures, though these correlations were weak (r was between .3 and .39). Hebrew Roots also correlated significantly with all the English grammatical measures; the strongest correlations were with Sentence Analogy and Word Analogy (.51 and .53 respectively).

Table 5.3. Correlations between Hebrew and English vocabulary and morpho-syntactic measures

	1	2	3	4	5	6	7	8
1. H Vocab	1							
2. H Oral-Cloze	.77 (116) p<.001	1						
3. H Roots	.31 (115) p=.001	.4 (115) p<.001	1					
4. E Vocab	.07 (116) p=.45	.25 (116) p=.008	.5 (115) p<.001	1				
5. E Oral-Cloze	.13 (116) p=.17	.32 (116) p<.001	.33 (115) p<.001	.66 (116) p<.001	1			
6. E Sent Anal	.08 (116) p=.4	.34 (116) p<.001	.51 (115) p<.001	.71 (116) p<.001	.56 (116) p<.001	1		
7. E Word Anal	.14 (101) p=.15	.39 (101) p<.001	.53 (100) p<.001	.66 (101) p<.001	.42 (101) p<.001	.58 (101) p<.001	1	
8. E Rows Justif	.12 (115) p=.2	.29 (115) p=.002	.35 (114) p<.001	.62 (115) p<.001	.47 (115) p<.001	.57 (115) p<.001	.5 (101) p<.001	1

Abbreviations: H = Hebrew; E = English Vocab = Vocabulary; Sent Anal = Sentence Analogy; Word Anal = Word Analogy; Rows Justif = grammatical justifications for correct choices on Rows task. The number of children is shown in parentheses.

There remains the possibility that significant correlations are due to effects of age and/or general language ability. Therefore a series of fixed-order hierarchical regression analyses were carried out to find out whether performance on the Hebrew grammatical tasks would predict performance on the English grammatical tasks even when the effects of age and English vocabulary were partialled out. Age was entered at the first step, and WISC-III Vocabulary (scaled score) at the second step. Each analysis shared these same first two steps. At the third step, either Hebrew Oral-Cloze or Hebrew Roots was entered. The analysis was repeated for each of the four outcome measures, which were the English Oral-Cloze, Sentence Analogy, Word Analogy and Rows Justifications. Figures 5.1 and 5.2 display the percentage of variance explained by each step of the analysis, for each of the four outcome measures. Where the Hebrew task significantly predicted the English task, the results are reported in more detail in Appendix III.

Neither of the Hebrew tasks significantly predicted performance on the English Oral-Cloze task, once Age and English Vocabulary had been partialled out. This may be a result of the ceiling effect observed for the English Oral-Cloze task.

Both Hebrew tasks significantly predicted performance on the Sentence Analogy and Word Analogy tasks. The Hebrew Oral-Cloze explained 5% of the variance in Sentence Analogy, while Hebrew Roots explained 3%. When Word Analogy was the outcome measure, Hebrew Oral Cloze explained 3% and Hebrew Roots 4% of the variance.

The Hebrew Oral Cloze score was significantly related to the number of grammatical justifications for correct responses on the Row Completion task (Figure 5.1), but Hebrew Roots was not (Figure 5.2).

To sum up, the Hebrew Oral Cloze task significantly predicted performance on three out of four of the English tasks, even after the effects of age and English vocabulary

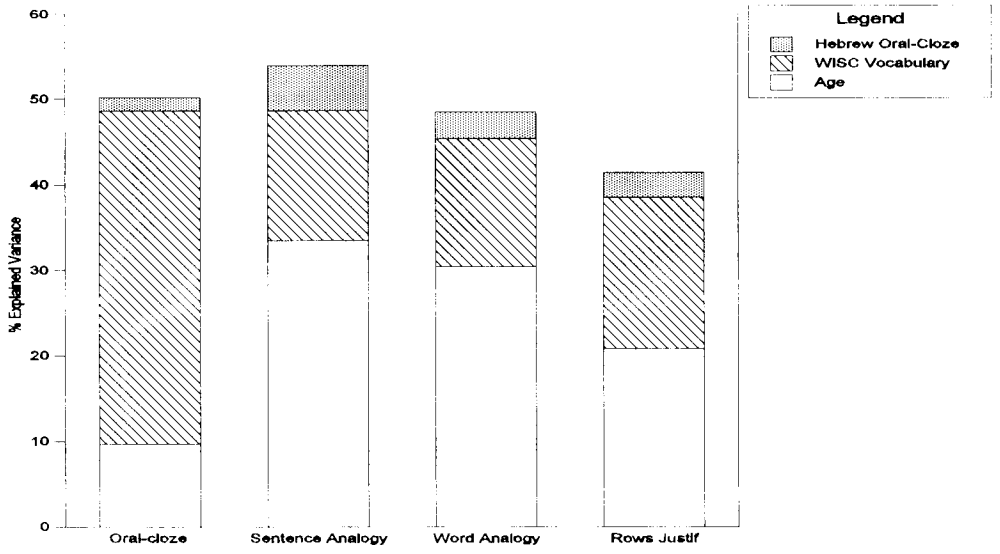

Figure 5.1. Percentage of variance in English grammatical tasks explained by Age, WISC-III Vocabulary and Hebrew Oral-Cloze

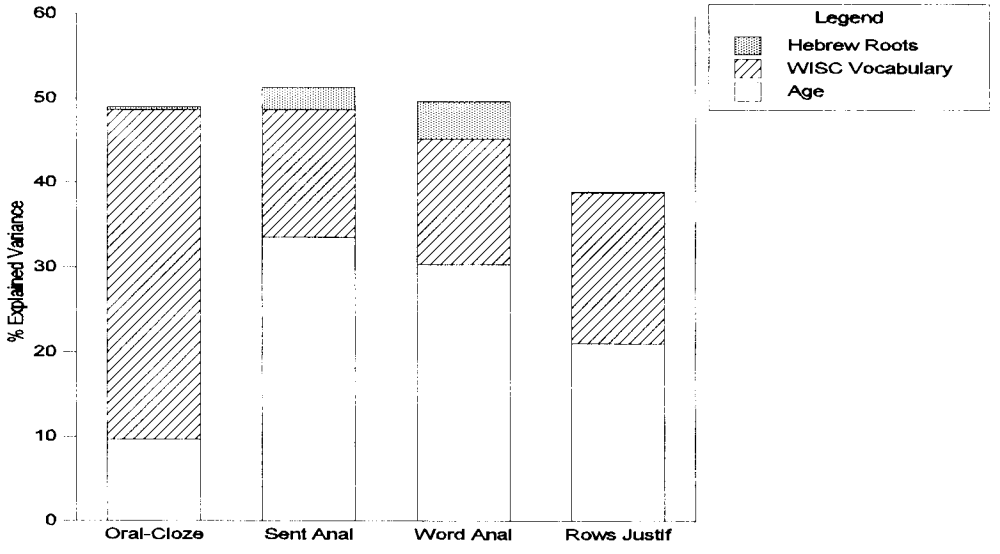

Figure 5.2. Percentage of variance in English grammatical tasks explained by Age, WISC-III Vocabulary and Hebrew Roots

were partialled out. Hebrew Roots significantly predicted performance on Word Analogy and Sentence Analogy tasks, but not on the English Oral-Cloze task nor the Rows Justifications.

5.2.2. Does the ability of L2 learners to transfer metalinguistic knowledge between their languages depend on the kind of L2 learning they experience?

It was hypothesised that the relationship between L1 and L2 metalinguistic knowledge would depend on the purpose for which the second language was taught and the way in which it was learned. In School 1, children learn both Modern and Classical Hebrew. In School 2, however, very little time is spent on Modern Hebrew (less than 1 hour per week). It was predicted that even though these children speak very little Modern Hebrew, they would nevertheless learn about some aspects of Hebrew morphology in their study of classical texts, and that this would be related to their morphological knowledge in English. Specifically, the Hebrew Oral-Cloze task, which demands a high level of spoken Hebrew, was expected to predict performance on the English grammatical tasks for children learning to speak Modern Hebrew (School 1). This task was not expected to be as good a predictor of performance on the English tasks for children from School 2. It was expected that for children from School 2, performance on the Hebrew Roots task would predict performance on the English tasks, as children learn about the Hebrew root in their study of classical texts. The Hebrew Roots task should also predict performance on the English tasks for children from School 1, as they too learn about the root in their study of both Modern and Classical Hebrew.

In order to investigate whether the relationships between Hebrew and English morpho-syntactic knowledge were different in the two schools, a series of multiple regressions were carried out in which the predictor variables were age, WISC-III Vocabulary, Hebrew morpho-syntactic knowledge (Oral Cloze or Roots), a dummy variable for school, and a term representing the interaction between school and Hebrew morpho-

syntactic knowledge. This interaction term was the product of the school and the Hebrew variables. These predictor variables were entered simultaneously. The response variable in each analysis was one of the English morpho-syntactic tasks. If the relationship between Hebrew and English morpho-syntactic awareness were different in the two schools, then a significant interaction was expected between Hebrew morpho-syntactic awareness and school, when the main effects of age, vocabulary, school and Hebrew morpho-syntactic awareness were held still.

The results showed that there were significant interactions between Hebrew Oral Cloze score and school for the analysis in which English Oral Cloze was the response variable, and for the analysis in which the English Word Analogy was the response. The results of these analyses are shown in more detail in Appendix III. There were no significant effects of the interaction term for Hebrew Oral Cloze and school, on the other two English tasks, nor were there any significant effects of the interaction term for Hebrew Roots and school on any of the English tasks.

In order to clarify the nature of the significant interactions, the correlations between Hebrew Oral Cloze and English Oral Cloze, and between Hebrew Oral Cloze and English Word Analogy, were examined in each of the two schools separately. Fixed-order multiple regression analyses were also carried out separately for each of the two schools, in order to see if the relationships between the Hebrew Oral Cloze and the two English tasks were significant in each school, once age and WISC-III Vocabulary score were partialled out.

In School 1, the correlation between the Hebrew Oral Cloze and the English Oral Cloze tasks was strong ($r=.68$; $n=56$; $p<.001$).

In the multiple regression analysis, age was entered as the first step, WISC-III Vocabulary as the second step, and Hebrew Oral Cloze as the third and final step, with English Oral Cloze as the response variable. The results of this analysis showed that

even after age and vocabulary had been controlled, the Hebrew Oral Cloze task significantly predicted English Oral Cloze, explaining 6% of the variance (p=.0009). The results of this regression analysis are shown in more detail in Appendix III.

In School 2, the correlation between Hebrew Oral Cloze and English Oral Cloze was not significant (r=.17; n=60; p=.19). A multiple regression analysis was not carried out because the lack of correlation showed that there was no relationship between Hebrew and English Oral Cloze tasks for School 2 children.

Next, the relationships between Hebrew Oral Cloze and the English Word Analogy were examined separately for the two schools. In School 1, there was a significant correlation between the two tasks, but this was not strong (r=.32; n=56; p=.015). A multiple regression analysis showed that when age and WISC-III Vocabulary were partialled out, the relationship between Hebrew Oral Cloze and English Word Analogy was not significant.

In School 2, on the other hand, the correlation between Hebrew Oral Cloze and English Word Analogy was strong (r=.67; n=60; p<.001). The multiple regression analysis showed that Hebrew Oral Cloze significantly predicted English Word Analogy even when age and WISC-III Vocabulary were partialled out, explaining 16% of the variance (p=.0001). These results are shown in more detail in Appendix III.

5.2.3. Can children use morpho-syntactic knowledge in one language for morphological spelling in another language?

It was hypothesised that, if transfer of morpho-syntactic knowledge can occur between languages, and if awareness of L1 morphology in oral language is related to children's L1 morphological spelling knowledge, then L2 morpho-syntactic knowledge should also be related to children's L1 morphological spelling knowledge. It was therefore expected that (i) English morpho-syntactic knowledge would correlate with correct

spelling of the past tense morpheme in English regular verbs, and consistent spelling of the stems of semantically related words, and (ii) Hebrew morpho-syntactic knowledge would in turn also correlate with these two kinds of morphological spelling. It was expected that of the two Hebrew measures, Hebrew Roots would correlate more strongly with consistency in spelling stems, since it was hypothesised that performance on these two tasks depended on understanding the idea that words which share meaning also share spelling of the root morpheme.

To examine the evidence for the first of these hypotheses, the correlations between performance on the English morpho-syntactic tasks and the two spelling tasks were examined. These correlations are shown in Table 5.4.

Table 5.4. Correlations between English morpho-syntactic and spelling measures

	1	2	3	4	5	6
1. Oral-Cloze	1					
2. Sent Anal	.56 (116) p<.001	1				
3. Word Anal	.42 (101) p<.001	.58 (101) p<.001	1			
4. Rows Justif	.47 (115) p<.001	.57 (115) p<.001	.5 (101) p<.001	1		
5. Spell 'ed'	.52 (101) p<.001	.46 (101) p<.001	.34 (86) p=.001	.41 (100) p<.001	1	
6. Spell consist	.36 (97) p<.001	.51 (97) p<.001	.45 (83) p<.001	.46 (96) p<.001	.59 (97) p<.001	1

Abbreviations: Sent Anal = Sentence Analogy; Word Anal = Word Analogy; Rows Justif = no. of grammatical justifications for correct choices on Rows task; Spell 'ed' = no. of 'ed's on regular verbs; Spell consist = No. of consistently spelled shared stems. The no. of children is shown in parentheses.

Moderate significant correlations were seen between performance on the English morpho-syntactic and spelling tasks.

Fixed-order hierarchical regressions were carried out to find out if the morpho-syntactic tasks would significantly predict spelling performance when age and WISC-III Vocabulary were partialled out.

The English Oral-Cloze task, but none of the other English morpho-syntactic tasks, significantly predicted the number of 'ed' endings children put on regular verbs. English Oral-Cloze explained 4% of the variance. The Sentence Analogy, and the number of correct justifications for correct responses on the Row Completion task, significantly predicted the number of consistently spelled stems (each task explained 4% of the variance), but Word Analogy and Oral-Cloze did not. Details of the results of these analyses are shown in Appendix III.

The next statistical hypothesis to be examined was that Hebrew morpho-syntactic knowledge would significantly predict correct spelling of the past tense morpheme and consistent spelling of the stems of semantically related words. First, the correlations between the Hebrew measures and the English spelling measures were examined (see Table 5.5).

The correlation between Hebrew Oral-Cloze and spelling of the past tense morpheme did not quite reach significance. Hebrew Oral-Cloze did, however, correlate significantly, though weakly, with the number of consistently spelled stems. Hebrew Roots correlated significantly but weakly with use of the 'ed' ending. As expected, the strongest cross-language correlation was between Hebrew Roots and consistency in spelling stems. Regression analyses were carried out to see if the Hebrew tasks would predict English spelling of morphemes when age and WISC-III Vocabulary were partialled out.

Table 5.5. Correlations between Hebrew morpho-syntactic measures and English spelling of morphemes

	1	2	3	4
1. H Oral-Cloze	1			
2. H Roots	.4 (115) p<.001	1		
3. Spell 'ed'	.19 (101) p=.058	.23 (100) p=.02	1	
4. E Spell Consist	.21 (97) p=.035	.44 (96) p=<.001	.59 (97) p=<.001	1

Abbreviations: H=Hebrew; E=English; Spell 'ed' = no. of -ed on regular verbs; Spell consist = no. of consistently spelled stems.The no. of children is shown in parentheses.

Both Hebrew tasks significantly predicted consistency in spelling stems (each explained 4% of the variance), but neither task predicted use of 'ed' on regular verbs. Details of the results of these analyses are shown in Appendix III.

As in the analyses relating to the previous research question, the possibility was examined that the relationships between Hebrew morpho-syntactic awareness and English morphological spelling would be different in the two schools. In a series of multiple regression analyses, Age, WISC-III Vocabulary, school, Hebrew morpho-syntactic awareness (Oral Cloze or Roots task) and a term representing the interaction between Hebrew morpho-syntactic awareness and school (the product of these two variables) were entered simultaneously as predictor variables, with either the number of 'ed' endings on English regular past tense verbs, or the number of consistently spelled English root morphemes, as the response variable.

The results showed that there was a significant effect of the interaction between Hebrew Oral Cloze and school, on the number of 'ed' endings children put on regular

past tense verbs. Details of this analysis are shown in Appendix III. There were no significant interactions in any of the other analyses.

To elucidate the nature of the interaction between Hebrew and school for the 'ed' task, the correlations between Hebrew Oral Cloze and the number of 'ed' endings on regular past tense verbs were examined for each school separately.

In School 1, Hebrew Oral Cloze correlated significantly with the number of 'ed' endings ($r=.50$; $n=56$; $p<.001$). A multiple regression analysis was carried out to see if this relationship remained significant when the effects of age and English vocabulary were partialled out. Age and WISC-III Vocabulary were entered as the first and second steps, and Hebrew Oral Cloze as the third step. The response variable was the number of 'ed' endings on regular past tense verbs. The results showed that there was still a significant relationship between the Hebrew Oral Cloze and the number of correct 'ed' endings. Hebrew Oral Cloze explained 5% of the variance, after age and vocabulary had been partialled out. The results of this analysis are shown in more detail in Appendix III.

In School 2, the correlation between the Hebrew Oral Cloze and the number of 'ed's on regular verbs was not significant ($r=.22$; $n=45$; $p=.15$).

5.2.4. (i) Can the ability of L2 learners to transfer metalinguistic knowledge between languages aid metalinguistic development? (ii) Does this depend on the level of L2 attained?

It was hypothesised that learning a second language would result in earlier development of metalinguistic knowledge than in monolingual children, because of the ability of L2 learners to transfer metalinguistic knowledge between their languages. It was predicted that L2 learners would perform better than monolingual children of the same age on L1 metalinguistic tasks. However, if metalinguistic awareness is only

raised once the child has reached a certain level of L2, children with only a little L2 metalinguistic knowledge should not show any advantage over monolinguals. Therefore it was predicted that Hebrew learners with a high level of Hebrew morpho-syntactic knowledge would score higher than age-matched monolingual children on English morpho-syntactic tasks. Hebrew learners with lower levels of Hebrew morpho-syntactic knowledge would score the same as monolinguals on these tasks.

First, the performance of the Hebrew learners and the monolinguals on the English Oral Cloze task was compared. This task was carried out by the monolingual children at the first testing session of the longitudinal study, when they were in Years 2, 3 and 4. To match the Hebrew learning and the monolingual groups for age, all the Hebrew learners and all the monolingual children whose ages fell within the same range were identified. The ages of the children thus selected ranged from six years and five months to nine years and eleven months. However, as well as ensuring that the ages of the two groups fell within the same range, a good age match required that they also had the same mean and variance. In order to fulfil all these three requirements, it was necessary to exclude children in both groups who were below the age of six years and eleven months and children who were above the age of nine years and six months. This was because within the original age range there were relatively few very young children in the group of Hebrew learners, and relatively few of the oldest children in the monolingual group, resulting in a greater mean age for the Hebrew learners than for the monolingual group.

This procedure resulted in a group of 68 Hebrew learners and a group of 227 monolingual children. The mean age of the Hebrew learners was eight years and three months (*SD* 8 months), and of the monolingual children was eight years and one month (*SD* 8 months). This difference was not significant (t=1.86; p=.06), and Levene's Test for Equality of Variances showed that the variances were similar (F=.04; p=.85).

The scores of the Hebrew learners and the monolinguals on the English Oral Cloze task were then compared. The mean score of the Hebrew learners was 11.88 (*SD* 2.4)

and of the monolinguals was 11.56 (*SD* 2.3). This difference was not significantly different (t=.98; d.f.=293; p=.33).

To examine the evidence for the hypothesis that any advantage for the Hebrew learners would only be apparent for those children who had a high level of Hebrew morpho-syntactic knowledge, while children with lower levels of Hebrew would perform more similarly to monolinguals, a series of further analyses was carried out. Each Hebrew learner was assigned to one of three groups of approximately equal size, on the basis of their level of performance on the Hebrew Oral Cloze task. Approximately the lowest scoring 33% of children were assigned to the first level ('low'), the middle 33% to the second level ('middle') and the highest 33% to the third level ('high'). The scores of each of these three groups of Hebrew learners on the English Oral Cloze task were then compared with those of the monolingual group. Prior to each comparison, the suitability of the age match between the Hebrew learners and the monolinguals was checked by comparing the mean age and variance of the two groups.

First, differences between children with a 'low' level of Hebrew morpho-syntactic knowledge and the monolingual children were examined. 24 Hebrew learners were classified as having a 'low' level of Hebrew, and these were compared with the 227 monolinguals described in the previous analysis. There was no significant difference in the mean ages of the two groups (t=1.22; d.f.=249; p=.22), and no significant difference between the variances (F=.40; p=.53). This may at first sight seem surprising, since it might be assumed that those children with a lower level of Hebrew would be the youngest children, and those with a higher level would be the oldest. This, however, was not the case; in fact, a number of the younger children scored highly on the Hebrew tasks and vice-versa.

Contrary to expectations, the comparison of the two groups of children on the English Oral Cloze task revealed that the monolingual children scored higher than the Hebrew learners (t=2.2; d.f.=249; p=.03). The mean scores are shown in Figure 5.3.

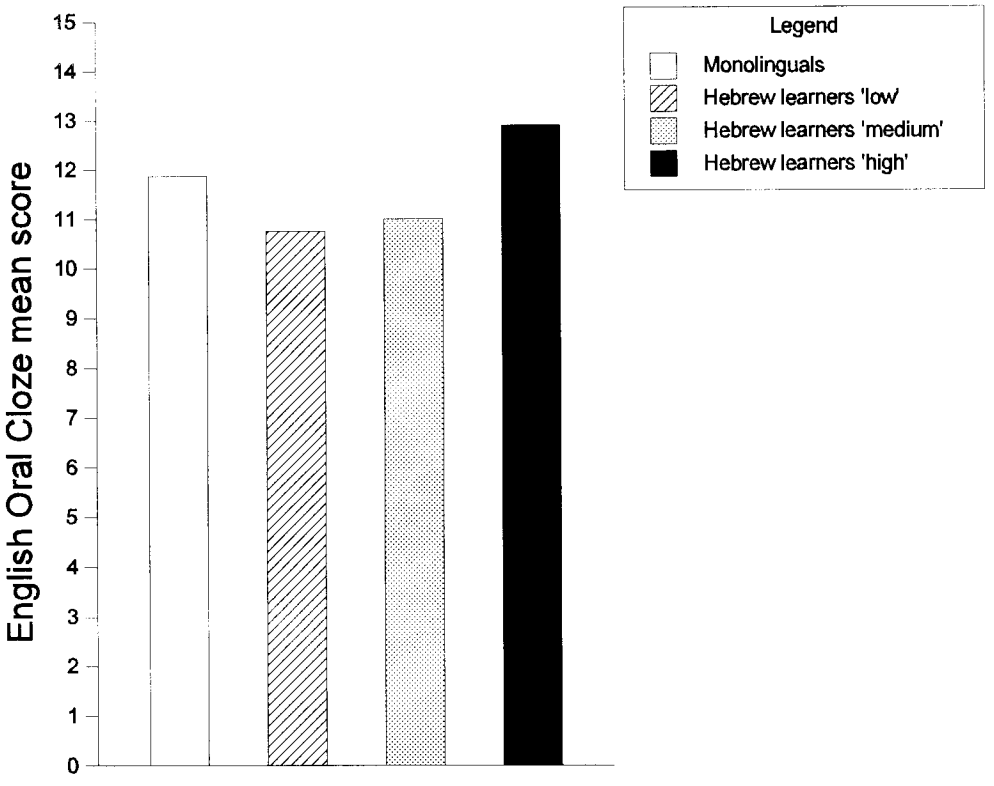

Figure 5.3. Mean scores of Hebrew learners and monolingual children on the English Oral Cloze task

Next, differences between the Hebrew learners with a 'medium' level of Hebrew and the monolinguals were compared. There were 21 Hebrew learners assigned to this level. There was no age difference between the groups (t=.34; d.f.=246; p=.73) and the variances were similar (F=2.2; p=.14).

There was no significant difference between the Hebrew learners with a 'medium' level of Hebrew and the monolinguals, on the English Oral Cloze task (t=1.6; d.f.=246; p=.10).

Finally, the scores of the Hebrew learners with a 'high' level of Hebrew were compared

with the monolinguals' scores on the English Oral Cloze task. There were 23 Hebrew learners with this level of Hebrew. There was no age difference between the two groups (t=1.88; d.f.=248; p=.06) and no difference in the variances (F=1.11; p=.29).

The comparison of the Hebrew learners with a 'high' level of Hebrew and the monolinguals on the English Oral Cloze task showed that the Hebrew learners scored higher than the monolinguals (see Figure 5.3. for mean scores). A t-test for unequal variances showed this difference to be significant (t=3.36; d.f.=39.43; p=.002).

An analysis of covariance was carried out to see if this difference remained significant after controlling for differences in vocabulary. The covariate was WISC-III Vocabulary scaled score, the independent variable was Group (Hebrew learners vs. monolinguals), and the dependent variable was English Oral Cloze score. There was a significant effect of the covariate WISC-III Vocabulary (F(1,242)=30.59; p<.001), due to the higher scores of the Hebrew learners, but the Group term was not significant (F(1,242)=.02; p=.90). Thus Hebrew learners were not better at the English Oral Cloze task than monolinguals, once differences in vocabulary level had been taken into account.

The next set of analyses compared the performance of the Hebrew learners and the monolinguals on the Sentence Analogy task.The versions of the Sentence Analogy task given to Hebrew learners and to monolinguals were different in 3 items. Therefore in the following analyses, only the scores on the 5 items which were identical were used. The monolingual children had carried out the Sentence Analogy task in the first testing session of the longitudinal study.

The same 68 Hebrew learners described for the previous analysis were compared with all the monolingual children who had a Sentence Analogy score and whose ages fell within the same range as those of the Hebrew learners (n=227). The mean age of the group of Hebrew learners was eight years and three months, and of the monolinguals was eight years and one month. This difference was not significant (t=1.78; d.f.=293;

p=.08), and Levene's Test for Equality of Variances showed that the variances were also similar (F=.06; p=.82).

A comparison of the Sentence Analogy scores of the two groups showed that the Hebrew learners scored higher than the monolinguals. The mean score for the Hebrew learners was 3.38 (*SD* 1.3), and for the monolinguals was 2.66 (*SD* 1.5). A t-test for unequal variances revealed that this difference was significant (t=3.55; d.f.=293; p<.001). An analysis of covariance was carried out to see if this difference would remain significant when vocabulary was controlled. This showed a significant effect of the covariate WISC-III Vocabulary (F(1,288)=37.21; p<.001), due to the higher scores of the Hebrew learners, but the term for Group did not reach significance (F(1,288)=3.4; p=.07).

Next, evidence for the hypothesis that an advantage for the Hebrew learners would only occur for those children with a high level of Hebrew knowledge was examined. First, the scores of the 24 Hebrew learners with a 'low' level of Hebrew on the Sentence Analogy task were compared with those of the monolinguals. There was no significant age difference between these Hebrew learners and the monolinguals (t=1.17; d.f.=249; p=.24), and the variances were similar (F=.35; p=.56).

Figure 5.4 displays the mean scores on the Sentence Analogy task, of the monolinguals and of the Hebrew learners at each level of Hebrew.

The 24 Hebrew learners with a 'low' level of Hebrew scored higher than the monolinguals. The mean score for the Hebrew learners was 3.38 (*SD* 1.3), compared with the mean score of 2.66 (*SD* 1.5) of the monolinguals. This difference was significant (t=2.22; d.f.=249; p=.03). An analysis of covariance was applied to see if this difference remained significant when vocabulary score was covaried. There was a significant effect of the covariate WISC-III Vocabulary (F(1,244)=29.96; p<.001), due to the Hebrew learners having higher scores, but the effect of the Group term was not significant (F(1,244)=2.99; p=.09). Once differences in vocabulary level were

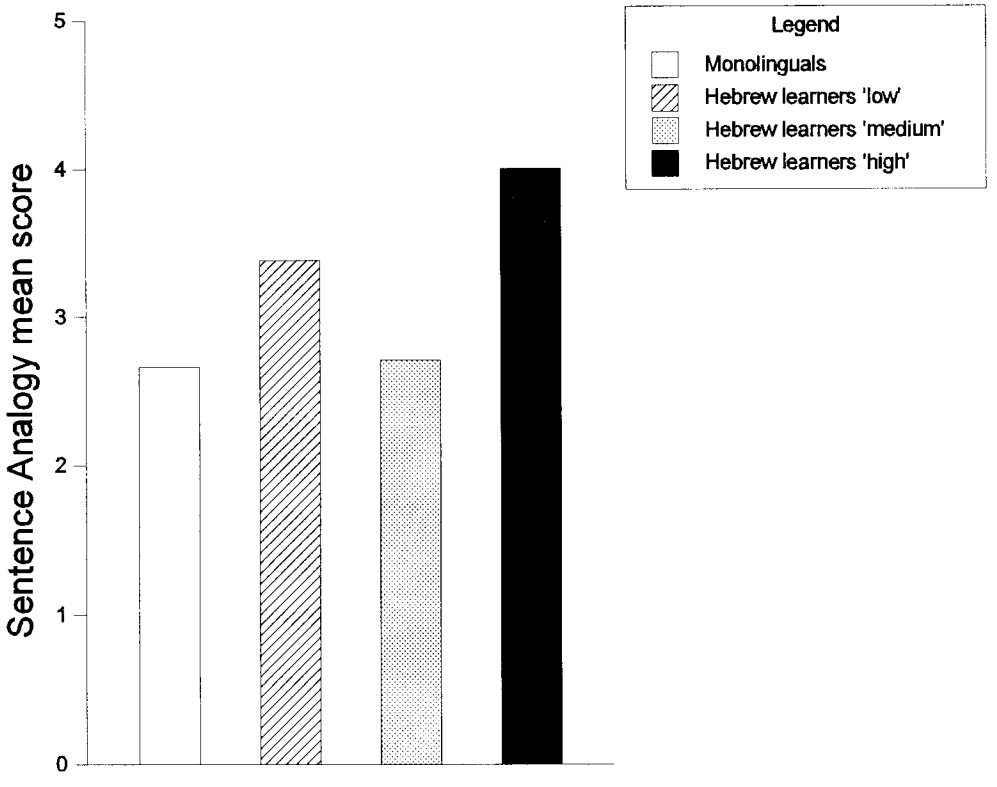

Figure 5.4. Mean scores of Hebrew learners and monolingual children on the English Sentence Analogy task

controlled, monolinguals and Hebrew learners performed similarly.

Next, the 21 Hebrew learners with a 'medium' level of Hebrew were compared with the monolinguals. There was no age difference between the two groups (t=.29; d.f.=246; p=.77) and the variances were similar (F=2.08; p=.15).

The mean Sentence Analogy score of the Hebrew learners with a 'medium' level of Hebrew was 2.71 (*SD* 1.3). This was not significantly different from the monolinguals' score (t=.16; d.f.=246; p=.88).

Finally, the mean Sentence Analogy score of the 23 Hebrew learners with a 'high' level

of Hebrew was compared with that of the monolinguals. There was no significant age difference between the two groups (t=1.83; d.f.=248; p=.07) and the variances were similar (F=1.19; p=.28).

The mean Sentence Analogy score for the Hebrew learners was 4.0 (*SD* 1.0). A t-test for unequal variances showed the difference between this and the monolinguals' mean score of 2.66 (SD 1.5)was significant (t=7.78; d.f.=33.25; p<.001). An analysis of covariance was carried out to see if this difference remained significant when vocabulary was controlled. There was a significant effect of the covariate WISC-III Vocabulary (F(1,243)=21.71; p<.001), due to the higher scores of the Hebrew learners, and a significant main effect of Group (F(1,243)=6.10; p=.014). Thus the Hebrew learners with a 'high' level of Hebrew were better than monolinguals at the Sentence Analogy task, even when vocabulary level was controlled.

In the next set of analyses, the performance of the Hebrew learners and the monolinguals on the Word Analogy task was compared. The versions of the Word Analogy task given to Hebrew learners and to monolinguals were different in 2 items. Therefore in the following analyses, only the scores on the 6 items which were identical were used.

The monolinguals were tested on this task at the first and the fourth testing sessions of the longitudinal study by Nunes, Bryant and Bindman. For the comparisons of Hebrew learners and monolinguals, the monolinguals' scores at the fourth testing session were used. This was because by the fourth testing session, the children were in Years 3, 4 and 5, as were the bulk of the Hebrew learners. Therefore, an age match would include larger numbers of children in both groups than if the scores from the first testing session, when the children were in Years 2, 3 and 4, were used.

The usual procedure of age matching resulted in 271 monolinguals and 86 Hebrew learners being selected. The age range of both groups of children was from seven years and six months to ten years and six months. The mean age of the monolinguals was

eight years and nine months (*SD* 9.7 months), and of the Hebrew learners was eight years and eleven months (*SD* 10.3 months). This difference was not significant (t=1.74; d.f.=355; p=.08) and the variances were also similar (F=1.09; p=.30).

The mean scores on the Word Analogy task were 1.63 (*SD* 1.2) (monolinguals) and 2.28 (*SD* 1.1) (Hebrew learners). A t-test showed this difference to be significant (t=4.59; d.f.=355; p<.001).

An analysis of covariance was applied to find out whether this difference remained significant after controlling for differences in vocabulary level. This showed a significant effect of WISC-III Vocabulary score (F(1,351)=20.05; p<.001), due to the higher scores of the Hebrew learners, and a significant Group term (F(1,351)=8.53; p=.004). Thus the Hebrew learners were significantly better than monolinguals at the Word Analogy task, even when vocabulary differences were taken into account.

The next series of analyses investigated whether the advantage for the Hebrew learners only occurred for those with a relatively high level of Hebrew. As in previous analyses, the Hebrew learners selected for the current analyses were assigned to one of three groups of approximately equal size, according to their score on the Hebrew Oral Cloze task.

First, the Hebrew learners with a 'low' level of Hebrew were compared with the monolinguals on the Word Analogy task. There were 27 Hebrew learners in this group. There was no significant age difference between the Hebrew learners and the monolinguals (t=.13; d.f.=296; p=.89) and the variances were similar (F=.00; p=.99).

The mean Word Analogy score of the Hebrew learners was 1.7 (*SD* .87), and of the monolinguals was 1.63 (*SD* 1.2). A t-test for unequal variances showed that this difference was not significant (t=.42; d.f.=35.77; p=.68). The mean scores are shown in Figure 5.5.

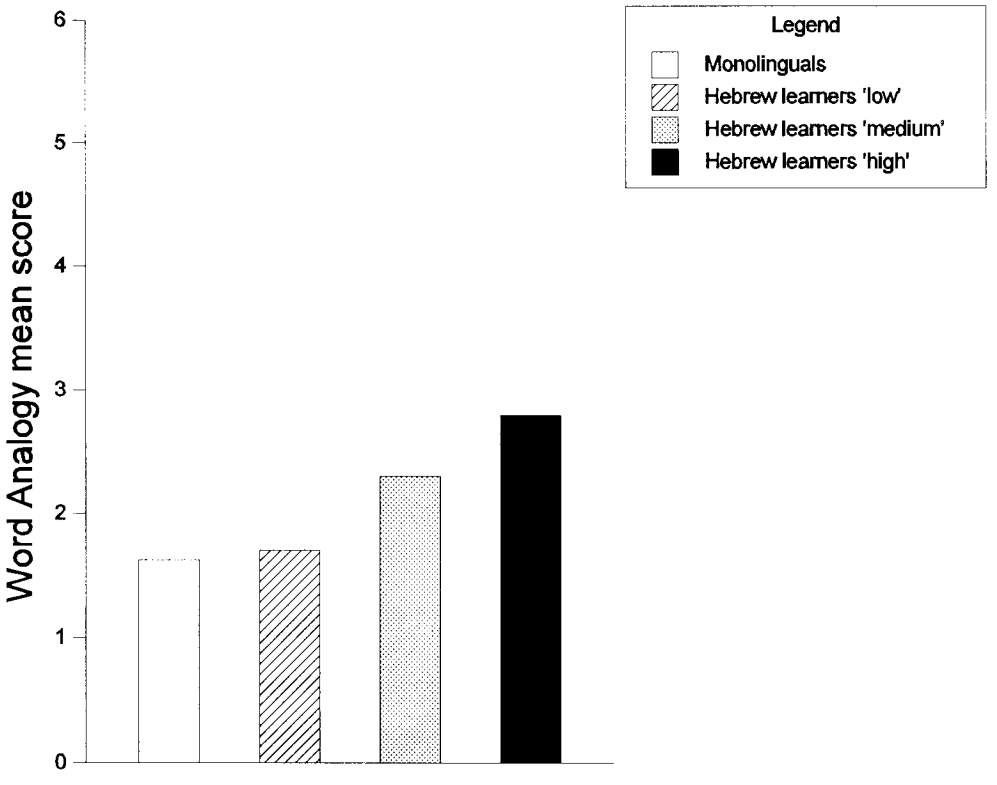

Figure 5.5. Mean scores of Hebrew learners and monolingual children on the English Word Analogy task

Next, the 30 Hebrew learners with a 'medium' level of Hebrew were compared with the monolinguals. There was no significant age difference between the Hebrew learners and the monolinguals (t=.1.29; d.f.=299; p=.18) and the variances were not significantly different (F=3.63; p=.06).

The mean score for the Hebrew learners was 2.3 (SD 1.3), compared with the monolingual score of 1.63 (SD 1.2) (see Figure 5.9.). A t-test showed that this difference was significant (t=3.01; d.f.=299; p=.003).

An analysis of covariance showed a significant effect of the covariate WISC-III Vocabulary (F(1,295)=16.10; p<.001) and a significant main effect of Group

(F(1,295)=4.71; p=.03). Thus children with a 'medium' level of Hebrew were significantly better than the monolinguals at the Word Analogy task, even when vocabulary level differences were controlled.

Finally, the Hebrew learners with a 'high' level of Hebrew were compared with the monolinguals. There were 29 Hebrew learners in this group. There was no significant age difference between the Hebrew learners and the monolinguals (t=.1.85; d.f.=298; p=.07) and the variances were similar (F=.13 p=.72).

The Hebrew learners had a mean Word Analogy score of 2.79 (SD .98). This was significantly higher than the monolinguals' mean score (t=5.26; d.f.=298; p<.001). An analysis of covariance showed a significant effect of the covariate WISC-III Vocabulary (F(1,294)=11.26; p=.001) and a significant main effect of Group (F(1,294)=14.77; p<.001). Thus the Hebrew learners were significantly better than the monolinguals at this task, even when vocabulary level differences were taken into account.

The final set of analyses compared the Hebrew learners and the monolinguals for their performance on the Row Completion task. The monolingual children carried out the Row Completion task at the first testing session of the longitudinal study, but they were only asked for justifications for 3 correct answers. Thus the monolinguals' mean scores on the three Row Justifications were compared with the first three Row Justifications given by the Hebrew learners.

The usual age matching procedure resulted in a group of 67 Hebrew learners and a group of 223 monolinguals. The age range of the Hebrew learners was between six years and ten months and nine years and four months, with a mean of eight years and two months (*SD* 8.0 months), and the ages of the monolinguals were between seven years and one month and nine years and eight months, with a mean age of eight years and one month *SD* 7.9 months). There was no significant difference in the mean ages (t=1.86; d.f.=287, p=.10) and the variances were similar (F=.09; p=.76).

The mean number of grammatical justifications for correct responses on the Row Completion task was .45 for the monolinguals (SD .85) and .96 (SD 1.1) for the Hebrew learners. A t-test for unequal variances showed this difference to be significant (t=3.98; d.f.=92.82; p=.001).

An analysis of covariance revealed a significant effect of the covariate WISC-III Vocabulary (F(1,282)=41.02; p<.001) but the term for Group did not quite reach significance (F(1,282)=3.76; p=.053).

Next, the Hebrew learners were assigned to three groups of approximately equal size according to their level of performance on the Hebrew Oral Cloze task. First, the 24 Hebrew learners with a 'low' level of Hebrew were compared with the monolinguals for the number of grammatical justifications they gave for correct responses on the Row Completion task. There was no significant age difference between these Hebrew learners and the monolinguals (t=1.26; d.f.=245; p=.21) and the variances were similar (F=.10; p=.75).

The mean scores are shown in Figure 5.6. The mean score for the Hebrew learners was .63 (SD .77), compared with the mean of .45 (SD .85) for the monolinguals. This difference was not significant (t=.95; d.f.=245; p=.34).

Next, the Hebrew learners with a 'medium' level of Hebrew were compared with the monolinguals. There were 20 Hebrew learners in this group, and there was no age difference between them and the monolinguals (t=.62; d.f.=241; p=.534) and no difference between the variances (F=2.47; p=.12).

The mean number of grammatical justifications for correct responses by the Hebrew learners was .70 (SD .92). A t-test showed that the difference between this and the monolinguals' mean score was not significant (t=1.23; d.f.=241; p=.22).

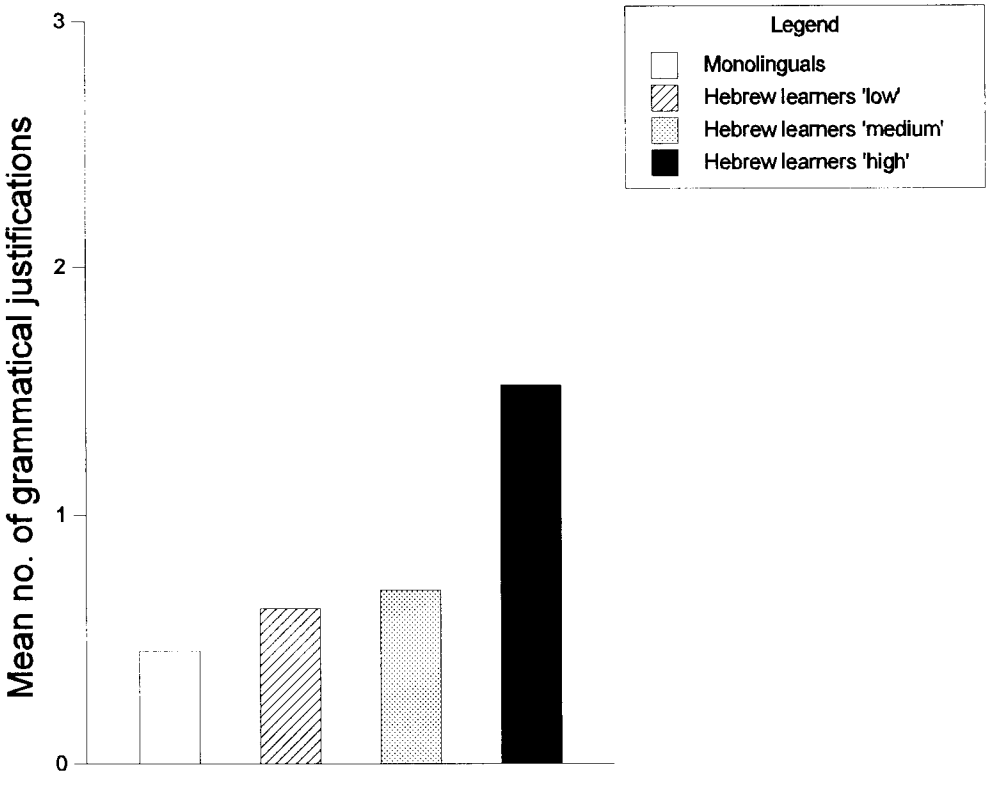

Figure 5.6. Mean no. of grammatical justifications given by Hebrew learners and monolinguals for correct responses on the English Rows task

Finally, the scores of the Hebrew learners with a 'high' level of Hebrew were compared with those of the monolinguals. There were 23 Hebrew learners in this group. There was no age difference between them and the monolinguals ($t=1.16$; d.f.=244; $p=.25$) and no difference between the variances ($F=1.93$; $p=.17$).

The Hebrew learners' mean score was 1.52 (SD 1.2). This was significantly higher than the monolinguals' mean score ($t=6.11$; d.f.=239; $p<.001$).

An analysis of covariance showed a significant effect of the covariate WISC-III Vocabulary ($F(1, 238)=20.28$; $p<.001$) and a significant main effect of Group ($F(1,238)=12.78$; $p<.001$). This showed that the Hebrew learners gave significantly

more grammatical justifications for correct responses than did monolinguals of the same age, even when their higher vocabulary level was taken into account.

To summarise, the data revealed that overall, the Hebrew learners were significantly better than age-matched monolinguals at the Word Analogy task only. However, more detailed analyses revealed that, as expected, Hebrew learners with a high level of Hebrew knowledge performed significantly better than monolinguals on three of the four English grammatical tasks, even when group differences in English vocabulary level were partialled out, while Hebrew learners with a low level of Hebrew knowledge performed similarly to monolinguals. In the case of the English Word Analogy task, children with a medium level of Hebrew knowledge also performed better than monolinguals. Only in the case of the English Oral Cloze task did the results not confirm the hypothesis that once a certain level of L2 was attained, L2 learners would perform better than monolinguals. Even so, the pattern of scores was not dissimilar to that observed for the other tasks. While the Hebrew learners with a low level of Hebrew were unexpectedly worse at the task than the monolinguals, those with higher levels of Hebrew performed similarly to the monolinguals once vocabulary differences had been taken into account.

5.2.5. Can learning an L2 hasten the development of L1 morphological spelling?

It was hypothesised that if learning a second language can result in children developing morpho-syntactic aspects of metalinguistic awareness earlier than their monolingual peers, then this may in turn help them to correctly spell L1 morphemes earlier than monolingual children do. It was therefore predicted that Hebrew learners with a high level of Hebrew morpho-syntactic knowledge would spell more past tense morphemes correctly than monolingual children of the same age (although the ceiling of performance on this task may mean that no effect is seen), and that they would be more consistent in their spellings of the stems of semantically related words.

The first set of analyses tested the first of these predictions. The numbers of 'ed' endings used by Hebrew learners and monolinguals on the five past tense verbs were compared. The monolinguals had carried out the 'ed' spelling task at various testing sessions of the longitudinal study. For the following analyses, their scores at the third testing session were used, because at the time of this session, the children were in Years 3, 4 and 5, as were most of the Hebrew learners.

The usual age matching procedure resulted in a group of 85 Hebrew learners and 301 monolinguals being selected for comparison. The age range of the Hebrew learners was from six years and five months to nine years and nine months. The mean age was eight years and four months (*SD* 10.47 months). The age range of the monolinguals was from six years and seven months to ten years and one month. The mean age was eight years and three months (*SD* 10.64 months). There was no significant difference between the mean ages of the two groups (t=1.4; d.f.=384; p=.16) and the variances were similar (F=.56; p=.46).

The two groups were compared for the number of 'ed' endings they wrote on past tense regular verbs. The mean number written by the Hebrew learners was 3.79 (SD 1.75) and the mean number written by the monolinguals was 2.55 (2.06). A t-test for unequal variances showed this difference to be significant (t=5.52; d.f.=155.37; p<.001).

An analysis of covariance was carried out to find out whether this difference would remain significant when English vocabulary level was controlled. The covariate was WISC-III Vocabulary scaled score, the independent variable was Group (Hebrew learners vs. monolinguals), and the dependent variable was the number of 'ed' endings on the past tense regular verbs. The analysis revealed a significant effect of the covariate, due to the higher vocabulary scores of the Hebrew learners (F(1,380)=36.77; p<.001). The Group term was also significant (F(1,380)=9.72; p=.002), showing that the Hebrew learners spelled significantly more past tense verbs with the correct 'ed' ending than did the monolinguals, even when group differences in

vocabulary level were controlled.

The next three analyses examined the evidence for the prediction that only those children with a high level of Hebrew knowledge would outperform the monolinguals, while children with lower levels of Hebrew would perform similarly to the monolinguals.

The Hebrew learners were assigned to one of three groups of approximately equal size, according to their level of performance on the Hebrew Oral Cloze task.

First, the number of 'ed's written on past tense regular verbs by the Hebrew learners with a 'low' level of Hebrew was compared with the number written by the monolingual children. There were 28 Hebrew learners in this group. There was no significant age difference between these Hebrew learners and the monolinguals ($t=1.19$; d.f.=327; $p=.23$) and the variances were also similar ($F=2.05$; $p=.15$).

The mean number of 'ed's written on past tense regular verbs by the Hebrew learners was 3.43 (*SD* 1.7). This was significantly greater than the mean of 2.55 (*SD* 2.06) written by the monolinguals ($t=2.17$; d.f.=327; $p=.03$). The mean scores are shown in Figure 5.7.

An analysis of covariance revealed a significant main effect of the covariate WISC-III Vocabulary ($F(1,323)=29.05$; $p<.001$), which was due to the higher vocabulary scores of the Hebrew learners, but the Group term did not reach significance ($F(1,323)=2.75$; $p=.098$). This shows that once differences in vocabulary level had been taken into account, the Hebrew learners ('low') and the monolinguals did not differ in the number of 'ed' endings they put on past tense regular verbs.

Next, the number of 'ed' endings used by the Hebrew learners with a 'medium' level of

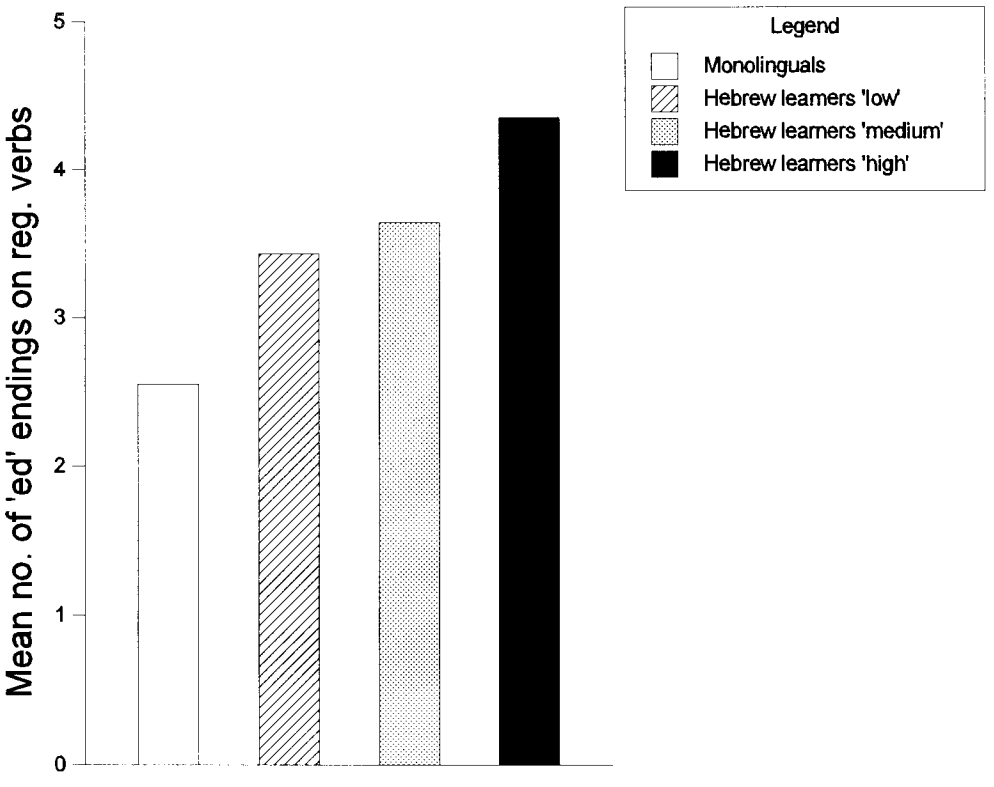

Figure 5.7. Mean number of correct 'ed' endings written by Hebrew learners and monolinguals on English regular past tense verbs

Hebrew knowledge was compared with the number used by the monolinguals. There were 31 Hebrew learners in this group. There was no significant age difference between these Hebrew learners and the monolinguals (t=.61; d.f.=330; p=.54) and the variances were similar (F=.92; p=.34).

The mean number of 'ed' endings written by these children was 3.64 (SD 1.80) (see Figure 5.7). A t-test for unequal variances showed that this was significantly greater than the the number written by the monolinguals (t=3.18; d.f.=38.55; p=.003).

An analysis of covariance revealed a significant effect of the covariate WISC-III Vocabulary (F(1,326)=25.42; p<.001), which was due to the higher vocabulary scores

of the Hebrew learners, but the term for Group did not quite reach significance ($F(1,326)=3.56$; $p=.06$). Thus Hebrew learners with a 'medium' level of Hebrew knowledge did not significantly differ from monolinguals in the number of 'ed's they puton past tense regular verbs, once vocabulary differences were controlled.

Finally, the number of 'ed's written by Hebrew learners with a 'high' level of Hebrew knowledge on past tense regular verbs was compared with the number written by the monolinguals. There were 26 Hebrew learners with this level of Hebrew. There was no significant age difference between these Hebrew learners and the monolinguals ($t=.83$; $d.f.=325$; $p=.41$) and the variances were similar ($F=1.17$; $p=.28$).

The mean number of 'ed's was 4.35 (*SD* 1.47). A t-test for unequal variances showed that the difference between this and the monolinguals' mean score was significant ($t=8.48$; $d.f.=33.67$; $p<.001$).

An analysis of covariance revealed that there was a significant effect of the covariate WISC-III Vocabulary ($F(1,321)=21.32$).This was due to the higher scores of the Hebrew learners.There was also a significant effect of Group ($F(1,321)=7.00$; $p=.009$), showing that Hebrew learners with a 'high' level of Hebrew put more correct 'ed' endings on past tense regular verbs than did monolinguals, even when vocabulary differences were controlled.

The final series of analyses examined differences between the Hebrew learners and the monolinguals in the number of pairs of English root morphemes (word stems) they spelled consistently. The monolinguals had carried out this spelling task in the third testing session of the longitudinal study, when they were in Years 3, 4 and 5.

A group of 84 Hebrew learners and a group of 289 monolinguals were successfully matched for age. The ages of the Hebrew learners ranged from six years and five months to nine years and eleven months. The ages of the monolinguals ranged from six years and six months to ten years and one month. The mean age of the Hebrew

learners was eight years and four months (*SD* 10.43 months) and of the monolinguals was eight years and two months (*SD* 10.66 months). This difference was not significant (t=1.81; d.f.=371; p=.07) and the variances were also similar (F=.63; p=.43).

The mean number of stem pairs (the maximum possible score was 10) spelled consistently by the Hebrew learners was 7.02 (*SD* 2.28) and by the monolinguals was 3.78 (*SD* 2.25). This difference was significant (t=11.62; d.f.=371; p<.001).

An analysis of covariance was carried out to see whether this difference would remain significant when vocabulary level was controlled. The covariate was WISC-III Vocabulary (scaled score), the independent variable was Group (Hebrew learners vs monolinguals) and the dependent variable was the number of stem pairs spelled consistently.

There was a significant effect of the covariate WISC-III Vocabulary (F(1,369)=35.61; p<.001), due to the Hebrew learners having higher vocabulary scores, and a significant effect of Group (F(1,369)=91.18; p<.001), showing that the Hebrew learners still spelled more stem pairs consistently than monolinguals, even when vocabulary differences were controlled.

In the next set of analyses, the evidence for the hypothesis that only the Hebrew learners with a high level of Hebrew knowledge would show an advantage over monolinguals, while children who knew only a little Hebrew would not, was examined.

First, the number of stem pairs spelled consistently by the Hebrew learners with a 'low' level of Hebrew knowledge was compared with the number spelled consistently by the monolinguals. There were 27 Hebrew learners in this group. There was no significant age difference between these Hebrew learners and the monolingual group (t=1.28; d.f.=314; p=.20), and the variances were also similar (F=2.64; p=.11).

The mean number of consistently spelled stem pairs by the children with a 'low' level of Hebrew was 6.81 (*SD* 1.92). This was significantly greater than the mean number consistently spelled by the monolinguals (t=6.8; d.f.=314; p<.001). Figure 5.8. shows the mean scores.

An analysis of covariance showed a significant effect of the covariate WISC-III Vocabulary score (F(1,312)=29.46; p<.001),due to the higher scores of the Hebrew learners, and a significant main effect of Group (F(1,312)=40.89; p<.001), showing that, contrary to expectations, children with a low level of Hebrew knowledge spelled more stem pairs consistently than did monolinguals, even when vocabulary differences were controlled.

Next, the number of stem pairs spelled consistently by Hebrew learners with a 'medium' level of Hebrew knowledge was compared with the monolinguals' score. There were 31 Hebrew learners in this group. There was no significant age difference between these Hebrew learners and the monolinguals (t=.96; d.f.=318; p=.34) and the variances were similar (F=2.64; p=.11).

The mean number of stem pairs spelled consistently by the Hebrew learners with a 'medium' level of Hebrew knowledge was 6.61 (SD 2.50). This was significantly greater than the monolinguals' score (t=6.61; d.f.=318; p<.001).

An analysis of covariance showed a significant effect of the covariate WISC-III Vocabulary (F(1,316)=31.43; p<.001), which was due to the higher scores of the Hebrew learners, and a significant Group term (F(1,316)=31.43; p<.001), showing that the Hebrew learners ('medium') spelled more stem pairs consistently, even when vocabulary differences were controlled.

The final analysis compared the Hebrew learners with a 'high' level of Hebrew with the monolinguals. There were 26 Hebrew learners in this group. There was no significant age difference between these Hebrew learners and the monolinguals (t=1.15; d.f.=313;

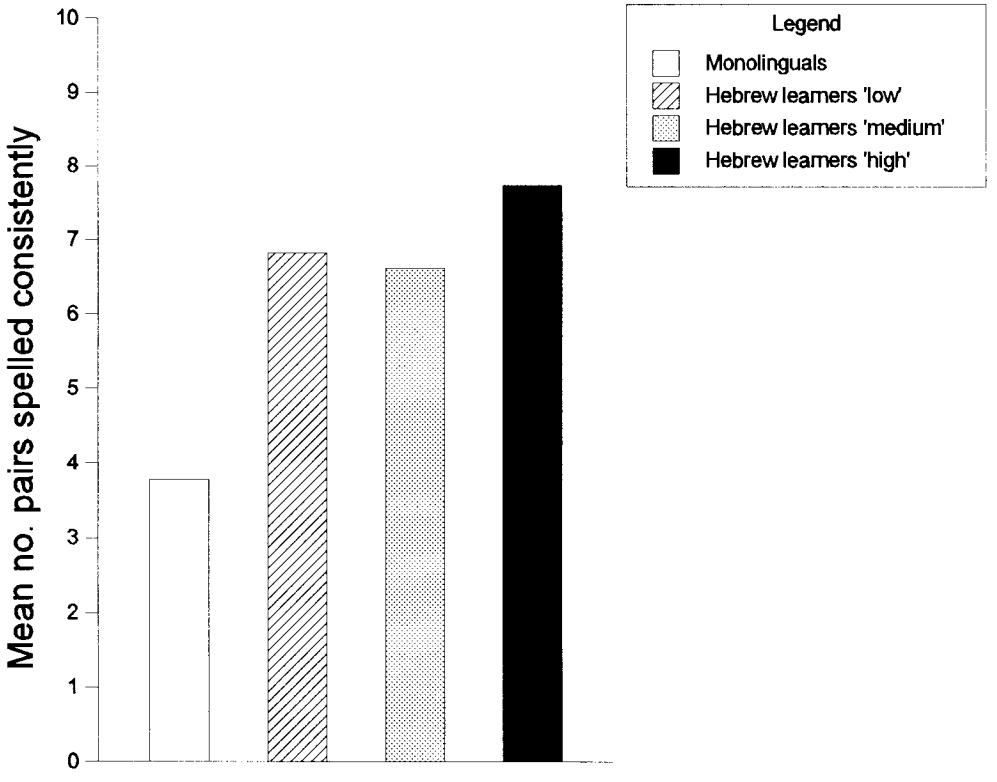

Figure 5.8. Mean number of English root morpheme pairs spelled consistently by Hebrew learners and monolinguals

p=.25) and the variances were similar (F=1.18; p=.28).

The mean number of stem pairs spelled consistently by the Hebrew learners with a 'high' level of Hebrew was 7.73 (SD 2.27). This was significantly greater than the number spelled consistently by the monolinguals (t=8.59; d.f.=313; p<.001).

An analysis of covariance showed a significant effect of the covariate WISC-III Vocabulary, due to the Hebrew learners' higher vocabulary scores (F(1,311)=23.60; p<.001), and a significant Group term (F(1,311)=43.92; p<.001). Thus Hebrew learners with a 'high' level of Hebrew spelled significantly more stem pairs consistently

than did monolinguals, even when differences in vocabulary level were controlled.

To summarise, the results of the comparisons of the Hebrew learners and the monolinguals on morphological spelling tasks showed that as a group, the Hebrew learners were better than monolinguals on both tasks, even when English vocabulary was partialled out. More detailed analyses revealed that, as expected, Hebrew learners with a high level of Hebrew spelled more of the past tense regular verbs with 'ed' than did monolinguals, while those with lower levels of Hebrew performed similarly to the monolinguals. Unexpectedly, Hebrew learners spelled more root morpheme pairs consistently than did monolinguals, irrespective of their level of Hebrew, though the difference was greatest between those with a high level of Hebrew and the monolingual group.

CHAPTER SIX

DISCUSSION OF STUDY 1

6.1. Summary of results

1. There was no relationship between Hebrew and English vocabulary level.

2. There were significant cross-language relationships between all measures of Hebrew and English morpho-syntactic awareness. In general, these relationships remained significant even when the child's age and level of English vocabulary were statistically controlled.

3. There were significant within-language relationships between English morpho-syntactic awareness and spelling of morphemes. In general, English morpho-syntactic awareness predicted morphological spelling even when age and English vocabulary were statistically controlled.

4. In general, there were significant relationships between Hebrew morpho-syntactic awareness and English spelling of morphemes. Hebrew morpho-syntactic awareness significantly predicted performance on one of the English spelling tasks when age and English vocabulary were statistically controlled.

5. The cross-language relationships between some of the morpho-syntactic and spelling measures were different in the two Jewish schools.

6. Comparisons of the performance of Hebrew learners and matched monolinguals on English morpho-syntactic and spelling tasks showed that overall, children learning Hebrew performed significantly better on English spelling tasks and on one morpho-syntactic task. When Hebrew learners were divided into three groups according to

level of Hebrew morpho-syntactic knowledge, children with a high level of Hebrew outperformed monolinguals on three out of the four English morpho-syntactic tasks and on both spelling tasks. Children with lower levels of Hebrew did not score significantly higher than monolinguals on any of the morpho-syntactic tasks or on the 'ed' spelling task.

In the next section, these results are discussed in more detail in relation to each of the hypotheses of the study.

6.2. Discussion of results

Hypothesis 1: Children who have knowledge of more than one language can transfer metalinguistic-level but not surface-level knowledge across languages.

This hypothesis was supported by the data. Looking first at transfer of surface-level knowledge, the lack of relationship between Hebrew and English vocabulary showed that there was no transfer of this kind of linguistic knowledge between the languages. The Hebrew lexicon is dissimilar to English, with the exception of words which are borrowed from English or other languages and Hebraicised, or very occasionally, English words which are borrowed from Hebrew. Since no shared or borrowed words were included in the vocabulary tests in either language, the children were not able to use their knowledge of English words to help them learn these Hebrew words or vice-versa. This result is consistent with Verhoeven's (1994) finding that children did not transfer lexical knowledge between Turkish and Dutch. Where the difference between two languages is too great, knowledge of vocabulary in one language does not appear to be transferable to the other. This result is also consistent with the findings of Sjoholm (1976), Purcell and Suter (1980) and Geva and Siegel (1994), who found that language specific knowledge of vocabulary, pronunciation and script-specific characteristics respectively, are acquired separately for each language.

Turning now to metalinguistic knowledge, the results showed that despite the surface dissimilarities between their two languages, there was evidence that the children could transfer metalinguistic knowledge of grammar between their languages. The significant cross-language relationships between all the grammatical tasks suggest that explicit awareness of morphology, or a combination of syntax and morphology, is not language-specific. Children who are aware of these aspects of grammar in one language tend to also be aware of them in their other language.

However, the cross-language correlations on their own do not tell us for certain that the relationship is due to transfer of grammatical knowledge as opposed to some other aspect of linguistic knowledge. It could reflect a more general phenomenon: children who are good at language in general are good at it in both languages. Age could also be an explanatory factor: as children get older, they learn more about morphology in each language. However, these variables did not totally account for the cross-language relationships in most of the analyses. The Hebrew Oral Cloze task continued to significantly predict performance on three of the four English morpho-syntactic tasks once age and English vocabulary, used as a control for verbal IQ, had been partialled out in regression analyses. The English grammatical task which was not predicted was the Oral Cloze, on which most children performed at or near ceiling. The lack of variability in scores on this task may be the reason for this result.

The Hebrew Roots task, too, continued to predict performance on two of the English grammatical tasks, once age and English vocabulary had been partialled out. Again, the English Oral Cloze was not predicted, and in this analysis, neither were the Rows Justifications. It is not entirely clear why Hebrew Oral Cloze predicted Rows Justifications but Hebrew Roots did not. The explanation may lie in the different demands the two Hebrew tasks make on grammatical knowledge. In oral cloze tasks, the child must have some level of awareness of parts of speech in order to correctly predict the kind of word which would fit the grammatical context given by the sentence. The Hebrew Roots task, however, did not necessarily test awareness of parts of speech. In this task, the child must focus upon the particular letters in semantically

related words which might indicate root meaning, rather than analyse the relationship between the words in terms of the parts of speech to which they belong. Thus the demands of the Hebrew Oral Cloze and the English Rows task may be more highly related than those of the Hebrew Roots task and English Rows.

The finding of interdependence of grammatical awareness in the two languages is consistent with the results of da Fontoura and Siegel (1991), Geva and Siegel (1994) and Geva (1995). These authors found significant relationships between grammatical awareness as measured by oral cloze tasks in English and Portuguese, and English and Hebrew. The cross-language correlations in these studies were .63 (English and Portuguese) and .46 (English and Hebrew). In the present study the cross-language correlation between oral cloze tasks was weaker (.32). However, children were sampled from two slightly different populations of Hebrew learners, and as will be discussed in the next section, the oral cloze correlations in the two subpopulations were quite different.

In the present study, the findings of previous researchers are extended in two ways. Firstly, the evidence for cross-language transfer of grammatical awareness in their studies was based on correlations alone. Although Geva (1995) partialled out non-verbal ability, in none of these previous studies was age or verbal ability controlled. The present study shows that the correlations between grammatical awareness in children's two languages are not completely accounted for by these variables, though in most of the analyses age and English vocabulary did account for significant and substantial portions of the variance. The relationship between grammatical awareness across languages over and above the contribution of verbal ability is evidence that there is genuine transfer of grammatical knowledge, as distinct from other aspects of linguistic knowledge.

The second way in which the present study extends our knowledge of transfer of grammatical awareness is that it has examined awareness of morphology in more detail than in previous studies. These used only oral cloze tasks, which confound syntactic or

morpho-syntactic with semantic knowledge. The present study has shown that children can transfer their grammatical knowledge, as measured by tasks which can not be solved using semantic knowledge.

Hypothesis 2: Different ways of learning an L2 will have different effects on L1 metalinguistic awareness.

When the data were examined for each of the two Jewish schools separately, quite a different pattern of results emerged. There was a significant effect of an interaction between school and performance on the Hebrew Oral Cloze task, on performance on the English Oral Cloze and Word Analogy tasks.

In School 1, there was a strong correlation between the English and Hebrew Oral Cloze tasks (r=.68). This was stronger than that reported by either da Fontoura and Siegel (1991) who reported r=.63, or Geva and Siegel (1994) who reported r=.46. The relationship between English and Hebrew oral cloze tasks remained significant even when age and English vocabulary were partialled out. In School 2 on the other hand, the English and Hebrew Oral Cloze tasks were not significantly correlated. This could be because for School 2 children, the Hebrew Oral Cloze task was difficult, even though an attempt had been made to include religious Hebrew sentences with which they would have some familiarity. The distribution of scores was skewed towards the lower end. The problem with the task for these children was that the whole or nearly the whole of each sentence had to be understood in order for the child to successfully complete it. This degree of comprehension, and the finding of a word with which to complete the sentence, demanded access to vocabulary that the child did not always have. The heavy semantic demands of an oral cloze task may have prevented the children from revealing the kind of grammatical knowledge they actually had, or, they may simply not have had a high enough level of morpho-syntactic knowledge in Hebrew oral language for there to be any relation to similar tasks in English.

Despite the difficulty of the task, the Hebrew Oral Cloze still correlated significantly with the Word Analogy task for these School 2 children. In fact, the correlation with Word Analogy was higher than for School 1 children, and remained highly significant even after age and English vocabulary were controlled for, while in School 1 Hebrew Oral Cloze did not predict Word Analogy at all after these controls.

It must be emphasised that what is being observed here is a school effect and that this study cannot fully explain the reasons for the school difference in the Hebrew-English relationships. One possibility, however, is that it is the children's different experiences of Hebrew which have resulted in quite different relationships with English grammatical awareness. Looking at those cross-language relationships for which there were significant interactions between Hebrew and school, for children learning primarily religious Hebrew, Hebrew grammatical knowledge predicted English ability to analyse and manipulate the relationships between single words presented without any context (Word Analogy), whereas for children learning to speak the oral language as well, Hebrew knowledge was related to ability to solve English grammatical tasks which made demands on semantic and syntactic knowledge (oral cloze). To explore the possible reasons for this, we need to look more closely at what the differences in the two groups of children's experiences with Hebrew actually are.

In School 2, children experience Hebrew mainly as a formal, written language presenting conceptually difficult material. The children explicitly analyse this text word for word when translating, in order to obtain the meaning. School 1 children, on the other hand, experience Hebrew also as a colloquial spoken language which they can understand without explicitly analysing word for word. Furthermore, School 1 children have a larger vocabulary than School 2 children. It is possible that the School 1 children's experience of Hebrew as a meaningful, comprehensible spoken language leads them to become aware of syntax and morphology as they feature in meaningful contexts, while School 2 children, on the other hand, with their more restricted access to meaning, are caused to analyse morphology in single words, in their attempts to translate difficult religious text. Because of their restricted vocabulary and also the

difficulty of the text, these children are probably less able to use syntactic or semantic context to help them understand, so they have to look to the information available in individual words. The demands of the English Word Analogy task, in which they have to analyse the relationships between pairs of single words, may be more similar to the kind of analysis they do in their study of literary Hebrew than it is to the metalinguistic tasks which concern sentences. In School 1, on the other hand, the children are more likely to understand a sentence and to be able to use the grammatical context. Thus their experience may be more similar to the kinds of English tasks which provide sentential context (Oral Cloze).

Turning to the Hebrew Roots task, performance was similar in the two schools. This showed that even children who are learning Hebrew mainly via religious text learn something about Hebrew morphology, even if they can speak very little of the language. There were no significant effects of interactions between Hebrew knowledge of roots and school, on English performance, showing that the relationships between Hebrew and English grammatical awareness were not significantly different in the two schools.

In conclusion, it was found that learning to speak, read and write an L2 and learning a written L2 primarily for religious purposes did have different effects on some aspects of L1 metalinguistic awareness. It may therefore be important to examine the purposes for which a second language is learned and the way in which it is learned, before making generalisations about the effects of knowing two languages on metalinguistic awareness. However, since the two kinds of Hebrew learning are confounded with school in the present study, more detailed research would be needed to confirm this hypothesis.

Hypothesis 3: Morpho-syntactic awareness in oral L1 is related to children's L1 morphological spelling knowledge.

This hypothesis was supported by the data, although not with respect to all the measures. As expected, there were significant correlations between all the English grammatical tasks and both of the English spelling tasks. This was in spite of the close to ceiling effect observed for the 'ed' spelling task. Thus our finding (Nunes, Bryant & Bindman, 1996, in press a, b; Bryant, Nunes & Bindman, in press b, c) of a connection between children's awareness of grammar in oral language and morphological spelling was replicated. However, unlike in the longitudinal study, when age and English vocabulary were partialled out, only the English Oral Cloze task survived as a significant predictor of the number of 'ed' endings on regular verbs. The lack of variability in the 'ed' scores in the present study may explain this. Although in the longitudinal study a large number of children of a similar age range had not yet come to grips with the grammatical significance of the 'ed' ending, the same was not true of the children in the present study. The children in the present study nearly all came from middle-class backgrounds and in School 2, received considerable tuition in spelling. The other difference, of course, was that these children had knowledge of another language.

Turning now to the spelling consistency task, two of the four grammatical tasks predicted consistent spelling of stem morphemes in semantically related words, even after the control for age and vocabulary, confirming the relation between reflection on morphology in oral language and its use in written language.

Hypothesis 4: In turn, L2 grammatical awareness is also related to children's L1 morphological spelling knowledge.

The strongest relationship between L2 grammatical awareness and use of morphological knowledge in L1 spelling was, as expected, between the Hebrew Roots

and the spelling consistency tasks (r=.4). There is evidence, then, that even where two languages form roots in different ways (here, the three-consonant root in Hebrew as opposed to word stems in English), children can transfer their knowledge of the principle of roots between their languages. The idea that the integrity of the root is preserved in the spelling of semantically related words is similar in the two languages, so understanding of this principle can be transferred from one language to the other.

However, cross-language relationships were not only seen between those aspects of morphological understanding which were conceptually similar. Significant but weaker correlations were also observed between the Hebrew Oral Cloze and English spelling consistency, and between Hebrew Roots and 'ed' spelling (despite the near ceiling effect for the 'ed' task), even though these tasks were not as closely related across languages as the Hebrew Roots and spelling consistency. Both the Hebrew tasks significantly predicted spelling consistency after the control for age and English vocabulary. Thus it seems that what can transfer is the ability to reflect in a general way about morphology, although the relationships between specific aspects of morphology which are similar in the two languages may be stronger.

Slightly different results were seen for the two schools on the 'ed' task. There was a significant effect of an interaction between school and performance on the Hebrew Oral Cloze task, on spelling knowledge of the 'ed' ending. Again, the data show that the cross-language relationship, this time between morpho-syntactic awareness in oral L2 and L1 morphological spelling, may be different depending on the way the second language is learned, but further research would be needed to distinguish between the effects of school and type of Hebrew learning, which are confounded in the present study.

Hypothesis 5: The ability of L2 learners to transfer grammatical knowledge between languages hastens development of L1 grammatical knowledge, but only once a threshold level of L2 grammatical knowledge has been attained.

For three out of four of the oral English morpho-syntactic measures, this hypothesis was supported. When the scores of the Hebrew learners were compared with the scores of the monolingual children, the Hebrew learners as a group were only better than the monolinguals on the Word Analogy task. However, when the Hebrew learners were divided into three groups according to their level of Hebrew morpho-syntactic awareness, those with a high level of Hebrew outperformed monolinguals on all the English tasks except the English Oral Cloze, while those with a low level performed similarly to the monolinguals. Thus the data show evidence that for children who have attained a certain level of L2 morpho-syntactic knowledge, L1 morpho-syntactic awareness is enhanced, relative to children who have no knowledge of a second language.

On the English Oral Cloze task, the Hebrew learners with a low level of Hebrew were actually worse than the monolinguals, which is a surprising result. However, Hebrew learners with medium and high levels of Hebrew performed similarly to monolinguals. The data from this task seem to suggest that having learned only a little of a second language may have given these children a slight disadvantage, but knowing more of a second language, if not in this case beneficial, at least does not confer a disadvantage. However, it must be noted that there was a close to ceiling effect on this task so there was little variation in the scores, and it is possible that a clearer result would be seen if a task was used which was more sensitive to variation between children.

Hypothesis 6: Learning an L2 hastens development of L1 morphological spelling.

On both of the spelling tasks, the Hebrew learners performed better as a group than the matched monolinguals. We can not be sure, however, that this is not due to different teaching methods or different amounts of time spent on spelling in the Jewish and the non-Jewish schools. In School 2, certainly, spelling is considered a priority and parents' help is enlisted to regularly test children's spelling. In School 1, however,while English spelling is considered important, so much of the school day is spent learning Hebrew that teachers complain they have less time to spend teaching English than in monolingual schools. In any case, if the differences between Hebrew learners and monolinguals were just due to different school experiences of English spelling, then we would not expect the gap between bilinguals' and monolinguals' spelling scores to vary with the level of Hebrew of the L2 learners.

The differences between Hebrew learners and monolinguals did indeed vary according to Hebrew level, with children who had a high level of Hebrew performing better than monolinguals on both spelling tasks. Children with a low and medium level, on the other hand, did not use more correct 'ed's. On the spelling consistency task, children at all levels of Hebrew were significantly better than monolinguals, but the difference between Hebrew learners and monolinguals was greatest at the high level of Hebrew.

These preliminary findings generally lend support, though not unequivocal, for the hypothesis that learning a second language can improve use of morphological knowledge in spelling, and show a promising direction for future research. However, both the morpho-syntactic and the spelling tasks need to be improved, to avoid ceiling and floor effects, and to provide more sensitive measures on which to compare L2 learners and monolingual children.

6.3. Conclusions and limitations

Study 1 has shown that children who have knowledge of two languages can transfer metalinguistic knowledge between their languages. There was evidence that six to eleven year olds can use their grammatical knowledge for both their languages. Not only this, but they can also use grammatical knowledge in one language for spelling morphemes in the other. Surface-level knowledge of vocabulary, on the other hand, was found to be language-specific and not transferable between languages.

A further interesting finding was that the aspects of grammatical knowledge which transferred were in some cases dependent on the kind of schooling the child had experienced. This may be due to the different ways in which Hebrew is taught in different Jewish schools. In addition, children with a relatively high level of second language proficiency generally outperformed monolingual children on grammatical and spelling tasks.

Thus at this point we have preliminary evidence that in a general sense there is a link between children's first and second language awareness of grammar, and between second language grammatical awareness and first language use of morphological knowledge in spelling. However, more research is needed to explore these relationships in more detail.

In Hebrew, limited aspects of children's grammatical knowledge in Hebrew were studied. Only two measures were used: an oral cloze task, and a measure of knowledge of the principle of the Hebrew root. In the next study, the extent of the children's awareness of Hebrew grammar is explored in more depth.

A further limitation of the Study 1 is that most of the findings relate to the connections between awareness of morphology and syntax in the two languages in a general sense, rather than looking at the specific ways in which particular grammatical concepts which are similar in the two languages may transfer. This direct kind of relationship

was examined in the case of the Hebrew root and consistency in spelling English root morphemes, and a stronger correlation was found between these two tasks than the other relationships between Hebrew grammatical awareness and English spelling. The next study relates children's knowledge of other aspects of grammar which seem closely conceptually related in the two languages, and which therefore may be transferable.

Another limitation of the previous study concerns the use of oral tasks but not written tasks in Hebrew. Whether children can transfer their knowledge of morphological spelling across two very different orthographies was not examined. Measures are needed which are designed to tap children's ability to use morphological information in their Hebrew and English spelling. Although Hebrew orthography is phonologically highly regular ('shallow') for reading, it is much less so for spelling. This is because in several cases one sound can be represented by more than one letter, and because sometimes letters are silent.The choice of letter or inclusion of a silent letter is often governed by morphology.

In the course of Study 1, a need to advance from previous studies in terms the measures used to measure grammatical awareness was revealed. Oral cloze tasks were used to replicate the findings of previous researchers, and adjustments made to Geva's Hebrew task to include items which took into account the children's knowledge of religious Hebrew. However, the use of this task as a measure of Hebrew grammatical awareness was problematic. It has been pointed out in the literature review that oral cloze tasks confound semantic and grammatical demands. This limitation was found to be particularly evident when the task was used as a second language measure. When oral cloze tasks are given to children in their first language, it is assumed that the child understands all the words in the sentence and thus can use the context to predict a grammatically appropriate word. However, when children are doing the task in a second language, they do not necessarily understand all of the vocabulary and thus are not always able to use the context, or, even if they know the correct grammatical category of the missing word, are not always able to find an appropriate word in their

lexicon. Thus it is difficult to know to what extent the task is measuring grammatical and to what extent vocabulary knowledge. The strong correlation between the Hebrew oral cloze and Hebrew vocabulary tasks (r=.77) suggests that the oral cloze task was indeed to a large extent measuring vocabulary knowledge. Thus tasks need to be developed in Hebrew which measure grammatical knowledge in Hebrew using very simple vocabulary and/or pictures to make sure that the demands of the task are principally of grammatical and not vocabulary knowledge.

6.4. Aims of Study 2

The aims of Study 2 were to replicate and extend some of the findings of Study 1, and to address some of the limitations. Replication was needed to check that the findings of cross-language transfer and L1 metalinguistic and spelling benefits for L2 learners did not arise by chance. Therefore the design of Study 2 was parallel to that of Study 1, and replication of the following findings was sought: (i) morpho-syntactic awareness in oral English and Hebrew are correlated, (ii) morphological spelling knowledge in English and Hebrew are correlated, (iii) Hebrew learners score higher than age- and vocabulary-matched monolinguals on tasks measuring morpho-syntactic awareness in oral English, and on tasks measuring English morphological spelling knowledge, and (iv) this advantage only occurs once a certain level of L2 has been attained.

As discussed in the previous section, Study 1 had several limitations. The first was that it examined very few aspects of the children's Hebrew grammatical knowledge. Study 2 therefore investigated Hebrew grammatical knowledge in more detail. Specifically, it examined the children's Hebrew knowledge of morpho-syntactic word relations and parts of speech, and possessive marking.

The second limitation was that Study 1did not examine spelling in Hebrew. In Study 2,

the children were given a spelling task designed to measure two aspects of Hebrew morphological spelling knowledge: knowledge that the spelling of root morphemes is preserved across different words derived from the same root, and knowledge of suffixes representing possession.

The third limitation of Study 1 to be addressed was that the oral cloze tasks used to replicate the findings of previous studies confounded semantic and grammatical demands, and the second language task was very difficult for L2 learners with limited vocabulary and experience of oral L2. Therefore, the analogy technique, as successfully used in English in the longitudinal study by Nunes et al. and in Study 1, was used in Study 2 for Hebrew tasks where feasible. These and other tasks used simple vocabulary from both Modern and Classical Hebrew, and for one task, pictures were used to aid comprehension.

A fourth limitation of Study 1 was that the findings mostly related to cross-language connections between morpho-syntactic awareness in a general sense. Study 2 aimed to extend these findings by examining transfer across specific grammatical concepts which are similar in the two languages.

One main focus was the children's knowledge of genitive marking in Hebrew, and their use of apostrophe to indicate possession in English. It was hypothesised that knowledge of possessive marking in Hebrew is related to children's ability to use apostrophe correctly in English, because the principle of possession applies to both languages.

Another aspect of metalinguistic awareness which applies to both languages is awareness of morpho-syntactic relations between words (such as the distinctions between different parts of speech and different tenses). If was therefore hypothesised that children can transfer their knowledge of morpho-syntactic relations across Hebrew and English.

Transfer of awareness that words derived from the same root share a part of their spelling was also examined, by giving the children spelling tasks in each language. In the Hebrew spelling task, children were asked to spell pairs of words, embedded in meaningful sentences, containing shared three-consonant root morphemes. These root morphemes contained some phonological ambiguity, so that to spell correctly, the children had use morphological knowledge to help them decide which letter to use. In English, a spelling task was given similar to the consistency in spelling root morphemes task given in Study 1, but this time more difficult words were included in order to avoid a ceiling effect.

6.5. Research Questions - Study 2

The following questions were asked and hypotheses were raised:

1. Can children with knowledge of two languages use morpho-syntactic awareness in both their oral languages, where, despite surface differences in the way each language is marked, there are conceptual similarities?

Hypothesis 1: The metalinguistic ability to analyse and manipulate morphological relations between spoken words is transferable across Hebrew and English, even though the specific ways in which words are derived and inflected are different in the two languages.

2. Can children use their knowledge of specific grammatical concepts for spelling morphemes in another language, where these morphemes are governed by similar concepts?

Hypothesis 2: Knowledge of possessive marking in L2 is related to use of the possessive morpheme in L1spelling, because the principle of possession applies to both

languages and therefore is transferable.

3. Can children use their knowledge of morphological spelling for both of their languages, even when the languages use different scripts and have different, language-specific morphological rules?

Hypothesis 3.1: Children who know in one language that words that come from the same root must share spelling of the root morpheme can use this knowledge for spelling morphemes consistently in their other language.

Hypothesis 3.2: Children can use spelling knowledge of morphemes indicating possession in one language for spelling morphemes indicating possession in their other language.

4. Does transfer of metalinguistic awareness of grammar across languages occur primarily for those grammatical concepts which are directly related in the two languages, or does a more general grammatical awareness transfer?

Hypothesis 4: Transfer of metalinguistic awareness of grammar occurs in a general way, but where grammatical concepts are closely related in the child's two languages, it is easier to transfer knowledge of these across languages.

5. Can the ability of L2 learners to transfer metalinguistic knowledge of grammar between languages aid metalinguistic development? Does this depend on the level of L2 grammatical awareness attained?

Hypothesis 5: The ability of second language learners to transfer morpho-syntactic awareness between their languages benefits L1 metalinguistic development. However,

this benefit only occurs once a threshold level of L2 grammatical awareness is attained.

6. Can the ability of L2 learners to transfer metalinguistic knowledge of grammar across languages hasten the development of L1 morphological spelling? Does this depend on the level of L2 attained?

Hypothesis 6: Learning an L2 benefits L1 morphological spelling development, because L2 knowledge of morphology in oral and written language can be transferred to L1. However, this benefit only occurs once a threshold level of L2 grammatical awareness is attained.

CHAPTER SEVEN

METHOD OF STUDY 2

7.1. Design

The mixed within-subjects between-subjects design of Study 2 was similar to that of Study 1. Within-subjects, relationships between Hebrew and English performance on grammatical awareness and morphological spelling tasks were examined in a sample of English-speaking children learning Hebrew as L2. Significant positive correlations between performance in one language and the other would suggest transfer of knowledge between languages.

Between-subjects, the performance of the Hebrew learners on English grammatical awareness and morphological spelling tasks was compared with that of a group of monolingual children exposed only to English. If second language learners can transfer L2 knowledge to L1, this may give them an L1 advantage over children of the same age who do not have this extra source of learning.

7.2. Subjects

The group of Hebrew learners was sampled from the same two Jewish schools visited in Study 1. All the Hebrew learners who had taken part in Study 1and who were still available were tested again for Study 2, which took place 16 months later.

Monolingual children for the bilingual-monolingual comparisons again came from the sample of 365 children from 4 London and 4 Oxford schools, tested as part of the longitudinal study by Nunes, Bryant and Bindman and described in previous chapters.

91 of the original sample of 116 were available for testing. Since testing for Study 2 took place more than a year after Study 1, these children had moved up one National Curriculum Year. Thus at School 1, they were in Years 3,4,5 and 6, while at School 2 they were in Years 4,5 and 6. Children from School 2 who had been in Year 6 at the first time of testing had moved on to secondary school and were not followed up.

A further 24 children were tested who had not taken part in Study 1. 15 of these were selected from Year 3 at School 2, by choosing every second child from the class register. The other 9 children were chosen randomly from class registers in both schools, in the classes from which children from the original sample had left. However, children were not selected who held a local authority statement of special needs, or had been referred to a psychologist for assessment for such a statement. All the children selected for the study spoke English at home and did not regularly speak Hebrew or any other language with their parents.

Table 7.1 shows the numbers of children in each National Curriculum Year by School. The age range of the sample was 7 to 11 years. The curricula in the two schools are discussed in Chapter 4.

Table 7.1. No. of subjects taking part in Study 2, by school and National Curriculum Year

	Year 3	Year 4	Year 5	Year 6
School 1	15	15	13	12
School 2	15	15	15	15

7.2.1. Matching Hebrew learners with monolingual children

The basic procedure for matching Hebrew learners with monolingual children was the same as that used in Study 1, described in Chapter 4, section 4.2.1. The matching procedure for each bilingual-monolingual comparison carried out is described in more detail in the relevant sections of Chapter Eight.

7.3. Procedure

Hebrew learners in Years 4, 5 and 6, and all the monolingual children, were tested on the following English tasks:

(i) WISC-III Vocabulary subtest

Morpho-syntactic task

(ii) Word Analogy task

Spelling tasks

(iii) Consistency in spelling English morphemes

(iv) Apostrophe sentence task

(v) Apostrophe production (picture task)

(vi) Apostrophe comprehension (picture task)

Hebrew learners in Years 4, 5 and 6 were also tested on the following tasks:

Hebrew morpho-syntactic tasks

(vii) Comprehension of possessive pronoun suffixes

(viii) Genitive constructs analogy task (*smichut*)

(ix) Word Analogy task

(x) Row Completion task

Hebrew spelling tasks

(xi) Consistency in spelling root morphemes

(xii) Accuracy in spelling suffixes indicating possession

Year 3 Hebrew learners in both schools were given the WISC-III Vocabulary subtest, and the following spelling tasks:

(iii) Consistency in spelling English morphemes

(xi) Consistency in spelling Hebrew root morphemes

(xii) Accuracy in spelling suffixes indicating possession

Year 3 children in School 1 were also given the English Word Analogy task.

Children in the monolingual sample carried out the WISC-III Vocabulary test at the second testing session of the longitudinal study by Nunes, Bryant and Bindman, the spelling consistency task at session 5 (when they were in Years 3, 4 and 5), the Word Analogy task at session 7, and the apostrophe sentence task at session 8, all when they were in Years 4,5 and 6. There were three months between each testing session.

The items in the English Word Analogy task given to the monolinguals were identical to those given to the Hebrew learners. In the spelling tasks, some of the items given to the monolingual children and Hebrew learners were different. Therefore, for the comparisons of performance of the Hebrew learners and the monolingual children, only those items in each task which were identical were used.

7.3.1. General testing procedure

All the children, except the monolingual children from the Oxford schools, were tested by the author. Oxford children were tested by an experienced teacher and researcher. Testing of the Hebrew learners took place between May and July 1996. Testing of the

monolinguals took place between May 1993 and October 1995. The tester was well known to the monolinguals and to the Hebrew learners who had taken part in Study 1, and even to those who had not, was a familiar figure around the school. At the start of each testing session, a few minutes were spent in general conversation with the child, to put him or her at ease. Grammatical awareness tasks were introduced as 'word games'.The researcher told the child that she would write down some of the things the child said, so that she would be able to remember them later, that the answers he or she gave were to help the researcher find out about how children learn languages, and that it was not a test. Assurance was given that no mark would be shown to the child's teacher.

7.3.2. Testing of the Hebrew learners

Testing was carried out individually, in the quietest available place away from the classroom. This was a library area, empty classroom, woodwork room or study area under a staircase. At times when the noise level was too high, testing was stopped and continued later. The tester and child sat at right angles to each other at a table.

All children carried out the English tasks first, and then the Hebrew. This was because if the Hebrew tasks had been given first, it may have sensitised the children to the English tasks, and given them an unfair advantage over monolinguals, invalidating the bilingual-monolingual comparisons. Year 3 children, who were only carrying out three or four tasks altogether, were tested in one session without a break. This session lasted approximately 20 minutes. For children in the other years, the total testing time was between 35 and 65 minutes. If the session was longer than about 40 minutes, the child was sent for break (e.g. playtime, lunchbreak, or a short walk and a drink), so that the testing was not too tiring. Children were not tested during the last half hour of the school day, when they were likely to be tired. If a testing session was unfinished at this time, it was continued the following day.

All the tasks, including the Hebrew tasks, were introduced in English, to ensure comprehension of the instructions.

The order of presentation of the tasks was the same for all children, so that any order effects would be equal across children. The order of tasks was as follows:

English tasks

1. Consistency in spelling English morphemes, wordlist A
2. WISC-III Vocabulary subtest
3. Apostrophe sentence task
4. Apostrophe comprehension (picture task)
5. Word Analogy task
6. Apostrophe production (picture task)
7. Consistency in spelling English morphemes, wordlist B

Hebrew tasks

1. Comprehension of possessive pronoun suffixes
2. Genitive constructs analogy task (*smichut*)
3. Spelling task (consistency in spelling root morphemes, and accuracy in spelling suffixes indicating possession)
4. Word Analogy task
5. Row Completion task

7.3.3. Testing of the monolingual children

The testing procedure is described in Chapter 4, section 4.4.3.

7.4. Measures

7.4.1. English measures

7.4.1.1. WISC-III Vocabulary subtest

A description is given in Chapter 4, section 4.5.1.

7.4.1.2. Word Analogy task

This task was identical to that given to the Hebrew learners in Study 1, and to the monolinguals in Session 7 of the longitudinal study. Details are given in Chapter 4, section 4.5.1.4.

7.4.1.3. Consistency in spelling English morphemes

This task was adapted from the spelling consistency task used in Study 1. The rationale is given in Chapter 4, section 4.5.1.6.

Design

The aim of adapting the task from the original version was to make it more difficult and therefore to try and avoid the close to ceiling effects observed amongst the older children in Study 1. Since the five 'dinosaur' pseudoword items in the original version were generally easy for children in Years 3 to 6, they were not given in the new version of the task. The new version included the five real word pairs from the original task, and 8 new pairs of real words which shared meaning and therefore spelling of the root morpheme. As with the original word pairs, they were selected as words which cannot be spelled correctly using phonological knowledge alone. Carlisle (1988) and Fowler and Liberman (1995) have found that derivational morphological relations involving phonological shifts are more difficult and learned later than those in which the base form is phonologically unchanged by derivation. Therefore, in order to make

the new items of appropriate difficulty for this age group, six of the eight new word pairs involved a phonological shift from the base to the derived form. The new word pairs were:

cycle - bicycle
decide - decision
courage - courageous
comforted - comfortable
muscle - muscular
break - breakfast
dream - dreamt
governed - government

The final wordlist was divided into two: Wordlist A and Wordlist B. One of each word pair appeared in each list.

Procedure

This is described in Chapter 4, section 4.5.1.6. The sentences in which each word was presented to the child are shown in Appendix IV.

7.4.1.4. Apostrophe sentence task

Rationale

The aim of this task was to measure the children's productive knowledge of the use of apostrophe to indicate possession.

Design

The task consisted of 16 incomplete sentences (14 in the case of the monolinguals), arranged in randomised order. The missing word in each sentence ended in the sound /s/. In half of the sentences, the missing word was a plural noun and therefore the

correct spelling for this ending was **-s** (e.g. "Some birds fly away to a warmer place"). In the other half, the missing word was a noun inflected for the possessive and therefore the correct spelling was **-'s** (e.g. "The shoe**'s** heel is broken") or, in 4 items, could be either **-'s** or **-s'** (e.g. "Did you eat the girl**'s**/girl**s'** cake?"). The same words which were plural nouns in half of the sentences were used as possessives in the other sentences, for example "girl + s" appeared both as a possessive ("Did you eat the girl's cake?") and as a plural noun ("The girls are crying.").

Thus the task was designed to measure not only the number of times the child used an apostrophe for possessives, but also the number of times he or she did not use an apostrophe for non-possessive plurals. Knowledge of the appropriate use of apostrophe for possessives and not non-possessive plurals (which sound exactly the same) would indicate knowledge of the concept of grammatical possession. The items in this task are shown in Appendix IV.

Materials and Procedure

The child was given a piece of paper on which the sentences were printed. The missing word from each sentence was indicated by an underlined space. The tester dictated each sentence one by one, including the missing word. She then repeated the missing word. The child was asked to write the missing word in the space provided.

7.4.1.5. Apostrophe production (picture task)

Rationale

Like the apostrophe sentence task described above, this task aimed to measure the children's productive knowledge of the use of apostrophe to indicate possession in spelling. However, following the method developed by Totereau et al. (in press), in this task, pictures were used instead of sentences to indicate to the child whether a possessive singular (-'s) or a non-possessive plural (-s) ending was to be written. This was to see whether the children could use apostrophe correctly in spelling even

without the help of linguistic context.

Design

The task consisted of 16 items each consisting of three words. Half of the items indicated more than one subject doing an action (e.g. "The girls drink"), and the other half indicated an object possessed by a singular subject (e.g. "The boy's hammer"). Each item had one accompanying cartoon picture showing what was meant by the three words (e.g. two girls drinking, or a boy pointing to his hammer). The child had to spell the middle word of each sentence, that is, either the noun plural (e.g. girls) or the possessive (e.g. boy's).

Materials and Procedure

The child was given a piece of paper on which the first and third words of each item were printed. The missing second word was indicated by an underlined space (e.g. "The _____ drink."). For each item in turn, the tester showed the child the relevant picture and dictated the item, including the missing word. The child was asked to write the missing word into the space. The items are shown in Appendix IV. Their accompanying pictures are also shown in Appendix IV.

7.4.1.6. Apostrophe comprehension (picture task)

Rationale

This task was designed to measure the children's understanding of the significance of apostrophe used to indicate possession, when reading text.

Design

The task given to the Hebrew learners had 16 items, while the version given to the monolinguals had 8. Like the apostrophe production picture task, each item consisted of three words, and half of the items indicated more than one subject doing an action while the other half indicated an object possessed by a single

subject. The three words in each item were printed underneath two pictures. The child had to read the text, and decide which picture represented what was written. If no attention were paid to the apostrophe or lack of apostrophe in the text, both pictures could represent the item. For example, for the item "The girl's drink", one picture showed two girls drinking, while the other showed one girl pointing to her drink. Since "The girl's drink" and "The girls drink" (for example) sound exactly the same, children who did not understand the significance of the apostrophe were expected to choose randomly. Children who did understand its significance were expected to consistently choose the picture representing an object possessed by a singular subject for the items written with apostrophe, and the picture representing plural subjects doing an action for the items written without apostrophe.

Materials and Procedure

For each item, the child was shown a pair of pictures, printed side by side on an A4 size page, with the text underneath. The pictures and their accompanying text are shown in Appendix IV. The child was asked to read the text and to point to the picture which went the best with it. For ease of presentation and smooth running of the task, the pages were presented in a ring-bound folder, and the child turned the pages as he or she completed each item. The tester noted the child's response on a scoresheet hidden from the child's view.

7.4.2. Hebrew measures

In the development of all the Hebrew tasks, care was taken to choose common words from Modern and Classical Hebrew with which the children were likely to be familiar.

7.4.2.1. Comprehension of possessive pronoun suffixes

Rationale

This task was designed to measure the child's knowledge of possessive pronoun suffixes affixed to Hebrew nouns. The task examined the children's knowledge of the possessive pronoun suffixes for each person (equivalent to the English possessive pronouns my, your, his, its etc).

Design

The multiple-choice style task consisted of eight test items and two practice items. Six of the test items, and the two practice items, showed firstly a Hebrew sentence which indicated possession of an object by a subject with the construct possessed + *shel* + possessor. The word *shel* means "of". These items took the form *hineh ha-*_____ [possessed] *shel* _____ [possessor]. ("Here is/Here are the _____ [possessed] of _____ [possessor] "). For example, *hineh ha-bayit shel Moshe* ("Here is the house of Moses"). After this sentence, the beginning of a new sentence was shown, starting with the word *hineh* ("Here is"/"Here are"). The next word was missing, indicated by an underlined space. Four candidates for this missing word were shown next to the second sentence. The child had to choose the correct transformation of the *shel* construct of the first sentence, to the genitively inflected form of the possessed noun, equivalent to, for example, "his house", where, in Hebrew, "his house" is expressed by 'house [possessed] + internal vowel change [associated with inflected forms of the noun] + suffix [possessor]'.

Each of the four candidates for the missing word was the object noun inflected with a different suffix (and sometimes also with internal vowel changes associated with inflected forms of the noun). One was correctly inflected for the genitive and person. In the example given, the correct choice would be ביתו (*beyto* - "his house"), where the first three letters בית represent "house", and the final letter ו represents "his". The three incorrectly inflected nouns were inflected either for

possession but incorrect person (e.g. ביתי *beyti* - "my house"), or for something other than possession (e.g. בתים *batim*, "houses").The child had to select which of the four words fitted best into the blank space.

The two final items were of a different form from "Here is the _____ of _____. Here is _____." The first of these was "You [m.sg.] have a name *(*שם, *shem)*. What is _____? (your [m.sg.] name *(*שמך, *shimcha)*?)". The second was "He does good-deeds *(*מצוות *mitzvot)*. What are _____? (his good-deeds *(*מצוותיו *mitzvotav)*)". The complete set of items in Hebrew, with English translation, is shown in Appendix IV.

Procedure

The child was given a worksheet on which all the items were printed in large Hebrew block typescript, with vowel diacritics included. The four inflected nouns between which the child had to choose were printed to the left (i.e. at the end) of each item. For the first practice item, the child was told "Read these two sentences out loud and see if you can tell which of these four words (tester points) fits the best into the space. When you have decided, put a circle around it with your pencil". If the child had trouble reading, help was given, but in practice this was rarely necessary. If the child circled the correct word, s/he was asked to explain why s/he or she had chosen that word. This was to check both that the child had understood the sentences, and that s/he realised that the task was to pick the word which was inflected for possession and person, so that the second sentence would follow directly in meaning from the first. If the child circled an incorrect word, or circled correctly but did not give a correct explanation, the tester translated the sentences, and explained that there was a 'clue' in the first sentence, saying "Here it says 'Here is Moshe's house. Here is _____' (tester points). Now we have to look for the word which means 'his house'. The clue is that it says that it is Moshe's house, so it must be his house. It wouldn't make so much sense to say 'Here is Moshe's house. Here are houses', because this sentence (points to second sentence) wouldn't really have anything to do with this sentence (points to first sentence)".

The second practice item was then carried out with similar instructions and help given as above when necessary. After the practice items, the child was told "Now carry on and do the rest. Read the sentences aloud, and then put a circle around the word you think fits best into the blank space". If there were words the child didn't understand in the sentences, the researcher gave the translation. However, translations of the inflected nouns were not given, and no feedback was given for these trial items.

7.4.2.2. Genitive constructs analogy task (*smichut*)

Rationale

The aim of the task was to measure the child's explicit knowledge of two kinds of Hebrew genitive construct, and of the relation between the two.

Design

In this task, the child had to perform an oral transformation of one kind of Hebrew genitive construct (generally used in informal language) into another (generally used in formal language). The analogy method was used in order to demonstrate the kind of transformation required, and to avoid confounding semantic and grammatical demands.

The first kind of genitive construct involved in the task takes the form possessed + *shel* + possessor, where *shel* means "of" (e.g. *elokim shel Yitzchak* - "god of Isaac"). This construct is, in general, used in informal Hebrew. The second is a compound noun construct in which the first noun of the compound is inflected. This is generally (but not exclusively) used in more formal language. Inflection involves changing the suffix of the first (possessed) noun and/or making internal vowel changes. For example, *elo**kim** shel Yitzchak* ("god of Isaac") becomes *elo**key** Yitzchak* ("Isaac's god"; suffix change), while ***bayit** shel yeladim* ("house of

children") becomes ***beyt*** *yeladim* ("children's house"; internal vowel change).

There were two practice items and eight test items. Four of these test items required the child to transform a phrase from the *shel* construct to the genitive compound (e.g. *sipur**im** shel savta* → *sipur**ey** savta* - "stories of Grandma" → "Grandma's stories"). The other four items required the opposite transformation, from the genitive compound to the *shel* construct (e.g. *na'al**ey** David* → *na'al**ayim** shel David* - "David's shoes" → "shoes of David").

Transformations of certain categories of noun were not used in the task. For masculine singular nouns, there is no suffix inflection for either the nominative case or the genitive compound (e.g. ***melech*** *shel yisrael* → ***melech*** *yisrael* - "king of Israel" → "Israel's king"), although in some words there is nevertheless an internal vowel change in the genitive compound (e.g ***bayit*** *shel yeladim* → ***beyt*** *yeladim* - "house of children" → "children's house"). For plural nouns (usually feminine) whose nominative ending is *-ot,* the suffix inflection for the genitive compound is identical to the nominative form (e.g. *mishpach**ot** shel ha-yeladim* → *mishpach**ot** ha-yeladim* "the families of the children" → "the children's families").

Neither masculine singular nouns nor plural nouns ending in *-ot* were used in the test. If they had been used, the transformation asked of the child would merely have been to add or omit the word *shel* ("of"), and/or to make subtle vowel changes which as second language learners, they would be unlikely to know. An exception was made, however, in the inclusion of an item involving transformation by vowel change of the masculine singular *bayit* [nom.] to *beyt-* [gen.] ("house"), which appears in many common compounds such as *beyt-sefer* ("house of books" ="school") and *beyt-kneset* ("house of gathering" ="synagogue") and was therefore likely to be known by the children. The other seven items of the test involved transformations of masculine plural suffixes (*-im* [nom.]⇔ *-ey* [gen.]), plural suffixes for dual nouns (*-ayim* [nom.]⇔ *-ey* [gen.]) and feminine singular

suffixes (*-ah* [nom.]⇔ *-at* [gen.]). The practice and test items, with English translation, are shown in Appendix IV.

In four of the items of the task, the analogous transformation the child had to make was phonologically similar to the example given (e.g. *kriy**ah** shel hatorah* → *kriy**at** hatorah*; *tfil**ah** shel boker* → *tfil**at** boker*). In the other four items, the transformation the child had to make was phonologically dissimilar (e.g. *hadlak**at** nerot* → *hadlak**ah** shel nerot*; *na'al**ey** David* → *na'al**ayim** shel David*).

Procedure

The child was 'introduced' to the same two monster-shaped finger puppets used in Study 1. The child was told "Yossi (first puppet) is going to say something in Hebrew, and then Dudi (second puppet) is going to say something very like it, but a little bit different. Listen carefully and see if you can tell the difference". The two example phrases of the first practice item were then 'spoken' by the puppets. The child was asked if s/he had heard the difference between the two phrases, and to explain what it was. If s/he did not hear the difference, the examples were given again, emphasising the ends of the words being transformed. If the child still could not hear the difference, testing was stopped and a mark of zero given. If the child heard the difference, s/he was told "Now Yossi's going to say something else in Hebrew, but this time, you have to tell Dudi what he's supposed to say. Dudi has to change what Yossi says in exactly the same way that he changed it last time".

The first phrase of the analogous pair was then spoken, and the child's response noted. If the response was incorrect, correction was given as well as a reminder of the example phrases and how they had been different from each other. The second practice item was then given and correction provided if necessary. When it was clear the child understood what s/he was supposed to do, the first four test items were given in fixed order, without feedback. The transformation required in these items was, as in the practice items, from the *shel* construct to the genitive compound. In the next four test items, given in fixed order, the opposite

transformation was required. The tester introduced these items saying, "Now Yossi and Dudi are going to swap jobs. Yossi's going to do what Dudi used to do, and Dudi's going to do what Yossi used to do. Listen carefully and see if you can hear how they've swapped jobs." The example pair of phrases of item five were then given. The child was asked if s/he had heard how the puppets had changed jobs, and to explain how they had changed over. When the tester was satisfied that the child understood that the reverse transformation was now required, the first of the analogous phrases in item five was given, and the child was reminded to tell Dudi what he was supposed to say. For speed of writing and ease of representing vowel sounds, the child's responses were transliterated directly into English on a scoresheet hidden from the child's view.

7.4.2.3. Hebrew Word Analogy

Rationale

This task was designed to measure the child's explicit awareness of morpho-syntactic relations between spoken Hebrew words. The analogy method was used to avoid confounding semantic and grammatical demands.

Design

The task was modelled on the English Word Analogy task. There were two practice items and eight test items. The test items involved the following transformations: noun to verb (three items), verb to noun (two items), present to past tense (one item), verb to adjective (one item), and adjective to noun (one item). In the noun to verb items, two of the verbs were in the masculine third person singular (present tense), and the other was an infinitive. In the verb to noun items, one of the verbs was in the third person singular (present tense) and the other was an infinitive.

In four items, the word patterns (consisting of an affix + a vowel pattern, or vowel

pattern only, mounted on a three-consonant root) of the words in the example pair were the same as in the analogous pair. Thus the correct response was analogous to the example not only in the part of speech to which it belonged, but also in its sound. For example, (root letters shown in bold, correct response underlined),

sipur : mesaper	סיפור : מספר	"story": "tells"
dibur: <u>medaber</u>	דיבור : <u>מדבר</u>	"speech": "<u>speaks</u>"

In the first pair *sipur: mesaper,* the root consonants are *s.p.r.* The vowel pattern *-i-u-*[1] is mounted on this root to make *sipur*, and the word pattern (prefix + vowel pattern) *me-a-e-* is mounted on the root to make *mesaper*. In the analogous pair, the same vowel patterns *-i-u-* and *me-a-e-* are mounted on the root consonants *d.b.r.* to make *dibur* and *medaber*.

In the other four items, the word patterns of the words in the example pair were different from the analogous pair. Thus for these items, the correct response was analogous to the example in terms of the part of speech to which it belonged, but not in its sound. For example,

lehadlik : hadlaka	להדליק : הדלקה	"to light" : "lighting" (noun)
likroa : <u>kriya</u>	לקרוא : <u>קריאה</u>	"to read" : "reading" (noun)

The word patterns mounted on the root *d.l.k.* (example pair) are different from those mounted on the root *k.r.a.* (analogous pair). Thus to give a correct response the child needed to realise that the transformation was from infinitive verb to noun, and to know the correct word pattern to apply in order to perform the transformation.

The test items with English translation are shown in Appendix IV.

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[1] hyphens indicate the position of the root letters

Procedure

The finger puppet characters Yossi and Dudi were again used to present the task. The child was told, "Yossi (first puppet) is going to say a word in Hebrew, and then Dudi (second puppet) is going to say a word which is a bit like it but also a little bit different. Listen carefully and see if you can tell the difference." The first puppet 'spoke' the first word of the example pair in the first practice item (*omed* - "stands"), and then the second puppet spoke the second word of this pair (*la'amod* - "to stand"). The child was asked "Did you hear the difference? What did Yossi say? What did Dudi say?". If the child answered these questions correctly, s/he was told "Now Yossi's going to say another word in Hebrew. This time, you're going to tell Dudi what he should say. Dudi's got to change Yossi's word in exactly the same way as he changed Yossi's word last time." The first word of the analogous pair was then given. If the child gave the second word of the analogous pair incorrectly, the tester provided correction and a reminder of what the puppets had said the first time, and how Dudi had changed Yossi's word. The second practice item was then given, with correction and help if necessary. When the tester was satisfied that the child understood what was required, the test items were given. No correction or feedback was given for the test items.

7.4.2.4. Row Completion task

Rationale

The aim of this task was to test the child's awareness of the distinctions between different word classes (parts of speech) in Hebrew.The task was modelled on the English Row Completion task given in Study 1.

Design

The task had eight items (see Appendix IV). Each item consisted of a set of four common Hebrew words belonging to one of the following word classes: pronouns, possessive pronouns, verbs (third person, present tense; infinitives), nouns, and

adjectives, for example, ילד ,ראש ,מורה ,לילה (*night, teacher, head, child*). Four additional words were then shown to the child, one of which also belonged to that word class, for example עומד , מדבר ,מדליק ,טלית *(prayer shawl, lights (v.), speaks, stands)*. The child had to decide which of these four words best completed the original row. Since it was important that the task was measuring the child's grammatical awareness and not Hebrew vocabulary knowledge, the words used in the task were selected from the first and second levels of Rivlin's (1994) wordlist (see Chapter 4, section 4.5.2.1.) in an attempt to make sure they would be familiar to the children.

Materials

Each word was printed in Hebrew block letters in a large font (24 pt), on a 5 x 3" index card. Vowel markings were included.

Procedure

The child was told "I'm going to make a row of Hebrew words which all go together, like this". The tester then laid four word cards on the table, to make the following row: הם ,אנחנו ,הוא ,אני (*I, he, we, they*). The tester explained, "These words are all like each other in some way. They all belong together." Then she made another row underneath this using the four words between which the child had to choose. The child was told, "Here are four more words. <u>One</u> of these four words belongs up here with <u>all</u> these words in the top row" (the underlined words were emphasised, and a finger swept along the rows to illustrate). "Read the words out loud, and then decide which of these four words (tester points) belongs up here in this row, and finishes it off." The tester pointed at the space at the end of the top row where the child was to place his or her chosen word, to finish off the row. If the incorrect choice was made on this first item, the correct answer was given, and all the words in the completed top row were read again, together with the child. No further explanation was given. The remaining items were then given, in random order (achieved by shuffling the pack). Individual word cards were also shuffled within each set. The child was asked to justify correct answers. No

correction or further feedback was given, with the following exceptions: if the child's justification showed that s/he was basing his or her choice on only one of the words in the top row, s/he was reminded that "the word you choose must go with all the words in the row". This reminder was given only once. If the child's answer showed that s/he was basing his or her choice on the letters in the words, the tester said, "Try to think of another way these words go together". Again, this prompt was given only once.

Encouragement was given with comments like "Mmm-hmm", or "you're doing fine", irrespective of the child's answer. Responses were noted on a scoresheet hidden from the child's view.

7.4.2.5 Hebrew spelling tasks

This was presented to the children as one task, but included the two separate measures described below.

7.4.2.5.1. Consistency in spelling root morphemes *(shorashim)*

Rationale

The aim of this task was to test the children's ability to use morphological knowledge of the Hebrew root in their spelling. More specifically, it aimed to test their knowledge that words which share meaning and come from the same root must be spelled with the same root letters.

Design

Seven pairs of words and one set of three words common in Modern and/or Classical Hebrew were chosen for the task (see Appendix IV). Each pair or set of three words shared a three-consonant root. The roots chosen contained some phonological ambiguity in that one or more of the sounds of the root letters could

also be represented by an alternative letter. For example, the words כותב (***kotev*** - writes) and מכתב (***michtav*** - a letter) share the root כ.ת.ב. In *kotev*, the first root letter, כ, represents the hard sound /k/. This sound can also be represented by another letter, ק. In *michtav*, the same first root letter כ represents the soft sound /ch/. This sound can also be represented by another letter, ח. Thus a child who spelled these two words using phonological knowledge only, could write one or both of the words using one of these alternative, incorrect letters. If the child realised, on the other hand, that *kotev* and *michtav* come from the same root, and must therefore share spelling of this root, then s/he would know that the first letter of the root in both words must be כ, since this is the only letter which can represent both the hard /k/ and the soft /ch/ sounds. The last sound of the same root k.t.v, /v/, could also be represented by an alternative letter. It could be written with a ב (correct), or a ו (incorrect). If the child understood that these two words come from the same root and therefore must share spelling, s/he could use either ב or ו, but would use the same letter in both words. Thus in order to spell both *kotev* and *michtav* correctly and consistently, the child needed to use morphological knowledge of the root shared by these two different sounding words.

The words chosen for the task were embedded in short Hebrew sentences, in either Modern or Classical Hebrew (see Appendix IV). Classical Hebrew items were taken from the standard daily prayer book (*siddur*) or from biblical stories known to the children. Some of the other words in these sentences were chosen for the other spelling task, described in the next section.

Because it was important that the children understood all the words in the task, so that they could draw on any morphological knowledge they had, each sentence was illustrated by a cartoon picture. Before writing the sentence down, the child was asked to translate the sentence using the picture for help. Any mistakes in the translation were corrected by the tester.

7.4.2.5.2. Accuracy in spelling suffixes indicating possession

Rationale

The aim of this task was to test the children's spelling knowledge of morphemes (suffixes) indicating possession.

Design

The task consisted of eleven words ending in various suffixes indicating possession. Many Hebrew suffixes indicating possession are spelled the way they sound, and letter choice is unambiguous. For this task, however, only those suffixes were chosen whose spellings are ambiguous according to the way they sound, because the sounds they represent could be spelled with one or more alternative letters. These suffixes were:

ו(י)	*-av*	"his" (on plural nouns) e.g. *na'**alav*** - "his shoes" (two items)
ת	*-at-*	"of" (on feminine nouns within genitive compounds,) e.g. *birkat-hamazon* "blessing of food (Grace after Meals)" (three items)
ך	*-cha*	"of you (m.sg)" e.g.*toratecha* "Your Torah" (three items)
ך	*-ach*	ending of *shelach* "of you (f.sg)" (one item)
י	*-ey*	"of" (on masculine plural nouns within genitive compounds) e.g. lomd**ey** toratecha "students of Your Torah" (two items)

Procedure for both Hebrew spelling measures

The child was told "Now you're going to do some Hebrew spelling. I'm going to say a sentence in Hebrew. You're going to look at a picture which will help you to understand the sentence. First of all, before you write anything down, try and translate the sentence. If there are any words you don't know, I'll help you. Then write the whole sentence down. If you know script, write in script and not in 'block'." The child was shown the first picture, and the first sentence was spoken

slowly and clearly. Any mistakes in the child's translation were corrected.

If the child asked whether or not to include vowel diacritics, s/he was told to do as s/he preferred. The sentences were repeated if the child so requested.

CHAPTER EIGHT

RESULTS OF STUDY 2

The first part of this chapter will describe univariate statistics for the sample of Hebrew learners and the tasks they carried out. Later sections will address the research questions for Study 2. Relevant statistics relating to the monolingual children with whom the Hebrew learners were compared for English performance will be given in the sections describing the results of these comparisons.

8.1. Description of the sample and measures

8.1.1. The sample of Hebrew learners

There were 50 girls and 65 boys. A chi-square test showed that this difference was not statistically significant. Table 8.1. shows the mean age (*SD*) of the Hebrew learners, by school and National Curriculum Year.

Table 8.1. Age (years: months) and SD (months) of Hebrew learners, by School and National Curriculum Year

	Year				Total N
	3	4	5	6	
School 1	8:3 (3.4)	9:4 (3.1)	10:3 (3.5)	11:2 (3.2)	
	n=15	n=15	n=13	n=12	55
School 2	8:3 (3.9)	9:4 (3.6)	10:1 (4.2)	11:5 (3.4)	
	n=15	n=15	n=15	n=15	60
					N=115

8.1.2. English measures

8.1.2.1. WISC-III Vocabulary

Scaled scores ranged from 6 to 19, with a mean of 13.06 (*SD* = 2.95; n=115). Since the mean scaled score for the population on which this test was normed is 10, Hebrew learners as a group had an above average level of English vocabulary.

8.1.2.2. English Word Analogy task

Each of the child's correct responses was given a point and the total number correct was calculated. The criterion for a correct response was strict, so that for each item there was only one possible correct response. Thus, for example, for the item *happy-happiness; high-?*, only *height* was scored as correct, and not *highness* or any other responses. The maximum possible score on the task was 8, and scores ranged between 0 and 8 (n=100). The mean score was 3.6 (*SD* 2.0). Scores were approximately normally distributed.

Cronbach's alpha for the task was 0.68, and scores improved with school year ($F(3,96)=7.3$; $p=.0002$). Mean scores on the task, by school year, are shown in Appendix V. School 2 children (Years 4,5,6) performed slightly better than School 1 children (Years 4,5,6) but this difference was not significant ($t=1.84$; $d.f.=83$; $p=0.07$). Year 3 children were excluded from this comparison because in School 2, Year 3 children did not do the task.

8.1.2.3. Consistency in spelling English morphemes

Each of the 13 pairs of root morphemes was scored as consistently spelled or inconsistently spelled. In consistently spelled pairs, the two roots were spelled exactly the same (e.g. *know-knowledge*, or *no-nolige*). In inconsistently spelled pairs, the stems were not spelled the same (e.g. *know-nolige* or *no-knowledge*). In addition, the suffix *-ness* on the words *naughtiness* and *specialness* was scored for consistency of spelling. Examples of the children's spellings are shown in Figure 8.1.

One point was given for each consistently spelled pair and a total score was calculated, with a maximum of 14. Scores ranged between 0 and 14. The mean score was 8.3 (*SD* 3.6; N=115). The distribution was approximately normal but with a slight negative skew (see Appendix V) .

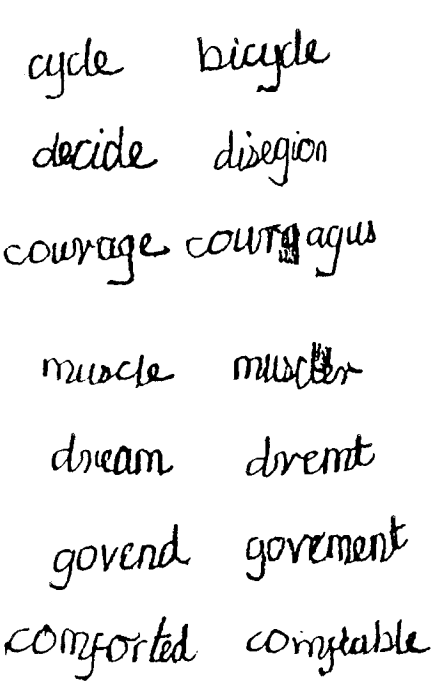
Cronbach's alpha for the task was 0.82. Scores improved significantly with school year ($F=19.6$ (3,111); $p<.0001$). The mean scores on the task by school year are shown in Appendix V. There was no significant difference between the mean scores of children from School 1 and children from School 2 ($t=1.53$; d.f.=113; $p=.128$).

8.1.2.4. Apostrophe sentence task

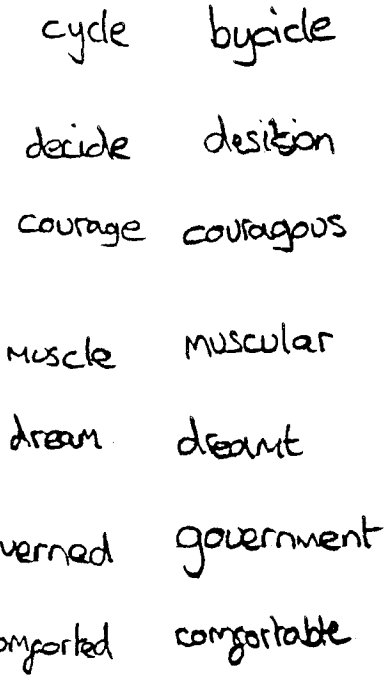
In this task, half of the trials were possessives and the other half were non-possessive plurals. The same words were used in the possessive and the plural trials. The way the child spelled the endings of each of these words, but not the rest of the word, was scored. Possessives were scored as correct if they were written with *-'s* at the end (or, where appropriate, *-s'*), while plurals were scored as correct if the child wrote *-s*.

As in the longitudinal study by Bryant, Nunes and Bindman (in progress), the task proved quite difficult for many children. 37 out of 99 children did not use apostrophes at all, on any of the items. 14 children correctly wrote apostrophes on all the

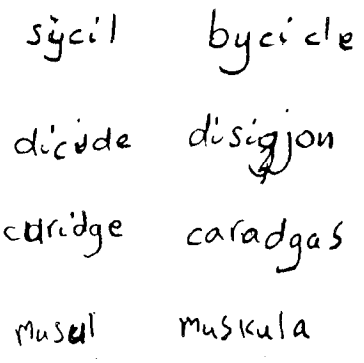
Robby, aged 9



Paul, aged 10



Adina, aged 7



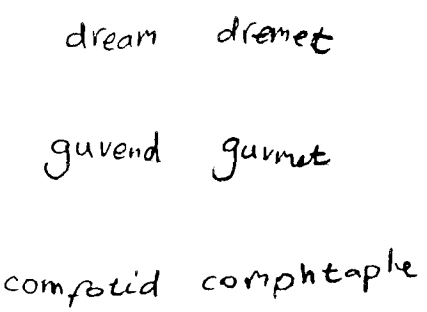


Figure 8.1. Examples of children's consistent and inconsistent spellings of English morphemes

possessives and omitted them from all the plurals. The remaining 48 children exhibited some confusion about the correct use of apostrophes, misplacing them on plural words, omitting them from some possessives, or both.

A measure of the child's success in discriminating possessive words from non-possessive plurals was calculated. One point was given for each word if the child correctly spelled the possessive form with an apostrophe and the plural form of the same word without (e.g *The dog's tail is wagging* and *The dogs are barking*). Since there were 16 trials on this task, the maximum possible score on this 'discrimination' measure was 8.

Scores on the discrimination measure ranged from 0 to 8, with a mean of 2.46 (*SD* 3.16) and the distribution of these scores was not normal (see Appendix V). 50 out of 99 children scored 0, compared with 14 children scoring the maximum of 8. A Mann-Whitney U-Test showed that there was no significant difference between the performance of School 1 children (Years 4,5,6) and School 2 children (Years 4,5,6) (U=719; z=1.67; p=.09). Cronbach's alpha for the discrimination measure was 0.95.

8.1.2.5. Apostrophe comprehension (picture task)

A score of one point was given for each item in which the child correctly chose the picture depicting possession to match the sentences showing an apostrophe, and the picture depicting a non-possessive plural for the sentences without an apostrophe. The total number correct (out of 16) was calculated, and, since there was a 50% probability of getting an item correct by chance, this score was adjusted by counting all total scores of 8 or below as 0. Thus the maximum possible score on the adjusted total was 8.

Scores ranged between 0 and 8, and the distribution of scores was not normal (see Appendix V). The mean score was 2.7 (*SD* 2.8), and the median was 2. The task

showed that the children had difficulty understanding the significance of the apostrophe to denote possession. Comments made by some children showed that they hypothesised that the task was to do with the distinction between plurality and singularity, rather than between possession and non-possession. This was because the pictures shown for each item of the task, which was modelled on that of Totereau et al. (in press), in their investigation of the acquisition of the plural marker in written French, showed not only the distinction between possession or non-possession, but also between plurality and singularity (e.g 'the girls drink', in contrast with 'the girl's drink'). Thus the children could consistently choose one picture or the other according to this distinction rather than realising the connection between possession and apostrophe.

A Mann-Whitney U-Test showed than there was no significant difference between the performance of School 1 children (Years 4,5,6) and School 2 children (Years 4,5,6) (U=821; z=.71; p=.48). Cronbach's alpha for the task was 0.77.

8.1.2.6. Apostrophe production (picture task)

In this task, responses were scored as correct or incorrect, and a total score was calculated. A correct response was one in which the child wrote the word shown in the picture with -*'s* at the end for a possessive, or -*s* for a plural. A 'discrimination' score could not be calculated for the apostrophe production picture task, because unlike the sentence task, the picture task was not designed so that the same words were used once in plural form and once in possessive form. Instead, the number of correct productions was used.

Since each picture showed either possession or a plural, and all children wrote either an -*s* or an -*'s* ending for each item, a score of 50% correct could be gained by putting no apostrophes on any of the items, by putting apostrophes on all the items, or by randomly guessing which items should or should not have apostrophes. The total score

was therefore adjusted so that only total scores above the 50% chance level were used. All scores below or equal to 8 were recoded as 0, a score of 9 was recoded as 1, 10 as 2, and so on. Thus the maximum possible score on this adjusted total score was 8.

Many children had difficulty with this task. 28 out of 99 children did not use apostrophes at all. This is a decrease compared with the results of the apostrophe sentence task, in which 37 children did not use any apostrophes. This is probably because some children who had not used apostrophe in the sentence task, given first, had noticed the apostrophes shown in the comprehension task, given second, by the time they did the production picture task, given third. 7 children realised that the task had something to do with apostrophe, but used them for all items irrespective of the picture. Children who did not use apostrophe, or who used it on all the items, sometimes commented that they did not need the picture to help them spell the word, confirming that they did not understand the significance of the information given in the pictures. A further 7 children put apostrophes on all the plurals and none of the possessives. 20 children wrote all the 16 items correctly.

Scores on the adjusted total correct ranged between 0 and 8, with a mean of 2.8 (*SD* 3.5), and a median score of 0 (see Appendix V for distribution). A Mann-Whitney U-Test showed that there was no difference between the performance of School 1 children (Years 4,5,6) and School 2 children (U=885; z=.14; p=.89). Cronbach's alpha for the task was 0.9.

8.1.3. Hebrew measures

8.1.3.1. Comprehension of possessive pronoun suffixes

The total number of correct responses on the task was calculated, with a maximum of 8. Since for each item there was a 25% chance of getting the correct answer by guessing, the total was adjusted so that scores between 0 and 2 were counted as 0, a

score of 3 as 1, 4 as 2, and so on. Therefore the maximum adjusted score was 6.

The distribution of scores was approximately normal, and ranged between 0 and 6 (n=99), with a mean of 3.2 (*SD* 2.06). The distribution of scores is shown in Appendix V. Children from School 1 (Years 4,5,6) performed significantly better than children from School 2 (Years 4,5,6). Mean scores were 3.7 (*SD* 2.02) and 2.6 (*SD* 1.8) respectively (t=2.66; d.f.=83; p=.009). Year 3 children were excluded from this comparison because in School 2 they had not carried out the task. The distributions of scores in each of the two schools are shown in Appendix V.

Cronbach's alpha for the task was 0.71.

8.1.3.2. Genitive constructs analogy task (*smichut*)

One point was given for each item answered correctly. Children were not penalised if they did not know the subtle irregular initial vowel change in one of the items (*sipurim shel savta: sipurey savta; etzim shel sadeh: atzey sadeh*), as long as they gave an otherwise correct response (i.e. *"etzey sadeh"*).

The maximum possible score on the task was 8, and scores ranged between 0 and 8. The data were approximately normally distributed though slightly positively skewed, showing that the task was a challenging one for the children. The mean score was 3.2 (SD 2.3; n=99). Children from School 1 (Years 4,5,6) were significantly better at the task than children from School 2 (Years 4,5,6). Mean scores were 4 (SD 2.3; n=40) and 2.27 (SD 1.8; n=45) respectively (t=3.95; d.f.=83; p<.001). Year 3 children were not included in this comparison because in School 2 they had not carried out the task (piloting had shown it was too difficult for them). The distributions of scores in each of the two schools are shown in Appendix V.

Cronbach's alpha for the task was 0.78.

8.1.3.3. Hebrew Word Analogy task

One point was given for a correct response, and a total score calculated. The maximum possible score was 8. This task was a challenging one for most children, especially those in School 2, and the distribution was positively skewed (see Appendix V). Scores ranged from 0 to 8, with a mean of 2.75 (*SD* 2.16). Children from School 1 (Years 4,5,6) were significantly better at the task than children from School 2 (Years 4,5,6). Mean scores were 3.3 (*SD* 2.4; n=39) and 2.2 (*SD* 1.8; n=45) respectively (t=2.37;d.f.=82; p=.02). Year 3 children were not included in this comparison because in School 2 they did not do the task. The distributions of scores in each of the two schools are shown in Appendix V.

Cronbach's alpha for the task was 0.74.

8.1.3.4. Hebrew Row Completion task

One point was given for a correct response, and 0 for an incorrect one, and a total score was calculated. Since there was a 25% chance of getting the correct answer for each item, a total score of 2 was possible by random guessing. Therefore the total score was adjusted so that scores between 0 and 2 were counted as 0, a score of 3 as 1, and so on. Therefore the maximum adjusted score was 6.

Scores ranged between 0 and 6, with a mean of 2.96 (*SD*=1.96; n=96). Scores were approximately normally distributed (see Appendix V), and there was no significant difference between the performance of School 1 children (Years 4,5,6) and School 2 children (Years 4,5,6) (t=.19; d.f.=80; p=.85). Distributions of scores in each school are shown in Appendix V.

Cronbach's alpha for the test was 0.65.

8.1.3.5. Consistency in spelling root morphemes (*shorashim*)

Each pair of (or in one item, set of three) roots was scored as consistently or inconsistently spelled. Consistently spelled pairs were written with the same two or three letters to represent the sounds of the root. Inconsistently spelled pairs were those in which the child used different letters in the two (or three) words to represent the sounds of the root.

Table 8.2. shows examples of two children's consistent and inconsistent spellings of the eight roots. In the first and third items, the final root letter has two forms. One is used when the letter appears in the final position in the word; the other is used when it appears in any other position. However, the child was not penalised if she or he used the incorrect form of these letters.

The root letters in the children's spellings are indicated by a red dot underneath. Where the child has used an incorrect letter to represent a sound in the root, this is shown in blue. Joanna, aged 7, spelled each root phonologically acceptably, conventionally and consistently. As well as using her letter-sound knowledge, Joanna used morphological knowledge of roots to help her decide which letter to use when more than one letter could represent a particular sound. Sammy, aged 8, spelled each word in a phonologically acceptable way, but in all but the first item, chose one or more wrong letters to represent the sounds of the root, in one or both of the word pairs (and in one of the set of three words). Although he used his letter-sound knowledge to write the words, his spellings show that he did not realize the morphological connection between them.

One point was given for each consistently spelled pair. In the case of the item consisting of three words from the same root, the child had to use the same three root letters in all of the words, in order to score a point. A total score was calculated, with a maximum of 8.

Table 8.2. Two children's consistent and inconsistent spellings of Hebrew words which share roots

	Task items							
	רוחץ *rochetz* "washes" מתרחצת *mitrachetzet* "washes herself"	העבדים *ha-avadim* "the slaves" עבדו *avdu* "worked"	ברוך *baruch* "bless" מברך *mevarech* "he blesses" ברכת- *birkat-* "blessing of"	צונו *tzivanu* "command-ed us" מצות *mitzvat-* "command-ment of"	נועל *no'el* "puts on" (footwear) נעליו *na'alav* "his shoes"	כותבת *kotevet* "she writes" מכתב *michtav* "a letter"	אומרים *omrim* "they say" ויאמר *va-yomer* "and he said"	בא *boh* "come" לבוא *lavoh* "to come"
Root letters	ר.ח.צ/ץ	ע.ב.ד	ב.ר.כ/ך	צ.ו	נ.ע.ל	כ.ת.ב	א.מ.ר	ב.א
Joanna, aged 7	רוחץ מתרחצת	העבדים עבדו	ברוך מברך ברכת	צונו מצות	נועל נעליו	כותבת מכתב	אומרים ויאמר	בא לבוא
Sammy, aged 8	רוחץ מתרחצות	העבדים עבדו	ברוך מברך ברכת-	צונו מצות	נועל נעליו	כותבת מכתב	אומרים ויאמר	בא לבוא

Scores ranged from 1 to 8, with a mean of 4.95 (*SD*=2.06; n=114), and were approximately normally distributed although slightly negatively skewed (see Appendix V). Children from School 1 spelled significantly more items consistently than children from School 2. Mean scores were 6.01 (*SD*=1.7; n=54) and 3.98 (*SD*=1.89; n=60) respectively (t=6.02; d.f.=112; p<.001). Cronbach's alpha for the test was 0.66.

8.1.3.6. Accuracy in spelling suffixes indicating possession

One point was given for use of the correct letter(s) for each suffix, and a score of 0 for use of an incorrect letter. One item had no variance because all the children spelled it correctly. A total score, excluding this item, was then calculated, with a maximum of 10. Scores ranged from 1 to 10, with a mean of 6.62 (*SD*=2.35; n=112). The distribution of scores was approximately normal, although slightly negatively skewed. Children from School 1 spelled significantly more suffixes correctly than children from School 2. Mean scores were 7.67 (*SD*=2.01; n=54) and 5.66 (*SD*=2.24; n=58) respectively (t=4.98; d.f.=110; p<.001).

Cronbach's alpha for the task was 0.76.

8.2. Research questions

8.2.1. Can children with knowledge of two languages use morpho-syntactic awareness in both their oral languages, where, despite surface differences in the way each language is marked, there are conceptual similarities?

It was hypothesised that the metalinguistic ability to analyse and manipulate morphological relations between spoken words would be transferable across Hebrew and English, even though the specific ways in which words are derived and inflected are different in the two languages. A significant positive correlation was therefore

expected between performance on Word Analogy tasks in English and Hebrew. It was also expected that this correlation would remain significant even after controlling for differences in age, level of English vocabulary and school.

The correlation between performance on the English and Hebrew Word Analogy tasks was 0.45. This was significant ($p<.001$; $n=99$).

It is possible that the significant correlation is due to age or general language ability, and/or school differences, rather than transfer of metalinguistic awareness. Therefore a fixed-order hierarchical regression was carried out to find out whether performance on the Hebrew task would predict performance on the English task even when the effects of age, WISC-III Vocabulary and school were partialled out. The variables age, WISC-III Vocabulary (scaled score) and the dummy variable School were entered as the first, second and third steps respectively. The fourth and final step was Hebrew Word Analogy. The response variable was English Word Analogy.

Table 8.3. shows the results of the regression analysis.

Table 8.3. Summary of fixed-order regression analysis measuring the relationship between Hebrew and English Word Analogy tasks

	Variable	R^2 change	B	SE B	β
(n=99)					
Step 1	Age	.18****	.05***	.01	.33
Step 2	WISC-III Vocab	.17****	.16**	.05	.31
Step 3	School	.01	.85*	.33	.22
Final Step	Hebrew Word Analogy	.10***	.33***	.08	.37

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

The results show that Hebrew Word Analogy continued to significantly predict English Word Analogy even after age, WISC-III Vocabulary and School had been partialled out, explaining 10% of the variance.

8.2.2. Can children use their knowledge of specific grammatical concepts for spelling morphemes in another language, where these morphemes are governed by similar concepts?

It was hypothesised that knowledge of possessive marking in L2 would be related to use of the possessive morpheme in L1 spelling, because the principle of possession applies to both languages and therefore may be transferable. Significant positive correlations were thus expected between measures of children's knowledge of Hebrew genitive inflections and measures of comprehension and production of apostrophe denoting possession in English. These relationships were expected to remain significant after the effects of age, WISC-III Vocabulary and school were partialled out.

Table 8.4. shows the correlation coefficients for relationships between performance on the two measures of knowledge of Hebrew possession and the three English apostrophe measures. In the case of the relationships involving the apostrophe discrimination score or the apostrophe production (picture task) score, Spearman's rho was used rather than Pearson's r, because of the non-normal distributions of scores on the apostrophe tasks. However, in the case of the apostrophe comprehension task, although the distribution of scores was not normal, it was suitable for transformation using normal scores. The distribution of the transformed normal scores for this task is shown in Appendix V. In Table 8.4, the coefficients shown for relationships between scores on the Hebrew tasks and apostrophe comprehension normal scores are Pearson's r.

The Hebrew genitive constructs task correlated significantly, though not strongly, with

all three English apostrophe tasks. The Hebrew possessive suffixes task correlated with apostrophe comprehension and production (picture task), but these correlations were weaker than those observed between the Hebrew genitive constructs task and these two apostrophe tasks.

Table 8.4. Correlations between measures of knowledge of Hebrew possession and English comprehension and production of apostrophe (n=99)

	1	2	3	4	5
1. Hebrew possessive suffixes	1				
2. Hebrew genitive constructs	.6 p<.001	1			
3. Apos sentences (discrim)	.15 p=.15	.3 p=.003	1		
4. Apos production (pictures)	.27 p=.008	.35 p<.001	.65 p<.001	1	
5. Apos comprehe-nsion (normal)	.26 p=.009	.32 p=.001	.48 p<.001	.65 p<.001	1

Abbreviations: Apos=apostrophe; discrim= discrimination score (no. spelled correctly in both possessive and non-possessive forms); normal=transformed to normal scores

For the next analyses, in which the relationships between awareness of possessives in Hebrew and apostrophe use in English were to be examined while controlling for extraneous variables, multiple regression was only used for those analyses in which the normal score on the apostrophe comprehension task was the response variable. For the other analyses, multiple regression could not be used due to the non-normal

distributions of scores on the apostrophe sentence task and apostrophe production (picture) task. Non-parametric techniques were needed. In addition, the shape of the distributions of scores on these apostrophe tasks (see Appendix V) indicated that treating the data from these tasks as categorical rather than interval variables might be fruitful.

Examination of performance on the apostrophe sentence task had revealed three types of speller: (i) children who did not use apostrophes on any of the words (n=37); (ii) children who used apostrophe, but with little or no regard for its grammatical significance (n=48); and (iii) children who used apostrophe correctly, taking each word's grammatical status into account (n=14).

In the five-stage model of spelling acquisition of the 'ed' ending for past tense verbs, proposed by Nunes, Bryant and Bindman (e.g. in press a) children at first spell phonetically and do not spell the morphological endings of words conventionally, then go through a period of confusion during which they use the conventional morphological ending but without understanding its grammatical significance, and finally, are able to distinguish between grammatical categories of words and to represent morphological endings accordingly. The data from the apostrophe sentence task in the present study allowed for an exploration of the possibility that a similar progression could be observed for an aspect of morphological spelling other than the 'ed', namely, apostrophe denoting possession.

If the three categories of speller observed for the apostrophe task represent stages of acquisition, then we would expect there to be an ordered relationship between the categories and age, vocabulary and grammatical awareness. Therefore, the mean ages, WISC-III Vocabulary scaled scores and scores on the English Word Analogy task were examined for each of the three categories of speller. In the first category were children who used no apostrophes at all. In the second were children who used apostrophes but inappropriately, putting them on plural words, omitting them from possessives, or both. In the third category were children who used apostrophes on all

the possessive words and none of the non-possessive plurals. Table 8.5 shows the mean age (years: months; *SD* in months), WISC-III Vocabulary scaled score and Word Analogy score *(SD)* for each type of speller on the apostrophe sentence task.

Table 8.5. Mean age, WISC-III Vocabulary and Word Analogy score (SD), by type of apostrophe speller

Type of speller	Age	Vocabulary	Word Analogy
1 (used no apostrophes; n=37)	9:6 (12.6)	12.2 (2.7)	2.9 (1.6)
2 (used apostrophes but inappropriately; n=48)	10:2 (11.4)	12.8 (3.3)	3.6 (1.9)
3 (used apostrophes appropriately; n=14)	10:4 (15.0)	15.1 (2.6)	5.4 (1.8)

Table 8.5 shows that age, vocabulary and grammatical awareness scores all ascended in an ordered fashion by spelling category. Oneway analyses of variance showed significant differences between the types of speller in age ($F(2,96)=5.37$; $p=.006$), vocabulary ($F(2,96)=4.54$; $p=.01$) and Word Analogy score ($F(2,96)=10.23$; $p=.0001$). Tukey's HSD post-hoc tests showed that for age, there were significant differences between the first and second, and the first and the third type of speller; and for WISC-III Vocabulary and Word Analogy scores there were significant differences between the first and third, and the second and third type of speller ($p<.05$).

If the three categories of speller genuinely represent stages of understanding of the grammatical significance of the apostrophe, and differences between the three groups of children are not due to differences in age, general verbal ability and/or to school effects alone, then grammatical awareness should be related to membership of the three categories, when the effects of age, vocabulary and school are controlled. To investigate this, Discriminant Function Analysis was used. Discriminant Function

Analysis is a technique which is used to investigate the relationship between a set of predictor variables and an outcome variable which represents two or more mutually exclusive groups of cases. Linear combinations of the predictor variables are formed and serve as the basis for classifying cases into one of the groups. An 'optimal' linear discriminant function is calculated to provide a classification rule which minimizes the probability of misclassification (Norusis, 1993).

The predictor variables were entered in fixed-order. The first step was age, the second step WISC-III Vocabulary scaled score, the third step was the dummy variable school, and the fourth and final step was Word Analogy score. The outcome variable was type of apostrophe speller.

The results showed that the first three steps, that is age, vocabulary and school, together significantly predicted type of speller (Wilk's lambda=.77; p=.0004), distinguishing between types 1 and 2 ($F(3,94)=5.1$; p=.0026), types 1 and 3 ($F(3,94)=5.9$; p=.001), but not between types 2 and 3 ($F(3,94)=2.46$; p=.0677). When the Word Analogy score was entered at the fourth step, it significantly improved the predictive power of the model (Wilk's lambda=.71; p=.0001), which now successfully distinguished between types 1 and 2 ($F(4,93)=3.79$; p=.0067), types 1 and 3 ($F(4,93)=6.14$; p=.0002) and between types 2 and 3 ($F(4,93)=3.8$; p=.0064). Thus the Word Analogy task significantly predicted type of apostrophe speller, even after age, vocabulary and school were controlled.

Since the children had also carried out the Word Analogy task 16 months earlier, for Study 1, a similar analysis could be carried out in which the predictor variables were age and vocabulary at the first testing session, and the outcome was, again, type of apostrophe speller. It may be that not only is there a connection between the child's grammatical awareness and simultaneous understanding of the grammatical significance of apostrophe, but that earlier grammatical awareness is related to later understanding of apostrophe.

For this analysis, age, vocabulary score and school at the first testing session were entered as the first three steps respectively. The fourth and final step was Word Analogy score in the first testing session. Again, the outcome variable was type of apostrophe speller at the second testing session, 16 months later. The results showed that Word Analogy score at the first testing session did not reach the statistical criterion for inclusion in the model, and therefore did not survive as a predictor of apostrophe stage 16 months later, once age, vocabulary and school had been controlled.

The next relationship to be examined was that between awareness of Hebrew possession and type of apostrophe speller. Again, the control variables age, vocabulary and school were entered at the first three steps respectively. The final and fourth step was either the child's score on the Hebrew genitive constructs task or on the Hebrew comprehension of possessive suffixes task.

The results showed that both the Hebrew genitive constructs analogy task and the Hebrew comprehension of possessive pronoun suffixes task significantly predicted type of speller after the controls for age, vocabulary and school. As in the analysis described in which the Word Analogy in the second testing session was the fourth step, the control variables age, vocabulary and school significantly predicted type of speller (Wilks lambda=.77; p=.0004), distinguishing between types 1 and 2, 1 and 3, but not 2 and 3. For the analysis in which the Hebrew genitive constructs analogy task was the fourth step, it significantly improved the predictive model (Wilk's lambda=.63; p<.0001), distinguishing between types 1 and 2 ($F(4,93)=4.5$; p=.0023), types 1 and 3 ($F(4,93)=10.56$; p<.0001), and types 2 and 3 ($F(4,93)=5.68$; p=.0004). For the analysis in which Hebrew comprehension of possessive suffixes was entered at the fourth step, it too significantly improved the model (Wilks lambda=.68; p<.0001), distinguishing between types 1 and 2 ($F(4,93)=4.2$; p=.0036), types 1 and 3 ($F(4,93)=6.09$; p=.0002), and types 2 and 3 ($F(4,93)=5.11$; p=.0009).

Next, relationships between Hebrew grammatical awareness and performance on the

other two apostrophe tasks, apostrophe comprehension and apostrophe production (picture tasks) were examined. For the first of these two tasks, the normal scores were used as the response variable in a fixed-order multiple regression analysis. Age, WISC-III Vocabulary and school were entered as the first three steps respectively. English Word Analogy, Hebrew genitive constructs or Hebrew comprehension of possessive suffixes was entered as the fourth step. The results showed that neither English Word Analogy nor Hebrew comprehension of possessive suffixes tasks significantly predicted the apostrophe comprehension score after age, vocabulary and school had been partialled out, but the Hebrew genitive constructs task did, explaining a further 4% of the variance ($p<.05$). These results are shown in more detail in Appendix VI.

Scores on the apostrophe production (picture task) were not normally distributed, but when transformed to normal scores, an acceptably normal distribution resulted. However, when multiple regression analyses were attempted, it was found that the distributions of the residuals were not normal, violating one of the assumptions of multiple regression. Therefore, multiple regression could not be used for this apostrophe task.

Instead, a median split of the total score (adjusted for chance) was taken, dividing the children into two equal groups representing a) those who had little or no understanding of the grammatical significance of the apostrophe, and b) those who had partial or complete understanding. To analyse the relationships between the predictor variables and this dichotomous variable, logistic regression was used. This is a type of regression procedure which is used to classify cases into one of two groups.

The covariates age, WISC-III Vocabulary scaled score and school were entered in fixed order as the first three steps, with the score on the English Word Analogy task, the Hebrew genitive constructs task or the Hebrew possessive suffixes task as the fourth and final step. The outcome variable was the dichotomous variable for the apostrophe production task.

First, the relationship between the English Word Analogy task and apostrophe production was examined. The results showed that the Word Analogy task predicted group membership on the apostrophe production task after the controls for age, vocabulary and school (χ^2=7.2; d.f.=1; p=.007). These results are shown in more detail in Appendix VI.

The next analysis examined whether group membership on the apostrophe production (pictures) task was significantly predicted by the Hebrew genitive constructs task, when age, vocabulary and school were controlled. The results showed that the Hebrew genitive constructs task did not significantly predict group membership on the apostrophe production task, once age, vocabulary and school had been controlled (χ^2=2.85; d.f.=1; p=.09). These results are shown in more detail in Appendix VI.

The final analysis examined the relation between performance on the Hebrew comprehension of possessive suffixes task, and group membership on the apostrophe production task. The results showed that the Hebrew comprehension of possessive suffixes task did not significantly predict group membership on the apostrophe production task, once age, vocabulary and school had been controlled (χ^2=1.29; d.f.=1; p=.26).

To summarise, when age, vocabulary level and school effects were controlled, Discriminant Function analyses showed that both tasks measuring knowledge of Hebrew possessive marking significantly predicted the child's stage of understanding of the grammatical significance of the apostrophe (apostrophe sentence task). Multiple regression analyses showed that the Hebrew genitive constructs analogy task but not the Hebrew comprehension of possessive suffixes task, significantly predicted performance on the apostrophe comprehension task. Finally, logistic regressions showed that neither Hebrew task distinguished between children who had little or no knowledge of apostrophe, and children who had partial or full knowledge of apostrophe, as measured by the apostrophe production task.

8.2.3. Can children use their knowledge of morphological spelling for both of their languages, even when the languages use different scripts and have different, language-specific morphological rules?

The previous question addressed transfer of morphological awareness between one oral language and another written language. The present question turns to the possibility of transfer of morphological knowledge between two written languages. The question raises two hypotheses. The first hypothesis is that children who know in one language that words from the same semantic root must share spelling of the root morpheme will be able to use this knowledge for spelling semantically related words consistently in their other language. This hypothesis predicts that there will be a significant positive correlation between consistency in spelling the roots in pairs of semantically related Hebrew words, and consistency in spelling English roots.

The second hypothesis is that spelling knowledge of morphemes indicating possession in one language will be related to children's understanding of the significance of and spelling of morphemes indicating possession in their other language. This hypothesis predicts that there will be significant positive correlations between accuracy in spelling Hebrew suffixes indicating possession, and comprehension and production of apostrophe to indicate possession in English.

In the case of both predictions, the correlations are expected to remain significant after the effects of age, level of English vocabulary and school are partialled out, if there is genuine transfer of awareness of morphology in spelling.

Consistency in spelling Hebrew roots and consistency in spelling English morphemes (13 out of 14 of which were root pairs) were positively and significantly correlated, though not strongly ($r=.35$; $n=114$; $p<.001$).

A regression analysis was carried out to discover whether the correlation between consistency in spelling Hebrew and English root morphemes remained significant when

age, vocabulary and school were controlled. The results of this analysis showed that the number of Hebrew roots spelled consistently significantly predicted the number of English morphemes spelled consistently, even when age, vocabulary and school were controlled, explaining a further 12% of the variance. These results are shown in more detail in Appendix VI.

The evidence for the second hypothesis, which predicts a relationship between spelling knowledge of Hebrew possessive suffixes and English apostrophe knowledge, was then examined. The correlations (Spearman's rho) between accuracy in spelling Hebrew suffixes indicating possession and the two English apostrophe production tasks (sentences and picture tasks), and the correlation (Pearson's r) between the Hebrew task and the apostrophe comprehension task (normal scores) are shown in Table 8.6.

The results show that accuracy in spelling Hebrew suffixes indicating possession correlated positively and significantly with all three English apostrophe tasks, though for the apostrophe sentence and comprehension tasks, these correlations were not very strong.

A Discriminant Function analysis was carried out to see if the Hebrew possessive suffix spelling task predicted type of speller (stage) on the apostrophe sentence task when age, WISC-III Vocabulary and school were controlled. Age, vocabulary and school were entered as the first to third steps respectively. The fourth step was the number of Hebrew possessive suffixes spelled accurately, and the outcome was type of speller on the apostrophe sentence task. The results showed that age, vocabulary and school together significantly predicted type of speller (Wilk's lambda =.76; p=.0004), successfully distinguishing between types 1 and 2 ($F(3,91)=5.33$; p=.002), and 1and 3 ($F(3,91)=5.64$; p=.0014) but not between 2 and 3 ($F(3,91)=2.36$; p=.08). When the number of Hebrew possessive suffixes spelled accurately was entered as the fourth step, it significantly improved the model (Wilk's lambda=.64; p<.0001), which now successfully distinguished between types of speller 1 and 2 ($F(3,91)=5.08$;

Table 8.6. Correlations between accuracy in spelling Hebrew possessive suffixes and performance on the English apostrophe tasks

	1	2	3	4	5
1. Hebrew spelling of possessive suffixes	1				
2. Apos sentences (discrim)	.20 p=.008 (96)	1			
3. Apos sentences (stage)	.29 p=.004 (96)	.83 p<.001 (99)	1		
4. Apos production (picture task)	.43 p<.001 (96)	.65 p<.001 (99)	.49 p<.001 (99)	1	
5. Apos comprehe-nsion	.32 p=.001 (96)	.5 p<.001 (99)	.43 p<.001 (99)	.66 p<.001 (99)	1

Abbreviations: Apos=apostrophe; discrim= discrimination score (number of words spelled correctly in both possessive and non-possessive forms); stage=type of speller (ordered categories 1-3). The number of children is shown in parentheses.

p=.001), types 1 and 3 ($F(3,91)=9.41$; $p<.0001$) and between types 2 and 3 ($F(3,91)=4.30$; $p=.003$).

In order to find out if there was a relationship between accuracy in spelling Hebrew suffixes indicating possession and score on the apostrophe comprehension task when age, vocabulary and school were controlled, a multiple regression analysis was carried out. Age was entered at the first step, WISC-III Vocabulary at the second, school at the third, and Hebrew accuracy in spelling suffixes at the fourth and final step. The response variable was the apostrophe comprehension score, transformed using normal scores. Results showed that Hebrew accuracy in spelling suffixes significantly

predicted apostrophe comprehension, even after the controls for age, vocabulary and school, explaining a further 4% of the variance. These results are shown in more detail in Appendix VI.

A logistic regression analysis was carried out to see if the number of Hebrew possessive suffixes spelled accurately predicted the dichotomous variable created in the previous analysis for the apostrophe production (pictures) task. The dichotomous variable represented whether the child showed little or no understanding of apostrophe, or partial to full understanding. The covariates were age, vocabulary and school, entered in that order. The results showed that the number of Hebrew possessive suffixes spelled accurately significantly predicted apostrophe production (picture task; χ^2=8.94; d.f.=1; p=.003). The results are shown in detail in Appendix VI.

8.2.4. Does transfer of metalinguistic awareness of grammar across languages occur primarily for those grammatical concepts which are directly related in the two languages, or does a more general grammatical awareness transfer?

We have already seen that there are significant positive correlations across languages between tasks which measure similar grammatical concepts, namely possession, word relations, and the constant spelling of morphemes. However, it may be that what transfers is a more general awareness of morphology, and not just knowledge of a particular grammatical concept which can be used for both languages.

It was hypothesised that children would transfer a general awareness of morphology across their languages, but where morphological principles are closely related in the child's two languages, it would be easier to transfer knowledge of these principles across languages. Significant positive cross-language correlations were expected not only between measures of those morphological principles which are similar across languages, but also between other aspects of morpho-syntactic knowledge. However, it was predicted that cross-language correlations would be strongest between the

conceptually related measures.

Table 8.7 shows the intercorrelations (Pearson's r) of those English and Hebrew oral and written morphological tasks which had approximately normal distributions. Table 8.8 shows the intercorrelations (Pearson's r for the apostrophe comprehension task, normal scores; otherwise Spearman's rho) of the English apostrophe tasks and Hebrew oral and written morphological tasks.

Looking first at the cross-language correlations between the Hebrew Word Analogy task and the English tasks, table 8.7 shows that Hebrew Word Analogy correlated significantly not only with English Word Analogy ($r=.45$; $p<.001$), but also with all the other English tasks. These correlations were between .33 and .41 and were all significant ($p \leq .001$), but were weaker than the correlation between the Hebrew and English Word Analogy tasks. These results therefore support the hypothesis that there is a general transfer of grammatical awareness, not only transfer of those concepts which are closely similar in the two languages.

Turning to the Hebrew genitive constructs analogy task, this too correlated positively and significantly with all the English tasks, not just those concerning possession. The correlation with the English Word Analogy task was .38 ($p<.001$), which is similar to the correlations with the three apostrophe tasks. This result again supports the hypothesis that it is not only those concepts which are directly related across languages which transfer, but rather there is transfer of grammatical awareness in a more general way. However, contrary to expectations, in this case the correlations between the Hebrew genitive constructs task and the apostrophe tasks were not higher than the correlations with the other English tasks.

Understanding of Hebrew possessive pronoun suffixes, like the Hebrew genitive constructs task, correlated significantly with English Word Analogy at $r=.38$ ($p<.001$), but not with English consistency in spelling morphemes. The correlations between this Hebrew possessive task and the three apostrophe tasks were unexpectedly lower than

Table 8.7. Correlations between Hebrew and English morpho-syntactic and morphological spelling measures

	1	2	3	4	5	6	7	8
1. H word analogy	1							
2. H genitive constructs	.68 p<.001 (98)	1						
3. H poss pronouns	.49 p<.001 (98)	.6 p<.001 (99)	1					
4. H row completion	.53 p<.001 (96)	.42 p<.001 (96)	.33 p=.001 (96)	1				
5. H spell roots consistency	.69 p<.001 (99)	.58 p<.001 (98)	.41 p<.001 (98)	.49 p<.001 (96)	1			
6. H spell poss suffixes	.63 p<.001 (97)	.52 p<.001 (96)	.38 p<.001 (96)	.4 p<.001 (94)	.67 p<.001 (112)	1		
7. E word analogy	.45 p<.001 (99)	.38 p<.001 (99)	.38 p<.001 (99)	.4 p<.001 (96)	.22 p=.03 (99)	.39 p<.001 (97)	1	
8. E spell consistency	.41 p<.001 (99)	.29 p=.003 (99)	.14 p=.16 (99)	.3 p=.003 (96)	.35 p<.001 (114)	.44 p<.001 (112)	.59 p<.001 (100)	1

Abbreviations: H=Hebrew; E=English; poss=possessive; apos=apostrophe; spell=spelling task.The no. of children is shown in parentheses.

the correlation with English Word Analogy.

Consistency in spelling Hebrew roots correlated positively and significantly with all the English tasks, but, as expected, correlated most strongly with English consistency in spelling stems (r=.35; p<.001). However, the English consistency task correlated more strongly with the Hebrew Word Analogy task (.41, p<.001) than with Hebrew consistency in spelling roots.

Hebrew Row Completion correlated significantly with all the English tasks (r was between .3 (p=.003) and .46 (p<.001).

Table 8.8. Correlations between performance on the English apostrophe tasks and on the Hebrew non-possessive morphological tasks

	Hebrew Word Analogy	Hebrew Row Completion	Hebrew roots spelling
Apos sentences (discrimination score)	.33 p=.001 (98)	.37 p<.001 (96)	.30 p=.003 (98)
Apos sentences (stage)	.36 p<.001 (98)	.29 p=.004 (96)	.34 p=.001 (98)
Apos comprehension (picture task)	.30 p=.002 (98)	.26 p=.012 (96)	.34 p=.001 (98)
Apos production (picture task)	.35 p<.001 (98)	.45 p<.001 (96)	.27 p=.007 (98)

Abbreviation: apos=apostrophe.The no. of children is shown in parentheses.

The apostrophe tasks correlated positively and significantly with all the Hebrew grammatical tasks which did not concern possession, lending further support to the

hypothesis that there is a general transfer of grammatical awareness. However, unexpectedly, it was not generally the case that these correlations were weaker than those between the apostrophe tasks and the Hebrew tasks which did concern possession.

8.2.5. Can the ability of L2 learners to transfer metalinguistic knowledge of grammar between languages aid metalinguistic development? Does this depend on the level of L2 grammatical awareness attained?

So far, we have seen evidence that English-speaking children learning Hebrew as a second language can transfer morpho-syntactic awareness between Hebrew and English. This finding raises the hypothesis that such transfer can benefit L1 metalinguistic development and give second language learners an L1 metalinguistic advantage over monolingual children of the same age. It is possible, however, that a threshold level of second language competence is necessary before an advantage will result, because children who have only a little knowledge of a second language will not have enough metalinguistic knowledge in that language to usefully apply to L1.

If the first of these two hypotheses is correct, children learning Hebrew are expected to score higher on the English Word Analogy task than monolingual children of the same age, even when differences in WISC-III Vocabulary (used as an indicator of verbal IQ) between the two groups are controlled. If the second hypothesis is correct, and if any advantage is genuinely due to transfer of morpho-syntactic awareness from Hebrew, then only those children who score highly on the Hebrew Word Analogy task will be significantly better than monolinguals at the English Word Analogy task, while children who perform less well on the Hebrew task will perform similarly to monolinguals.

The design of the part of the study testing these hypotheses is parallel to that of Study 1, but in the present study, the Hebrew learners can be assigned to the three levels of Hebrew on the basis of their performance on a Hebrew task (Hebrew Word Analogy)

which is directly related to the English task (English Word Analogy). In Study 1, children were assigned to the different Hebrew levels on the basis of their performance on a more general Hebrew grammatical awareness task (the Hebrew Oral Cloze task) which, as discussed in Chapter Six, may have been measuring other aspects of language knowledge than specifically grammatical awareness.

The group of Hebrew learners were compared for performance on the English Word Analogy task with a group of monolingual children who had taken part in the longitudinal study by Nunes, Bryant and Bindman. The two groups of children were matched for age. The general procedure for matching was similar to that carried out for Study 1, and is described on page 96.

All the monolingual children who had carried out the English Word Analogy task (identical to the version of the task carried out by the Hebrew learners) at session seven of the longitudinal study, and all the Hebrew learners whose ages fell within the same range as the ages of these monolingual children, were identified. The ages of the children thus selected ranged from seven years and nine months, to eleven years and six months. However, as well as having approximately the same age range it was important for a good match that the ages of the two groups of children should also have the same mean and variance. To achieve this, the three youngest children in the monolingual sample (aged seven years and nine months) were excluded, and a child of seven years and eight months from the sample of Hebrew learners was included.

This procedure resulted in a group of 290 monolingual children and a group of 93 Hebrew learners being selected for comparison. The mean age of the monolinguals was 9:8 (*SD* 10.6 months), and of the Hebrew learners was 9:9 (*SD* 12 months) ($t=1$; d.f. 381; $p=.32$). The variances were not significantly different ($F=1.5$; $p=.22$).

The scores of the Hebrew learners and the monolinguals on the English Word Analogy task were then compared. The mean score of the Hebrew learners was 3.4 (*SD* 1.9), while for the monolingual group it was 2.33 (*SD* 1.6). This difference was significant

(t=5.37; d.f.=381; p<.001). However, it is possible that this difference is due not to transfer of morpho-syntactic awareness on the part of the Hebrew learners, but rather due to differences between the two groups in verbal ability. Therefore an analysis of covariance was carried out, in which vocabulary was controlled. The independent variable was Group (monolinguals vs Hebrew learners), the dependent variable was English Word Analogy, and the covariate was WISC-III Vocabulary (scaled score).

This analysis produced a significant Group term ($F(1,377) = 9.05$; $p=.003$), showing that there was still a significant difference between the Hebrew learners and the monolinguals, even when WISC-III Vocabulary was controlled. The effect of the covariate WISC-III Vocabulary was significant ($F(1,377)= 33.28$; $p<.001$), which was due the higher vocabulary scores of the Hebrew learners.

To examine the prediction that the advantage for the Hebrew learners would only be apparent for those children who had a high level of Hebrew morpho-syntactic awareness, while the children with lower levels of Hebrew morpho-syntactic awareness would perform similarly to monolinguals, a series of further analyses was carried out. Each Hebrew learner was assigned to one of three groups of approximately equal size, according to their level of performance on the Hebrew Word Analogy task. The lowest scoring 33% of Hebrew learners was assigned to the first level ('low'), the middle 33% to the second level ('medium'), and the highest scoring 33% to the third level ('high'). The scores of each of these three groups of Hebrew learners on the English Word Analogy task were then compared with the scores of the monolingual group. Prior to each analysis, the suitability of the age match between the Hebrew learners and the monolingual group was checked by comparing the mean age and variance of the two groups.

First, differences between children with a 'low' level of Hebrew morpho-syntactic awareness and the monolingual group were examined. 31 Hebrew learners were classified as having a 'low' level of Hebrew, and these were compared with the group of 290 monolinguals described in the first analysis. There was no significant difference

between the mean ages of the two groups (t=.16; d.f.=319; p=.871), and no significant difference between the variances (F=.292; p=.59).

The Hebrew learners with a 'low' level of Hebrew morpho-syntactic awareness did not perform significantly differently from the monolinguals on the English Word Analogy task (t=.71; d.f.=319; p=.478). The mean scores are shown in Figure 8.2.

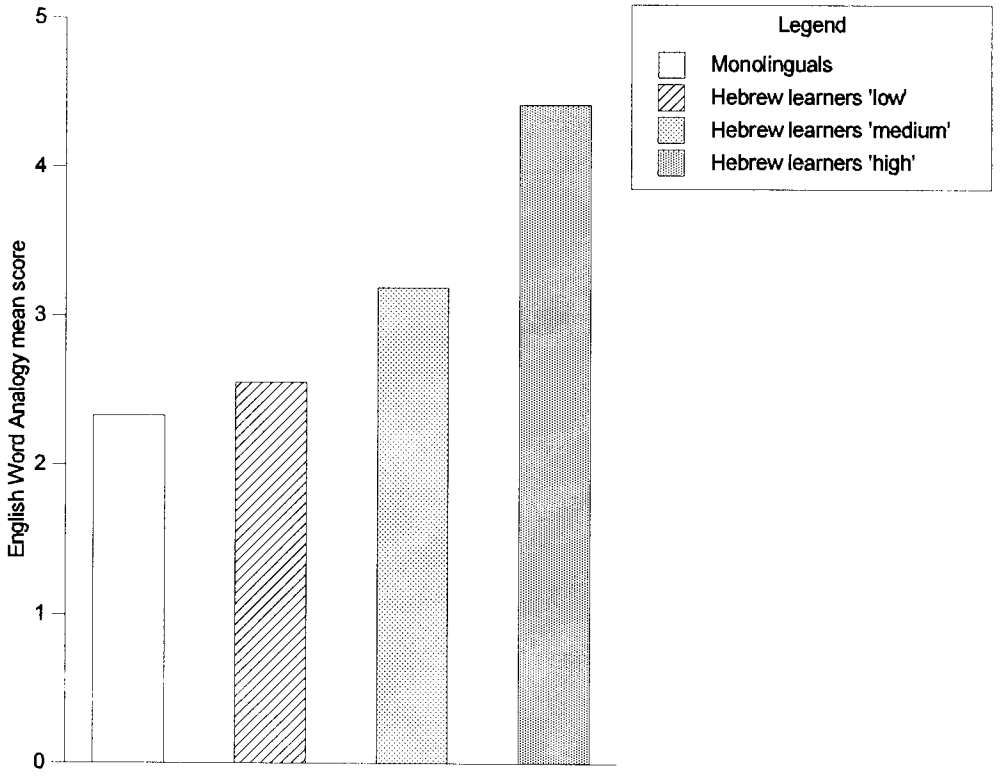


Figure 8.2. Mean scores of Hebrew learners and monolinguals on the English Word Analogy task

Next, differences between children with a 'medium' level of Hebrew morpho-syntactic awareness and the monolinguals were examined. There were 31 Hebrew learners in

this group. There was no significant age difference between the Hebrew learners and the monolingual group (t=.9; d.f.=319; p=.37), and the variances were also similar (F=.07; p=.8).

The Hebrew learners with a 'medium' level of Hebrew morpho-syntactic awareness performed significantly better than the monolingual group on the English Word Analogy task (t=2.88; d.f.=319; p=.004; see Figure 8.2.). An analysis of covariance was applied to see if this difference remained significant when differences in WISC-III Vocabulary were controlled. This revealed a significant effect of the covariate WISC-III Vocabulary ($F(1,315)=16.3$; $p<.001$), but the term for Group did not quite reach significance ($F(1,315)=3.45$; $p=.06$).

Finally, the differences between Hebrew learners with a 'high' level of Hebrew morpho-syntactic awareness and the monolinguals were examined. 30 Hebrew learners were assigned to this level. Although there was no difference in the mean ages of the Hebrew learners and monolingual group (t=1.02; d.f.=318; p=.31), the variances were significantly different (F=5.66; p=.018). To remedy this and ensure a good age match, the oldest four of the Hebrew learners were excluded. There was no difference in the mean ages of the remaining group of 26 Hebrew learners and the monolinguals (t=.34; d.f.=314; p=.731), and no difference in the variances (F=1.84; p=.18).

The Hebrew learners with a 'high' level of Hebrew were then compared with the monolinguals on the English Word Analogy task. The Hebrew learners scored significantly higher than the monolinguals (t=6.4; d.f.=314; $p<.001$; see Figure 8.2.). An analysis of covariance was carried out to see whether this difference would remain significant when WISC-III Vocabulary was controlled. The Group term was significant ($F(1,310)=18.98$; $p<.001$), showing that the advantage for the Hebrew learners with a 'high' level of Hebrew remained significant after WISC-III Vocabulary was controlled. The effect of the WISC-III Vocabulary covariate was also significant

($F(1,310)=19.24$; $p<.001$).

To summarise, Hebrew learners who had a relatively high level of Hebrew morpho-syntactic awareness were significantly better at the English Word Analogy task than monolingual children, even when differences in vocabulary were controlled, while Hebrew learners who had lower levels of Hebrew morpho-syntactic awareness performed similarly to monolinguals.

8.2.6. Can the ability of L2 learners to transfer metalinguistic knowledge of grammar across languages hasten the development of L1 morphological spelling? Does this depend on the level of L2 attained?

It was hypothesised that learning a second language would enhance children's morphological spelling in their first language, because of their ability to apply L2 knowledge of morphology in oral and written language to their L1 spelling. If this hypothesis is correct, then L2 learners should be better than monolingual children of the same age at L1 morphological spelling. However, it is again possible that a certain level of L2 knowledge is necessary before any benefits for L1 are seen, because children who only know a little about morphology and spelling in L2 will not have enough knowledge to usefully transfer to L1.

Therefore the following predictions were made:

(i) Children learning Hebrew will score higher on the English spelling consistency task than monolingual children of the same age, even when differences in English vocabulary are controlled. However, this advantage may only be apparent for those children with a relatively high level of Hebrew knowledge of spelling roots, while children who know relatively little may score similarly to monolinguals.

(ii) Children learning Hebrew will be better at using English apostrophes than

monolingual children of the same age, even when differences in English vocabulary are controlled. Again, however, this advantage may only occur for those children who score relatively highly on Hebrew tasks measuring knowledge of possession.

To test the first prediction, Hebrew learners were compared with a group of monolingual children who had taken part in the longitudinal study by Nunes, Bryant and Bindman, on performance on the English spelling consistency task. Since the Hebrew learners and monolinguals had carried out different versions of this task, only the scores on those items which had been given to both groups were used for the comparison. A total of six items were given to both groups. This comprised five pairs of word stems (*know-knowledge, magic-magician, strong-strength, special-specialness, naughty-naughtiness*) and one pair of suffixes (the *-ness* ending on *specialness* and *naughtiness*).

The two groups of children were matched for age by identifying all the monolingual children who had carried out the task in session five of the longitudinal study, and all the Hebrew learners whose ages fell into the same range as the monolingual children. The ages of the two groups ranged from seven years and nine months to ten years and eight months. 127 monolingual children and 82 Hebrew learners were identified in this way. The mean age of the monolingual children was nine years and two months (*SD* 10.1 months), and of the Hebrew learners was nine years and one month. This difference was not significant ($t=.48$; $d.f.=207$; $p=.63$), and the variances were also similar ($F=.43$; $p=.52$).

The children's scores on the English spelling consistency task were then compared. The mean score for the Hebrew learners was 3.87 (*SD* 1.7), while for the monolinguals it was 2.2 (*SD* 1.84). This difference was significant ($t=6.58$; $d.f.=207$; $p<.001$).

An analysis of covariance was then carried out to see if the advantage for the Hebrew learners remained significant when vocabulary level was controlled. The independent variable was Group (monolinguals vs Hebrew learners), the dependent variable was

consistency in spelling English morphemes, and the covariate was WISC-III Vocabulary scaled score.

This analysis showed a significant effect of vocabulary level ($F(1,204)=17.55$; $p<.001$), and produced a significant Group term ($F(1,204)=29.27$; $p<.001$), showing that Hebrew learners were still significantly better than monolinguals at the English task, even when differences in vocabulary were controlled.

To examine the prediction that the advantage for the Hebrew learners would only be apparent for those children who scored highly on the Hebrew roots spelling consistency task, the Hebrew learners were assigned to one of three groups according to their score on this Hebrew task. Approximately the lowest scoring 33% of children were assigned to the first level ('low'), the middle scoring 33% to the second level ('medium'), and the highest scoring 33% of children to the third level ('high'). The scores of each of these three groups of Hebrew learners were then compared with the scores of the monolingual group. Prior to each analysis, the suitability of the age match between the subsample of Hebrew learners and the monolingual group was checked.

First, differences between the group of 24 Hebrew learners with a 'low' level of Hebrew root spelling knowledge and the monolingual group ($n=127$) were examined. There was no significant difference between the mean ages of the two groups ($t=.24$; $d.f.=149$; $p=.81$), and no difference between the variances ($F=.85$; $p=.36$).

The Hebrew learners spelled significantly more English morphemes consistently than the monolingual children ($t=3.5$; $d.f.=149$; $p=.001$; see Figure 8.3 for mean scores).

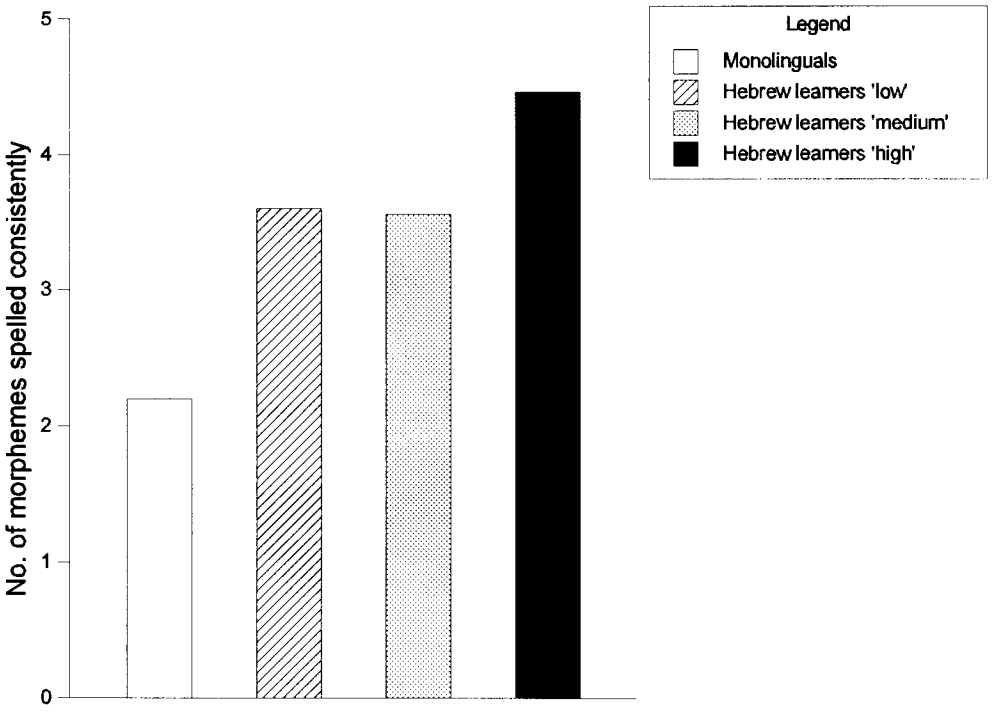


Figure 8.3. Mean number of English morphemes spelled consistently by Hebrew learners and monolinguals

An analysis of covariance was carried out to see if this difference remained significant when differences between the two groups in WISC-III Vocabulary were controlled.

This analysis produced a significant Group term ($F(1,146)=9.42$; $p=.003$), and a significant effect of the covariate WISC-III Vocabulary ($F(1,146)=13.71$; $p<.001$), showing that the difference between the Hebrew learners ('low' level of Hebrew) was significant, even when the effect of vocabulary was controlled.

Next, differences between Hebrew learners with a 'medium' level of Hebrew root spelling knowledge and the monolinguals were compared. There were 32 Hebrew learners in this group. There was no significant difference in the mean ages of the two groups ($t=.97$; $d.f.=157$; $p=.33$) and no significant difference between the variances

(F=1.39; p=.24).

The Hebrew learners spelled significantly more English morpheme pairs consistently than the monolinguals (t=3.81; d.f.=157; p<.001). An analysis of covariance showed a significant Group term (F(1, 154)=11.22; p=.001) and a significant effect of the covariate WISC-III Vocabulary (F(1,154)=11.9; p=.001), showing that the difference between Hebrew learners and monolinguals remained significant after group differences in vocabulary were controlled.

Finally, the difference between the Hebrew learners with a 'high' level of Hebrew root spelling knowledge and the monolinguals on the English task was examined. There were 26 Hebrew learners. There was no significant age difference between the two groups (t=.32; d.f.=151; p=.75) and no difference between the variances (F=.4; p=.53).

The Hebrew learners spelled significantly more English morpheme pairs consistently than did monolinguals (t=5.83; d.f.=151; p<.001). An analysis of covariance showed a significant main effect of Group (F(1,148)=20.65; p<.001) and a significant effect of the covariate WISC-III Vocabulary (F(1,148)=14.23; p<.001), showing that the difference between the Hebrew learners and the monolinguals was significant even when differences in vocabulary were controlled.

To summarise, Hebrew learners spelled significantly more English morpheme pairs consistently than did monolinguals, whether they had a low, medium or a high level of Hebrew knowledge of spelling roots. However, the advantage for the Hebrew learners was most marked between those children who had a high level of Hebrew root spelling knowledge and the monolingual children.

Next, the second prediction was analysed. This was that children learning Hebrew would understand the grammatical significance of the apostrophe better than the age-matched monolinguals.

The comparison of Hebrew learners and monolinguals was not carried out for the two picture tasks (apostrophe comprehension and apostrophe production). This was because the Hebrew learners and monolinguals had carried out slightly different versions of these two tasks and under different conditions, so equivalence could not be assumed.

Differences between the Hebrew learners and the monolinguals on the apostrophe sentence task were examined. The score used for the comparison was the 'discrimination' score, which was a measure of how many times the child spelled each word correctly in both its plural and its possessive forms. The 'stage' analysis described in previous analyses, in which children were classified as one of three types of speller (i.e. 1: used no apostrophes, 2: used them but grammatically inappropriately, or 3: used them appropriately) was not carried out for the monolinguals, because the instructions given to the monolingual children and the Hebrew learners had been slightly different. Monolinguals were told by the tester that the task concerned apostrophes, while the Hebrew learners were not. This meant that few monolinguals put no apostrophes at all, compared with a large number (n=37) of Hebrew learners. However, this difference in the instructions was unlikely to significantly affect the discrimination score, in which points were only given if the child spelled each word correctly in both its plural and possessive forms. If the child used apostrophes but did not discriminate between plurals and possessives, s/he would receive a low discrimination score, whichever instruction had been received.

Only the monolingual children from the four Oxford schools had carried out this task, and not the London children, reducing the number of children available for comparison. The monolingual children carried out the task in session eight of the longitudinal study by Nunes, Bryant and Bindman. Scores were available for 152 monolingual children.

All the Hebrew learners whose ages were in the same range as those of the monolingual children, and who had carried out the apostrophe task, were selected. The

number of children selected was 82.

The ages of the two groups of children ranged from seven years and eleven months to eleven years and two months. The mean age of the Hebrew learners was nine years and seven months (*SD* 9.6 months) and of the monolinguals was nine years and eight months (*SD* 10.5 months). The difference in the mean ages was not significant (t=.1.05; d.f. 232; p=.294) and the variances were also similar (F=.41; p=.523).

The scores of the Hebrew learners and the monolingual learners on the apostrophe discrimination measure were then compared. It should be noted at this point that the distribution of 'discrimination' scores on this task was not normal, and therefore, strictly speaking, parametric tests should not be used. Since no non-parametric statistical test was available that could test the differences between the groups while covarying for vocabulary, t-tests and analysis of covariance were used to explore the differences. However, caution must be used when interpreting the results of these comparisons.

The scores of the Hebrew learners and the monolingual children were not significantly different. These means were 1.85 (*SD* 2.6) and 1.66 (*SD* 1.8) respectively (t=.6; d.f.=124.84; p=.55).

To examine the prediction that the Hebrew learners who had a relatively high level of knowledge of possession in Hebrew would score higher on the apostrophe task than the monolinguals, while children with less knowledge of Hebrew possession would not, the Hebrew learners were assigned to one of three levels according to their scores on the Hebrew genitive constructs analogy task. Approximately the lowest scoring 33% of children on this task were assigned to the first level ('low'), the middle 33% to the second level ('medium'), and the top scoring 33% to the third level ('high').

The 'low' scorers on the Hebrew genitive constructs task (n=29) were then compared with the monolinguals. The mean ages of these Hebrew learners and of the

monolingual group were not significantly different (t=1.4; d.f.=179; p=.175) and neither were the variances (F=.49; p=.485).

Unexpectedly, the monolinguals scored higher than this group of Hebrew learners on the apostrophe task (t=2.61; d.f.=179; p=.01; see Fig. 8.4. for mean scores).

Next, the scores of the Hebrew learners who had a 'medium' level of knowledge of Hebrew genitive constructs (n=26) were compared with those of the monolingual group. The mean ages of the Hebrew learners and the monolingual group were not significantly different (t=.4; d.f.=176; p=.693) and neither were the variances (F=.05; p=.833).

This group of Hebrew learners did not score significantly differently from the monolinguals (see Figure 8.3.;t=1.45; d.f.=29.01; p=.159).

Finally, the scores of the Hebrew learners who had a 'high' level of knowledge of the Hebrew genitive construct were compared with the scores of the monolinguals. Although the mean age of this group of Hebrew learners (n=27) and of the monolingual group were similar, the variances were significantly different. To remedy this, the oldest Hebrew learner was excluded from the comparison. The mean ages of the adjusted Hebrew sample (n=26) and of the monolinguals were not significantly different (t=.02; d.f.=176; p=.986) and neither were the variances (F=3.14; p=.08).

The Hebrew learners in this group scored slightly higher than the monolinguals (see Figure 8.4.) but this difference was not significant (t=1.47; d.f.=28; p=.315).

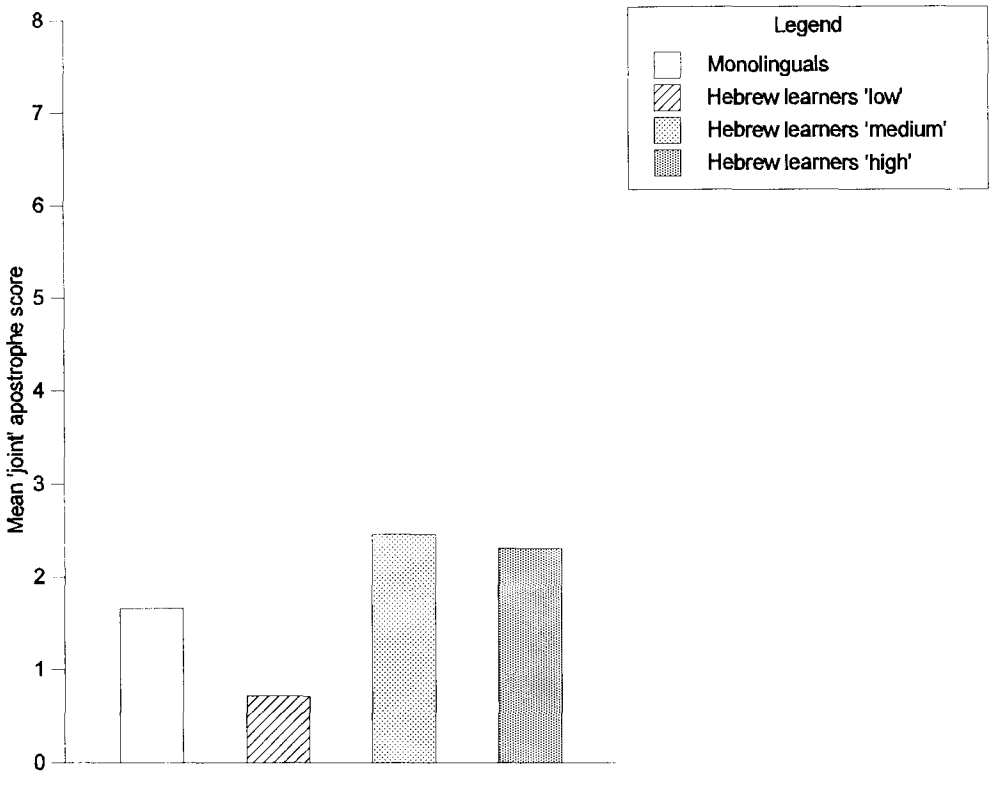


Figure 8.4. Mean scores of Hebrew learners and monolinguals on the apostrophe sentence task ('discrimination' score)

CHAPTER NINE

DISCUSSION OF STUDY 2

9.1. Summary of results

1. There was a relationship between English and Hebrew morpho-syntactic awareness, as measured by the English and Hebrew Word Analogy tasks. This remained significant even when age, vocabulary level and school were statistically controlled.

2. There was some evidence to support a three-stage model of acquisition of English apostrophe denoting possession, analogous to the five-stage model of acquisition of the 'ed' ending for past tense verbs proposed by Nunes et al. (in press a). In this model, children at first do not use apostrophe at all, then begin to use it but without understanding its grammatical significance, and finally, use it appropriately.

3. There were significant relationships between knowledge of the Hebrew genitive construct and three measures of knowledge of the English apostrophe denoting possession. Two of these three relationships remained significant even when age, vocabulary and school were controlled. There were also significant relationships between knowledge of Hebrew possessive pronoun suffixes and two out of the three apostrophe tasks. One of these relationships remained significant when age, vocabulary and school were controlled.

4. Spelling knowledge of Hebrew suffixes indicating possession was related to all three measures of English possessive apostrophe knowledge, even when age, vocabulary and school were controlled.

5. There was a significant relationship between the number of pairs of Hebrew root morphemes children spelled consistently, and the number of pairs of English morphemes they spelled consistently. This relationship remained significant even after

controlling for age, vocabulary and school differences.

6. There were significant cross-language relationships between measures of morpho-syntactic awareness other than those which were designed to measure similar grammatical concepts.

7. Children who scored highly on the Hebrew Word Analogy task showed a significant advantage over monolingual children on the English Word Analogy task, while children with lower Hebrew Word Analogy scores did not.

8. Hebrew learners spelled more pairs of English morphemes consistently than did monolingual children, irrespective of their level of spelling knowledge of Hebrew roots. However, the advantage over monolinguals was most marked for those children who had a high level of Hebrew root spelling knowledge.

In the next section, these results are discussed in more detail in relation to each of the hypotheses of Study 2.

9.2. Discussion of results

Hypothesis 1: The metalinguistic ability to analyse and manipulate morphological relations between spoken words will be transferable across languages, even if the specific ways in which words are derived and inflected are different in the two languages.

This hypothesis was supported by the data. The cross-language correlation between performance on the Word Analogy tasks was moderately strong and highly statistically significant, and remained significant after controlling for age, English vocabulary level and school. This result is consistent with the findings of da Fontoura and Siegel (1991), Geva and Siegel (1994) and Geva (1995), who found significant correlations

between performance on grammatical awareness (oral cloze) tasks in English and Portuguese, and English and Hebrew. The present finding extends these studies by showing that the cross-language relationship is not explained by age, verbal ability, or semantic awareness. The effects of age and verbal ability were not partialled out in these previous studies, and the oral cloze tasks used confounded semantic and grammatical demands. The use of the analogy method in the present study allows a more direct examination of the children's metalinguistic awareness of morphology and syntax. The correlation between performance on Hebrew and English Word Analogy tasks, despite the surface differences in the ways in which the words are derived and inflected in the two languages, suggests that metalinguistic awareness of word relations is common to the child's two languages.

This result also replicates and extends the findings of Study 1. In Study 1, significant relationships were found between a measure of morpho-syntactic awareness in oral Hebrew (the oral cloze task) and measures of morpho-syntactic awareness in oral English (Word Analogy, Sentence Analogy, Oral Cloze and Row Completion). However, the choice of tasks used in Study 1 did not allow for an examination of cross-language relationships between measures of awareness of grammatical concepts which are similar in the two languages. Study 1 showed that morpho-syntactic awareness in a general sense is linked across languages. The moderately strong relationship observed in the present study between Hebrew and English ability to analyse and manipulate word relations suggests that one way in which grammatical awareness in one language may become linked to grammatical awareness in the other is by cross-language transfer of grammatical concepts which can be applied in both languages.

In Chapter Six, some problems with using oral cloze tasks as measures of morpho-syntactic awareness in L2 learners were discussed. The criticism made by Gombert (1992) and Bowey (1994) that this type of task makes semantic as well as morpho-syntactic demands is particularly relevant to its validity as a measure of L2 grammatical awareness. For children who are less than fluent in their oral L2, full comprehension of

the sentences and/or the presence of an appropriate 'missing word' in the child's lexicon can not always be assumed. This means that failure on an item may not be an accurate reflection of the child's grammatical knowledge in L2 but rather of their limited vocabulary. For children learning a second language principally as a written religious one, this limitation is especially true. The use of the word analogy technique in the present study addressed this methodological problem, allowing children with limited experience with the oral L2 to demonstrate their knowledge of L2 morpho-syntactic relationships. The relationships between Hebrew and English Word Analogy scores were not significantly different in the two Jewish schools (the effect of the interaction between school and Hebrew score on English score was not significant), showing that on these tasks, the children were able to use their awareness of word relations in both languages, irrespective of the kind of Hebrew learning they had experienced. It is suggested that word analogy tasks are a useful method of tapping children's morpho-syntactic awareness in a second language in which they may have limited oral proficiency.

Hypothesis 2: Knowledge of possessive marking in L2 will be related to use of the possessive morpheme in L1 spelling, because awareness of possessives will be transferable across languages, and will influence spelling.

The evidence for this hypothesis was mixed. While performance on the Hebrew genitive constructs analogy task was positively correlated with all three measures of apostrophe knowledge, the relationship with the apostrophe production (pictures task) did not remain significant once age, English vocabulary level and school were controlled. The task measuring comprehension of Hebrew possessive pronoun suffixes correlated with the two apostrophe picture tasks (comprehension and production) but not the apostrophe sentences 'discrimination' score. However, when the children were divided into three groups according to their stage of understanding of apostrophe as measured by the sentence task, group membership was predicted by the Hebrew suffix task even when age, vocabulary and school were controlled, while performance on the

two picture tasks was not.

The mixed nature of the results may result in part from the distributions of scores on the tasks used to measure knowledge of the English apostrophe. Scores on these tasks showed that the children in this sample had considerable difficulty with apostrophes. Bryant et al. (in press a) and Bryant et al. (1997) similarly found that the children in their studies showed a great deal of confusion about the appropriate use of apostrophe. In the present study, a large number of children did not use apostrophes at all on the two production tasks, and scored at chance level on the comprehension task, and of those who did use apostrophes on the production tasks, the majority did so without fully understanding their grammatical significance, putting them on non-possessive plural words as well as on possessive words. Only 14% of the children used apostrophe consistently correctly in the apostrophe sentence task, and 20% did so on the picture task. The skewed nature of the distributions of scores on the apostrophe production tasks is likely to have affected the strength of the correlations observed with the Hebrew possessive tasks. In addition, although a median-split was used for the apostrophe picture production task to divide children into two groups (those who had little or no understanding of apostrophe, and those who had partial or complete understanding), this provided only a very rough measure of apostrophe knowledge. The method of assigning children to one of two groups was used so that a statistical analysis could be carried out which could examine the cross-language relationship while controlling for extraneous variables (logistic regression), but it meant that children were included in both groups who really did not understand the function of the apostrophe and used it quite haphazardly.

Nevertheless, there were significant relationships between knowledge of the Hebrew possessive and English apostrophe knowledge in three out of six analyses, even with the stringent controls for age, vocabulary and school, and despite the difficulty of the apostrophe tasks for this age group. This provides some evidence that awareness of the possessive is common to the child's two languages and can influence spelling across languages.

Hypothesis 3.1. Children who know in one language that words with the same semantic root must share spelling of the root morpheme will be able to use that knowledge for spelling semantically related morphemes consistently in another language.

This hypothesis was supported by the data. There was a highly significant correlation between the number of Hebrew root morphemes and the number of English morphemes the children spelled consistently, and this relationship remained significant even when age, vocabulary and school effects were partialled out. Of the English morphemes, 13 out of 14 were root morphemes. The way that roots are represented in English and Hebrew is quite different. In English, the root letters which remain constant in all the words sharing this root are represented continuously, with no other letters interrupting the integrity of this root (e.g. *cycle, bicycle*). In Hebrew, on the other hand, the root letters (usually three letters), while always represented in the same order, are often interrupted by other letters in between (e.g. מכתב, כיתב). Another difference, of course, is that the two languages use different scripts and are written in opposite directions. Nevertheless, the principle of constancy of spelling applies in both orthographies. The relationship between the children's knowledge that the spellings of English morphemes and the spellings of Hebrew morphemes remain constant across different but related words is evidence that despite the surface differences in the ways in which English and Hebrew roots are represented in writing, knowledge of the principle of spelling constancy is common to the child's two languages.

This finding is in line with the previous result (Study 1) that children's understanding of the principle of the three-consonant Hebrew root was related to how consistent they were in spelling pairs of English stems in real and pseudowords. In the present study, this finding is extended to the children's productive knowledge of the root in their writing in both orthographies.

Hypothesis 3.2. Children's spelling knowledge of morphemes indicating possession in one language will be related to their spelling knowledge of morphemes indicating possession in their other language.

This hypothesis was supported by the data. There were significant positive correlations between the child's accuracy in spelling Hebrew suffixes indicating possession and all three measures of knowledge of the English apostrophe denoting possession. All of these three relationships remained significant when age, English vocabulary and school were controlled.

It is interesting that accuracy in spelling Hebrew possessive suffixes predicted all three apostrophe tasks, while the other two measures of knowledge of the Hebrew possessive (the genitive constructs analogy task and the comprehension of Hebrew possessive suffixes task) did not always significantly predict apostrophe knowledge once age, vocabulary and school were controlled. A possible explanation for this is that the link between spelling Hebrew possessive suffixes and understanding and appropriately using English apostrophes is more transparent than the link between the Hebrew genitive construct in oral language, or Hebrew possessive pronouns, with English apostrophe. In order to spell the Hebrew possessive suffixes given in the spelling task, the child has to choose between two or more alternative ways of representing the sound of the suffix, but the correct spelling is determined by its status as a possessive. Thus in order to spell these suffixes consistently correctly rather than haphazardly guessing which letters to use, the child must realise that the suffix in question represents possession, and know which letter or letters are used to represent this possession. Similarly in English, the /s/ or /z/ sound at the end of a word could be represented by -s or -'s (or -s'), and to choose the correct one the child must recognise whether or not possession is being indicated, and know which one represents the possessive. The connection between the Hebrew genitive construct in oral language (genitive constructs analogy task), or the possessive pronoun which also represents person (comprehension of Hebrew possessive pronoun suffixes task), and the apostrophe may be less transparent and therefore this connection may be harder for the

child to make.

Hypothesis 4. Children can transfer a general morpho-syntactic awareness across their languages, but where grammatical concepts are closely related in the child's two languages, it will be easier to transfer knowledge of these across languages.

The hypothesis that there is a general interdependence of morpho-syntactic awareness in the two languages was supported by the data. The significant and positive cross-language correlations between all but one combination of the morpho-syntactic tasks lend support to the hypothesis that a general awareness of grammar is common to the two languages, and that children do not only transfer their knowledge of those concepts which have very similar applications in both languages. This replicates a similar finding in Study 1.

However, the evidence for the hypothesis that transfer will be easier when a concept has a directly similar application in both languages was more mixed. Although the relationship between the Word Analogy tasks in Hebrew and English was stronger than the cross-language relationships between these tasks and the other morpho-syntactic tasks, the same was not true for the possessive tasks or the spelling consistency tasks. These tasks were more strongly or similarly correlated across languages with tasks which were not measuring very similar grammatical concepts. Thus the hypothesis put forward in the discussion of Study 1 (Chapter Six) that the relationships between knowledge of specific aspects of morphology which are similar in the two languages would be stronger than between less closely related aspects of morphology was not consistently supported.

Hypothesis 5. Learning a second language can hasten children's morpho-syntactic awareness in their first language. However, this may only be true for children who have attained a relatively high level of L2 competence.

This hypothesis was supported by the data. As a group, Hebrew learners were significantly better than monolinguals at the English Word Analogy task. More detailed analyses showed that the advantage over monolinguals was in fact only present for those children who had a relatively high level of morpho-syntactic awareness in Hebrew, as measured by the Hebrew Word Analogy task. These results suggest that learning a second language can benefit morpho-syntactic awareness, but a certain level of second language competence must be attained before such a benefit occurs.

The findings of Study 1 were replicated and extended. In Study 1, too, Hebrew learners as a group were significantly better than monolinguals at the English Word Analogy task, and more detailed analyses showed that the advantage actually only occurred for those children who had a medium or high level of Hebrew, as measured by the Hebrew Oral Cloze task. However, the versions of the English Word Analogy task carried out by Hebrew learners and monolinguals in Study 1were different in two items, so that scores could only be compared on six items. In the present study, the Word Analogy tasks given to both groups consisted of exactly the same eight items, so the total scores could provide a more sensitive measure of morpho-syntactic awareness. In addition, in Study 1, the Hebrew learners could only be assigned to the three levels of Hebrew according to their performance on a general grammatical task (the Hebrew Oral Cloze) which was also measuring their Hebrew vocabulary and semantic awareness. In the present study, they were assigned to the three levels of Hebrew according to their morpho-syntactic awareness as measured by a task parallel to the English task. This provides more convincing evidence that the advantage for the Hebrew learners is a result of transfer of morpho-syntactic awareness across Hebrew and English.

The results are consistent with previous findings of an advantage for bilingual children

on tasks measuring various aspects of metalinguistic awareness. For example, studies by Rubin and Turner (1989) and Rubin et al. (1991) showed that children learning a second language at school were better than monolingual children of the same age at syllable and phoneme deletion tasks. Bialystok (1987) and Galambos and Goldin-Meadow (1990) found that bilingual children were better than monolinguals at judging the grammatical acceptability of sentences. However, until now there have been no studies which have investigated whether children with knowledge of more than one language have an advantage over their monolingual peers on tasks requiring metalinguistic awareness of morphology. The present study thus furthers our understanding of the effects of second language learning on metalinguistic development, showing that knowing more than one language can accelerate development of an aspect of metalinguistic awareness which has recently been shown to influence children's progress in reading and spelling.

The present finding also lends support to the threshold hypothesis (Cummins 1979), which states that the bilingual child must attain a threshold level of linguistic competence in order to allow the potentially beneficial aspects of bilingualism to influence cognitive and academic functioning. Children who had a high level of L2 morpho-syntactic knowledge showed an L1 advantage over their monolingual peers, while children with low levels of L2 did not.

Hypothesis 6. Learning a second language can hasten the development of children's morphological spelling in their first language. However, this may only be true for children who have attained a relatively high level of L2 competence.

The prediction that the Hebrew learners would spell more English morphemes consistently than would monolingual children of the same age and English vocabulary level was supported by the data, but the prediction that only the Hebrew learners who spelled a relatively large number of Hebrew morphemes consistently would show such an advantage was not. Children at all levels of Hebrew spelling knowledge, as

measured by the number of root pairs they spelled consistently, spelled more English morphemes consistently than did monolinguals. Thus it appears that even a minimal level of knowledge of Hebrew roots in spelling helped the Hebrew learners to understand the connection between pairs of English morphemes and to spell them consistently. It is possible that the differences between the Hebrew learners and the monolinguals are due to school differences in the teaching of spelling rather than due to transfer of morphological knowledge from Hebrew. However, it was argued in Chapter Six that if this were the case then the advantage for the Hebrew learners should not depend on their level of Hebrew knowledge. The data showed that although the Hebrew learners spelled significantly more English morpheme pairs consistently irrespective of their level of Hebrew root spelling knowledge, the advantage was greatest for those Hebrew learners with a high level of spelling knowledge of Hebrew roots.

The pattern of results seen here is very similar to that observed for the comparison of Hebrew learners and monolinguals on the English spelling consistency task in Study 1. The English task used in Study 1 was slightly different, in that it had less items, and half the morpheme pairs included a 'dinosaur' pseudoword. The Hebrew learners were assigned to a level of Hebrew knowledge according to their performance on the Hebrew Oral Cloze task. Despite these differences, the results of the comparisons were identical to those of Study 2. Hebrew learners spelled more morpheme pairs consistently than did monolinguals, irrespective of their level of Hebrew, but the advantage was greatest for those Hebrew learners with a high level of Hebrew. Thus in Study 2, the findings of Study 1 were replicated for this aspect of morphological spelling, lending support to the hypothesis that learning a second language can improve the use of morphological knowledge in spelling.

Rubin and Turner (1989) showed that first-grade children in French immersion programmes in Canada performed similarly to monolingual children on tasks measuring their ability to read and spell orthographically regular (in terms of grapheme-phoneme correspondence) real words and non-words in English, despite having had no

instruction in English reading, and Rubin et al (1990) found that Hebrew learners who had had instruction in both English and Hebrew reading and writing were better at reading orthographically regular real and non-words than monolingual English-schooled children. They claimed that the advantages for second language learners showed that children learning to read and spell in a second language were able to transfer their knowledge of the letter-sound principle from one alphabetic orthography to another. The present study shows that second language literacy can benefit a later stage of children's literacy development than the alphabetic stage: the stage at which children learn about orthographic representation of morphology. Together with the cross-language correlations observed for morphological spelling knowledge and discussed in earlier sections, these results provide evidence that morphological spelling knowledge can be transferred between orthographies.

Evidence for a three-stage model of English apostrophe acquisition

One finding which has not yet been discussed does not concern cross-language relationships. This is the observation that on the English apostrophe sentence task, there were three distinct types of speller. One large group of children (n=37) did not use apostrophe at all, another large group (n=48) used it but without understanding its grammatical significance, and a third, smaller group (n=14) understood its grammatical significance and correctly and consistently used it only for possessive words, and not for plurals. The previous two studies looking at the development of apostrophe knowledge were not able to observe these three types of apostrophe speller, because in these studies, the children were asked beforehand if they had heard of the apostrophe and were explicitly told that this was what the task was about. Therefore, children to whom it might otherwise not have occurred to use any apostrophes used them, because the tester had given them a clue as to what they were expected to do. In the present study, the children were not given this information before carrying out the task.

There was some preliminary evidence that the three groups of apostrophe speller

represent ordered stages of acquisition of the apostrophe denoting possession. Membership of the three groups was related in an ordered fashion to age, vocabulary and grammatical awareness (English Word Analogy), and both English and Hebrew grammatical awareness (English Word Analogy, and Hebrew possessive tasks) predicted group membership even when age, vocabulary and school were controlled. Thus there is evidence that the three groups represent not only increasing levels of knowledge of the apostrophe in particular, but also increasing levels of grammatical awareness in oral language.

Such stages of development have been observed for another aspect of morphological spelling: the 'ed' ending on regular past tense verbs (Nunes et al., in press a; Bryant et al, in press b). As discussed in detail in Chapter One, we showed that the spelling stages were predicted in ordered fashion by the children's morpho-syntactic awareness in oral language, tested simultaneously and in an earlier session, even when age and vocabulary were partialled out. The model proposed to chart and explain the development of spelling knowledge of the 'ed' ending has five stages, the first of which is the pre-phonetic stage, in which children do not reliably represent the final sound of verbs and non-verbs. An analogous stage was not observed in the present study for the acquisition of apostrophe, because all the children reliably represented the end sounds of the words they were given to spell with the letter 's'. The fourth stage of the 'ed' model is the generalisation stage, in which the children distinguish between verbs and non-verbs, but still generalise some 'ed' endings to irregular verbs. An analogous stage might perhaps be observed for the apostrophe in which children reliably use the apostrophe to distinguish possessives from non-possessives, but have not yet mastered the distinction between the -'s for singular possessives and the -s' for plural possessives. In the present study, most of the possessives given were singular, and both -'s and -s' were counted as correct, so this possibility could not be analysed.

This leaves us with three stages of 'ed' development in which 1) word endings are represented phonologically acceptably, but the 'ed' morpheme is not used at all; 2) the 'ed' is used but without understanding of its grammatical role (indicated by

overgeneralisations to non-verbs); and 3) the 'ed' is used correctly. The three types of apostrophe spelling behaviour observed in the present study may represent stages of developing awareness of the grammatical role of the apostrophe, analogous to these three stages of 'ed' spelling development, which can be said to form the core of our five stage model. This is interesting because it suggests that the stage model can explain not only children's progress in spelling of one specific instance of morphology (the 'ed'), but is applicable to another instance of a spelling pattern which reflects morphology. It is possible that the model could chart the development of children's morphological spelling in a more general way and not just the specific instances of the 'ed' for regular past tense verbs and the apostrophe denoting possession. However, this possibility would need to be investigated for further aspects of morphological representation in spelling, and in languages other than English. The appropriateness of the stage model for describing the development of spelling of apostrophe denoting possession would also need to be confirmed by further research. The present study provides only cross-sectional data, assigning children to one of three groups on the basis of their spelling on one occasion. Longitudinal data would be needed to find out whether individual children progress through these stages over time, and how this progress is related to their developing grammatical awareness in oral language.

9.3. Conclusions and limitations

Study 2 has shown that children with knowledge of two languages can transfer their metalinguistic awareness of grammar between their languages, and that learning a second language can benefit first language awareness of grammar. It has also shown that children learning to read and write in a second language can use their morphological spelling knowledge for spelling in both languages, and that this can benefit the development of morphological spelling knowledge in the first language.

Study 1 also showed a link between children's metalinguistic awareness of grammar in their first and second languages, and some L1 benefits of learning an L2. However,

there were limitations to some of the tasks used to measure this grammatical awareness. Oral cloze tasks made demands not only on morpho-syntactic awareness but also on vocabulary and semantic awareness. This limitation was especially true for children doing such a task in their second language, in which their vocabulary and experience with spoken language was limited. In Study 2, the word analogy method was used in an attempt to measure morpho-syntactic awareness in first and second languages without making heavy demands on vocabulary and semantic awareness. The word analogy method was found to be useful as both a first and a second language measure, and the ability to solve word analogy tasks was related across languages. The Study 1 finding of a relationship between morpho-syntactic awareness in first and second languages was confirmed in Study 2 by the relationship between performance on the English and Hebrew Word Analogy tasks. However, although useful, the Hebrew Word Analogy task was nevertheless difficult for children from School 2, despite the effort to use simple vocabulary in the designing of the task. This could reflect their limited morpho-syntactic knowledge and/or their lack of experience in producing oral Hebrew.

Study 2 also extended Study 1 by exploring the children's Hebrew knowledge in more depth, and by including two measures of Hebrew spelling knowledge which were thought to have parallel applications in English spelling. In general, Hebrew knowledge of genitive constructs and of possessive pronouns in oral language was related to English knowledge of the apostrophe denoting possession, though not all the relationships examined remained significant once age, vocabulary and school were controlled. Productive knowledge of possessive suffixes in Hebrew spelling, however, was related to English knowledge of the apostrophe despite these statistical controls. Spelling knowledge of Hebrew root morphemes was related to spelling knowledge of English morphemes. Thus Study 2 showed that children learning to read and write in a second language can use morphological spelling knowledge in the orthographies of both their languages, even where these use different alphabets, are written in opposite directions, and have different, language-specific morphological rules.

In Chapter Ten, the conclusions, limitations, and theoretical and educational implications of the research reported in this thesis will be discussed, and suggestions for further research will be made.

CHAPTER TEN

CONCLUSIONS

10.1. Conclusions

At the outset of this study, it was proposed that children who have knowledge of more than one language can use their knowledge of underlying linguistic concepts for both languages, even where these languages are dissimilar. It was assumed that the possibility of cross-language transfer of knowledge depends on the way in which linguistic knowledge is represented. Three hypotheses were raised. First, linguistic knowledge is represented in terms of the specific structures and distinctions of the first language we learn. This hypothesis predicts that users of languages which do not make particular discriminations will have difficulty making these discriminations when they use other languages. For example, Japanese speakers have difficulty distinguishing between the sounds /l/ and /r/ in a second language. This is not a contrast in the Japanese language and the ability to discriminate between the two sounds is lost in infancy (Elman et al., 1997). Under this hypothesis, linguistic knowledge in one language can only be used for another language where the specific aspects of language in question are very similar in both languages. Where they are not, learning in one language does not facilitate learning in the other.

The second hypothesis was that more abstract aspects of linguistic knowledge are represented, which are common to other languages. Under this hypothesis, the fact that an aspect of language is formed in different ways in dissimilar languages does not mean that transfer of knowledge cannot occur, because transfer is assumed to occur at a deeper level. This hypothesis predicts, for example, that learning to read in one alphabetic script (e.g. English) will facilitate learning to read in another (e.g. Hebrew), because the underlying principle that letters represent units of sound and grammar is the same in both.

The third hypothesis was that both of the above hypotheses are correct, but for different levels of language. At a surface level, the detailed 'facts' of a particular language or script are not transferable across languages wherever the two languages are dissimilar, and must therefore be learned separately for each language. However, at a deeper level, metalinguistic knowledge of linguistic or orthographic principles can be used across languages.

The results of the two studies described in the thesis supported this third hypothesis. On the one hand, there was no evidence that vocabulary knowledge in one language could be used for the other language. This can be explained by the dissimilarity between English and Hebrew words. Knowledge of English words is of no use for learning Hebrew words, and vice-versa.

On the other hand, metalinguistic knowledge of grammar was transferable across languages. In spoken language, metalinguistic knowledge of morphological and syntactic relationships could be used in both languages, even though at a surface level, English and Hebrew have very different grammatical structures and make different distinctions. Similarly, knowledge of morphology in written language was related across languages, even though English and Hebrew are written with different alphabets, are read in opposite directions, use different systems for representing consonants and vowels, and mark morphology in different, language-specific ways. In addition, metalinguistic grammatical knowledge in one oral language was linked to morphological spelling in the other.

Evidence of transfer came from two sources. First, within-subjects analyses showed that knowledge of a variety of aspects of grammar was related across languages. These cross-language relationships were not due solely to other factors such as the age of the children or their general language ability. Second, between-subjects comparisons showed that second language learners who had attained a high level of the second language had higher levels of first language oral grammatical awareness than monolingual children of the same age and general language ability. This suggests

transfer of second language knowledge to the first language, at least once a certain level of second language knowledge has been achieved. Second language learners were also better at first language morphological spelling than monolinguals.

How is it possible that children can transfer linguistic knowledge from one language to another, and from one script to another, when the two languages are unrelated, have different grammatical structures, make different distinctions, and are written with different alphabets? Despite these differences, many of the deeper level grammatical concepts conveyed by the two languages are similar. For example, the ways in which words from different parts of speech are distinguished from each other are different in Hebrew and English, but the principle that words can be classified according to their syntactic function (for example nouns, verbs, adjectives) is the same. Once the child has explicit knowledge of this concept in one language, there is no need to learn it again for the other language. Such awareness can be used for spelling (and progress in reading and spelling may help raise the child's awareness of this concept). For example, mastery of the 'ed' ending on English past tense regular verbs depends on the child being able to distinguish between verbs and non-verbs. The endings of these often sound the same (for example, the endings of 'field' and 'filled', or 'soft' and 'kissed'). Knowledge of the syntactic functions of the words must be used because phonological knowledge alone is not enough.

To take another example investigated in the study, the possessive case is marked in quite different ways in Hebrew and English. In Hebrew it is marked in oral and written language by means of a special genitive construct or suffix; in English it is marked in written language by apostrophes. Nevertheless the idea of possession is common to both languages. Once the child has become aware that certain constructions or spelling patterns are used to indicate 'belonging' as opposed to some other grammatical idea (such as simple plurality), the principle that there is a special marking to indicate this 'belonging' does not have to be relearned for each language.

The findings of the study provide evidence that linguistic knowledge is not represented

only in terms of the specific surface-level 'facts' of the native language. There must also be representation of more abstract aspects of linguistic knowledge, which are not specific to the child's first language. As discussed in Chapter Two, Elman et al. (1997) have recently claimed that the early capacity to discriminate between all the sounds relevant to all human languages is progressively lost in infancy, and that only those sounds relevant to the infant's native tongue are retained. Thus, for example, Japanese infants lose sensitivity to the /l/-/r/ distinction, because this contrast is not present in the Japanese language. This theory implies that when a second language is learned, first language knowledge will not be transferable to the second where distinctions made in the two languages are different. The findings of the present study do not support this as a more general model of language acquisition. Knowledge of morphology and morpho-syntax does not seem to become as highly specialised as this to the particular native tongue of the child. Such a degree of specialisation would not allow for transfer of morphological and morpho-syntactic knowledge across languages which have different surface structures and make different distinctions. Under the hypothesis proposed by Elman et al., bilingual children would be disadvantaged, because the inability to use knowledge for both languages would mean that acquiring two languages would impose a far greater language-learning burden than acquiring one language. The evidence from the present study suggests that while there are some aspects of language for which knowledge of one language is of no use for learning the other (for example, knowledge of vocabulary in dissimilar languages) and must be learned separately for each, there are other aspects of language knowledge which can be used for both despite different language-specific surface structures and distinctions. Becoming bilingual did not disadvantage the children for the aspects of language studied. On the contrary, it conferred some benefits.

Previous research has shown that within languages, monolingual children transfer their metalinguistic knowledge of grammar across oral and written forms of language (e.g. Nunes et al., in press a). Another situation in which transfer of metalinguistic knowledge occurs has been demonstrated: that of transfer across languages. Studies of bilingual and biliterate children have shown that metalinguistic knowledge of

phonology and the alphabetic principle are transferable across languages and scripts (e.g. Durgonoglu et al., 1993; Wagner et al., 1989). The present study has drawn on both these sources and extended our understanding of the link between metalinguistic knowledge of grammar and morphological spelling to the bilingual situation. It has been shown that children becoming bilingual and biliterate can transfer their metalinguistic knowledge of grammar between oral forms of their two languages (Figure 10.1.), between written forms (Figure 10.2.), and between the oral form of one language and the written form of the other (Figure 10.3.). It has also been shown that knowledge of two languages benefits specific aspects of grammatical awareness and morphological spelling development, once an adequate level of second language proficiency has been attained.

10.2. Limitations and suggestions for further research

One limitation of the study is that bilingualism and biliteracy were confounded. The children were learning both oral and written forms of their two languages. Therefore it is not possible to tell to what extent the findings are due to bilingualism and to what extent they are due to biliteracy.

Learning an oral language and learning to read and write differ in the demands they make on implicit and explicit levels of knowledge. One can learn to speak a language without having explicit or conscious knowledge of the way in which this language works as a system. Reading and writing, on the other hand, do necessitate conscious reflection on the language as a system, and make explicit aspects of linguistic knowledge which were previously known only at an implicit level. I have claimed that it is this explicit level of linguistic knowledge (i.e. metalinguistic knowledge) which transfers across languages, because this type of knowledge is not specific to particular languages. Further research is needed to determine whether children who are bilingual in the oral forms of their languages but who are not biliterate transfer grammatical knowledge between their languages. It may be that learning the oral forms only would

Figure 10.1. Grammatical awareness transfers across oral languages

Figure 10.2. Morphological spelling knowledge transfers across languages

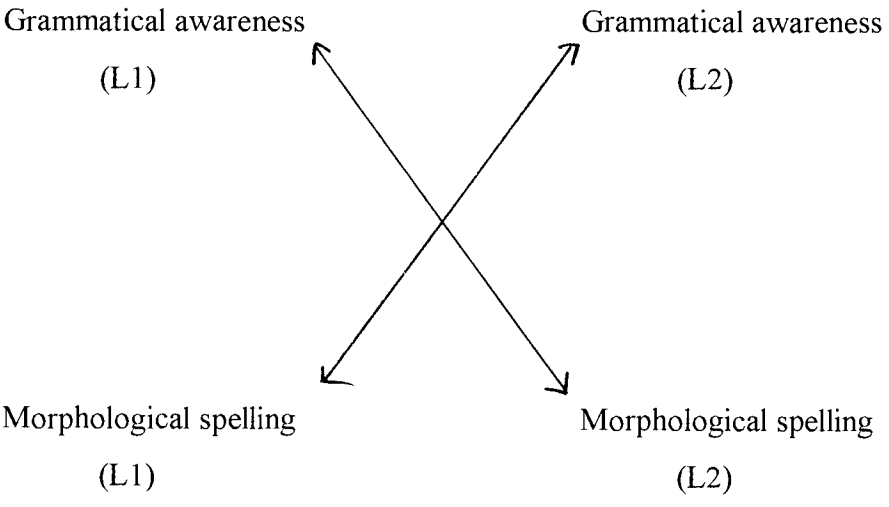


Figure 10.3. Grammatical awareness in one oral language transfers to morphological spelling in the other

not bring implicit linguistic knowledge to the explicit level which may be necessary for transfer to occur.

In this study, only two languages were studied. It is now necessary to study transfer of grammatical knowledge across other languages and scripts, in order to assess the generalisability of the present findings. In particular, it would be interesting to examine transfer of morphological and morpho-syntactic awareness in children learning languages which are especially rich in morphology, and in orthographies in which morphological information is represented to a large degree, such as Arabic and French.

Even in the English and Hebrew case, there is room for further research. For example, the children in this study were learning Hebrew as a second, principally religious, language which is usually printed with diacritic vowel markings. Vowelised Hebrew is phonologically 'shallow', in that letters and diacritics correspond in a highly predictable fashion to sounds, though this is not as true for spelling as it is for reading (because some sounds can be represented by more than one letter). When reading and writing unvowelised Hebrew (i.e.without diacritic marks), however, grammatical awareness plays a greater role. This is because without diacritics, less phonological information is provided, so that one must depend to a greater degree on morphological, syntactic and semantic context to obtain meaning and pronunciation (reading) or to decide which letters to use (spelling). In the present study, morphological spelling was investigated but use of morphological and syntactic context in reading without vowels was not. It would be interesting to study cross-language transfer of morphological knowledge in situations in which bilingual children have experience of reading unvowelised Hebrew, such as Israeli children learning English. Learning to read unvowelised Hebrew would be expected to raise morphological and syntactic awareness, and therefore have a greater impact on English morpho-syntactic and spelling development.

The second language learners in the present study were mostly from middle-class backgrounds and were being brought up in a traditional community which strongly emphasises the importance of written text as the source of religious and cultural

knowledge. In addition, the children's home language was the majority language of the dominant culture. Both the children's first and second languages were highly valued by their schools, families and community. Further research is needed to find out whether benefits of learning a second language are also seen for children from different social, economic and cultural backgrounds and in different language-learning contexts. Skutnabb-Kangas and Toukomaa (1976) found that the relative status of first and second languages was a determining factor in the positive or negative effects of bilingualism. It is therefore important to extend the study of cross-language transfer of grammatical awareness and literacy knowledge to contexts in which children speak a minority language at home and learn the language of the dominant culture at school.

10.3. Educational implications

This study has drawn attention to the fact that even when two languages appear very different, and are written with different scripts, children can use linguistic knowledge for both these languages and writing systems. This implies that children in bilingual education programmes (for example, Jewish children learning Hebrew, Canadian children learning French, English-speaking children learning Welsh) could benefit from an approach which emphasises the commonalities between their languages and orthographies. Teachers could capitalise on the children's knowledge in one language to help them learn related concepts in their other language. Bilingual curricula could be designed so that instruction in aspects of language and literacy which are conceptually related in the two languages would coincide. For example, if children are being taught about the Hebrew three-consonant root, then their learning of this principle and their English spelling may both benefit from teaching which draws their attention to the ways in which English words form roots. Teaching could make explicit the principle that words which are derived from the same root share a part of their spelling and that this applies to both languages.

The finding that learning a second language generally only benefited metalinguistic

awareness and spelling in the case of children who had a high level of second language knowledge suggests that it is worthwhile for second language programmes to aim for a high level of proficiency for all children. If children learn only a little of the second language, the benefits for first language and literacy development may be foregone.

Finally, this study has implications for a more common bilingual language-learning situation than that of majority language speakers learning a second language as a school subject - the situation of children who speak a minority language at home and learn the language of the dominant culture when they go to school.

Children who speak a minority language at home and come to school with little or no knowledge of the school language are often viewed as disadvantaged. They face the significant task of learning the school language to the level of their native-speaker peers, if they are not to lag behind in academic subjects. Nevertheless, they bring with them to school a wealth of linguistic knowledge. If the home language seems very different to the school language, it may be easy to overlook the relevance of what the child already knows when teaching him or her to speak, read and write a second language. The present study shows that despite apparent dissimilarities between languages, they may share underlying linguistic principles. Teachers of children who speak minority languages and school curricula could capitalise on the children's existing knowledge of such principles to help them develop linguistic and literacy skills in the second language, and second language knowledge could also be used to further develop first language skills. It may also be important for bilingual children to learn to read and write in their home language, because reading and writing help bring implicit knowledge of spoken language to an explicit level. Without this explicit level of knowledge of the home language, transfer across languages may not readily occur. This, however, is a subject for future research.

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APPENDIX I

TASKS USED IN STUDY 1

English Oral-Cloze task

Examples:
The ( ) is crying.
The ( ) went out.

1. The pretty little ( ) put on their dresses.
2. The ( ) little chickens ate corn.
3. "( ) is at the door?" he asked.
4. John buys sweets at the ( ).
5. They ( ) raking leaves when it got dark.
6. She baked chocolate ( ).
7. The boy ( ) down and hurt his knees.
8. The mean ( ) scared little Red Riding Hood.
9. Jack ( ) his sister ran up the hill.
10. Three ( ) the boys were eating their lunch.
11. "( ) is wrong with you?" the doctor asked.
12. It ( ) very cold yesterday.
13. Because of the rain, the children ( ) inside the house.
14. The puppy jumped ( ) his basket.
15. It was a sunny day with a pretty ( ) sky.

Row Completion task

1. we she he they	you yours
2. mine yours his theirs	ours us
3. sing run sleep sit	cow eat
4. nice big fast noisy	old house
5. bus house stone shop	bag fall
6. push start count leave	teach nice
7. book flower cup van	good pond
8. bad large bright wide	build smart

Word Analogy task

anger	angry	sing	song
strength	_____	live	_____
teacher	taught	work	worker
writer	_____	write	_____
walk	walked	see	saw
shake	_____	dance	_____
happy	happiness	cried	cry
high	_____	drew	_____

Sentence Analogy task

David helps Sarah	David helped Sarah
David sees Sarah	_____
Ruth gives the ball to Ben	Ruth gave the ball to Ben
Ruth sings a song to Ben	_____
Jonathan threw the ball	Jonathan throws the ball
Jonathan kicked the ball	_____
I felt happy	I feel happy
I was ill	_____
The dog is scratching the chair	The dog scratched the chair
The dog is chasing the cat	_____
Joe turns the television on	Joe was turning the television on
Joe switches the kettle on	_____
The cow wakes up	The cow will wake up
The cow runs away	_____
She keeps her toys in a box	She had kept her toys in a box
She hangs her washing on the line	_____

Spelling tasks

Past tense verbs and non-verbs ending in a /t/ sound

Regular verbs	Irregular verbs	Non-verbs
dressed	sent	paint
laughed	lost	soft
fixed	slept	except
stopped	felt	belt
kissed	left	

Consistency in spelling root morphemes task

ironosaurus	iron
swordosaurus	sword
knotosaurus	knot
halfosaurus	half
combosaurus	comb

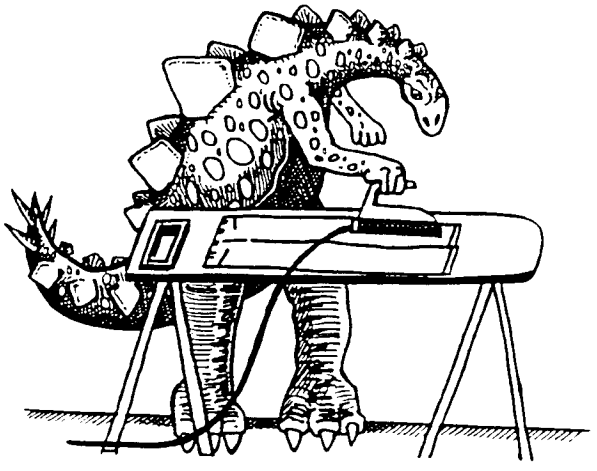
special	specialness
magic	magician
strong	strength
know	knowledge
naughty	naughtiness

Spelling Wordlist A

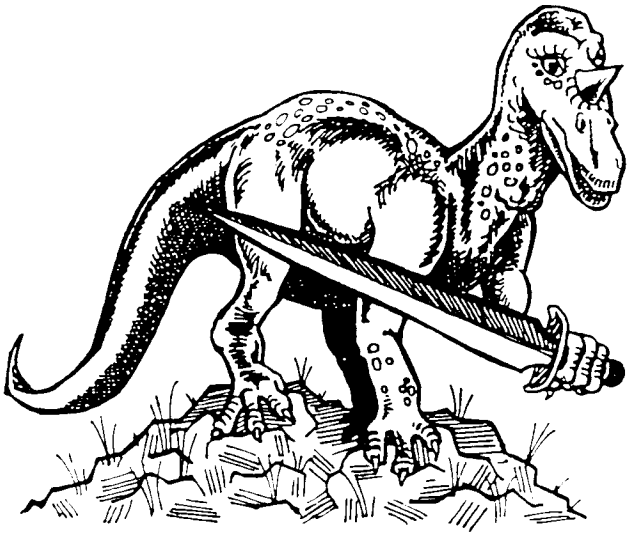
sent	I sent a letter to my friend
iron	You iron your clothes to make them smooth
paint	What colour paint shall I use in this picture?
sword	The knight killed the dragon with his sword.
magic	The magic word is abracadabra.
lost	I lost my ball in the playground.
knot	I tied a knot to keep my shoelaces tied.
special	My best friend is my special friend.
half	I cut my apple in half.
dressed	I got dressed quickly and ate breakfast.
comb	I comb my hair every morning.
strong	If you drink lots of milk you will be strong.
know	I know how to use computers.
soft	The cat's fur is very soft.
naughty	When I'm naughty my teacher tells me off.
laughed	We all laughed at the joke.
slept	Last night I slept very well.

Spelling wordlist B

ironosaurus	(picture shown)
swordosaurus	(picture shown)
knotosaurus	(picture shown)
halfosaurus	(picture shown)
combosaurus	(picture shown)
fixed	My bike works better since I fixed it.
knowledge	My knowledge of dinosaurs is very good.
except	Everyone except me went swimming.
naughtiness	My dad said "I won't stand for such naughtiness!"
stopped	Suddenly the rain stopped and the sun shone.
magician	The magician pulled a rabbit out of his hat.
felt	I felt very ill last week.
specialness	There was a lovely feeling of specialness about my birthday.
belt	You wear a belt to keep your trousers up.
strength	She used her strength to lift the heavy box.
kissed	My grandma kissed me on the cheek.
left	I left the house at 9 O'Clock.



ironosaurus



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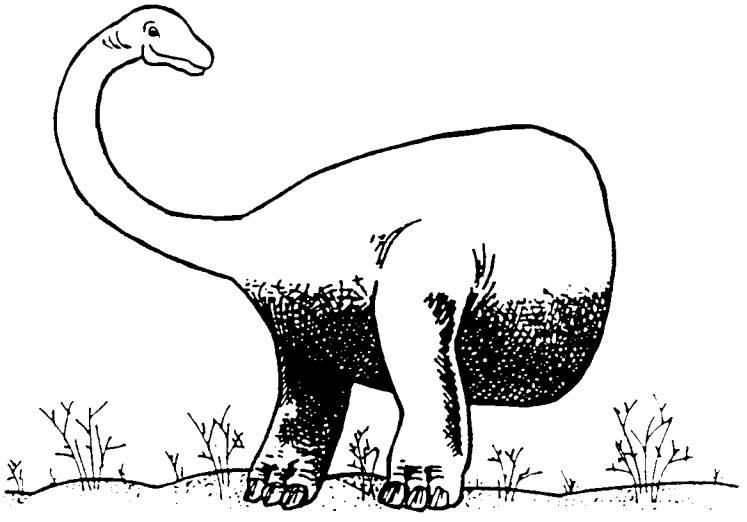
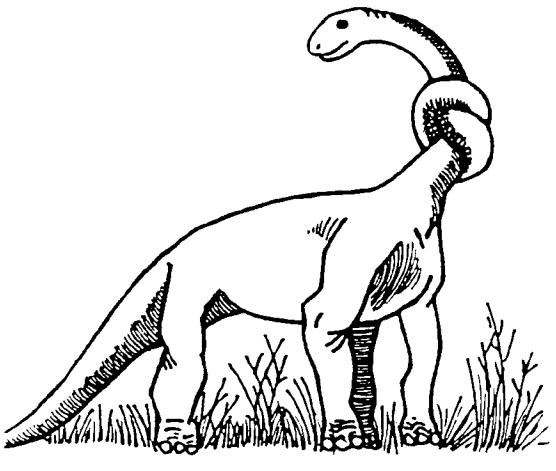


halfosaurus



knotosaurus

combosaurus

Drawings by Eldad Druks

Test of Hebrew Receptive Vocabulary

The levels below refer to the first 150, 300, 400, 500, 700, 800 and 1000 words in Rivlin's graded wordlist.

Modern		Religious	
Level 150		**Level 150**	
children	ילדים	says	אומר
teacher (m.)	מורה	to light	להדליק
sitting (f.)	יושבת	praying (m.)	מתפלל
Level 300		**Level 300**	
cup	כוס	going up (m.)	עולה
going out (f.)	יוצאת	darkness	חושך
ill (m.)	חולה	five (m.)	חמישה
Level 400		**Level 400**	
baby (m.)	תינוק	leaven	חמץ
sad (f.)	עצובה	prayer shawl	טלית
suddenly	פתאום	moon	ירח
Level 500		**Level 500**	
ice cream	גלידה	holy ark	ארון הקודש
shouting (m.pl)	צועקים	mountain	הר
car	מכונית	vegetables	ירקות
Level 700		**Level 700**	
newspaper	עיתון	field	שדה
elephant	פיל	dies	מת
to ring	לצלצל	ark	תיבה
Level 800		**Level 800**	
wheel	גלגל	roots	שורשים
knee	ברך	wicked (m.)	רשע
broken (m.)	שבור	snake	נחש
Level 1000		**Level 1000**	
tap (n.)	ברז	tent	אוהל
fly (n.)	זבוב	chose (m.)	בחר
sofa	ספה	slaves	עבדים

Hebrew Oral Cloze task

1. בשבת אני הולך לבית-ה_____. (כנסת)
2. בראש השנה אומרים שנה _____. (טובה)
3. ביום יש אור, ובלילה יש _____.(חושך)
4. חם לי. פתח את ה _____. (חלון/דלת)
5. בבוקר אני _____ חלב. (שותה)
6. אבא _____ לעבודה ברכבת. (נוסע/הולך/נסע)
7. בקיץ חם _____ בחורף קר (ו/אבל)
8. אני הולך _____ את סבתא. (לבקר)
9. סבתא _____ עוגה טעימה (הכינה/עשתה/עושה/אפתה)
10. האישה הזקנה יושבת _____ היא עייפה. (כי)
11. בראשית ברא ה' את הארץ ואת ה_____. (שמיים)
12. משה הוציא את _____ ישראל ממצריים. (בני)
13. איש צדיק עושה דברים _____. (טובים)
14. בני ישראל היו במדבר ארבעים _____. (שנה)
15. ויהי הגשם על הארץ ארבעים יום ו _____לילה. (ארבעים)
16. קרא ה' לחושך לילה ול _____ קרא יום. (אור)
17. ה' שמע את תפילה _____ בני ישראל. (של)
18. ויאמר ה' לנח בא אתה ו_____ אל התיבה. (בניך/משפחתך)
19. צוה לנו ה' זכור את _____ השבת. (יום)
20. ה' _____ לנו ללמוד תורה. (אמר/צוה)

Approximate English translation

1. On the sabbath I go to the _____. (synagogue)
2. At the new year we say _____ New Year. (Happy)
3. In the day it is light, and at night it is _____. (dark)
4. I'm hot. Open the _____. (window/door)
5. In the morning I _____ milk. (drink)
6. Daddy _____ to work by train. (goes/travels)
7. In the summer it's hot _____ in the winter it's cold. (and)
8. I'm going _____ grandma. (to visit)
9. Grandma _____ delicious cake. (prepared/baked/makes/made)
10. The old woman sits down _____ she's tired. (because)
11. In the beginning God made the earth and the _____. (heavens)
12. Moses took the _____ of Israel out of Egypt. (children)
13. A righteous man does _____ things. (good)
14. The children of Israel were in the desert for forty _____. (years)
15. And the rain was on the earth for forty days and _____ nights. (forty)
16. God called the darkness night and the _____ he called day. (light)
17. God heard the prayer _____ the children of Israel. (of)
18. God said to Noah take yourself and _____ to the ark. (your family/your children)
19. God commanded us to remember the sabbath _____. (day)
20. God _____ us to study Torah (commanded/told).

Examples

סֵפֶר

Book

סִפְרִיָּה
Library

יֶלֶד
Boy

עוֹבֵד

Works

לוֹמֵד
Learns

עֲבוֹדָה
Job

לוֹמֵד

לְדַבֵּר

תַּלְמִיד

קְרִיאָה

כְּתִיבָה　　קְרִיעָה　　רִיקָה　　לִקְרוֹא

מַאֲבֶדֶת

מַתָּנוֹת　　בַּד　　אִיבְּדוּ　　מַעֲבֶדֶת

בְּחִירָה

בְּכִירָה　　שִׁירָה　　בְּחִינָה　　לִבְחוֹר

מִטָּרִיָּה

מָטָר　　מַלְכָּה　　סַפְרִיָּה　　בַּטַּרְיָה

שֶׁמֶשׁ

אֶמֶשׁ　　מְשַׁשׁ　　שִׁמְשִׁיָּה　　שָׁם

לְדַבֵּר

בַּר　　מְלַמֵּד　　דִּיבּוּר　　דְּבַשׁ

גַּרְבַּיִם

עֶרֶב　　עֵינַיִם　　גַּרְבּוֹנִים　　גֶּבֶר

הֲלִיכָה

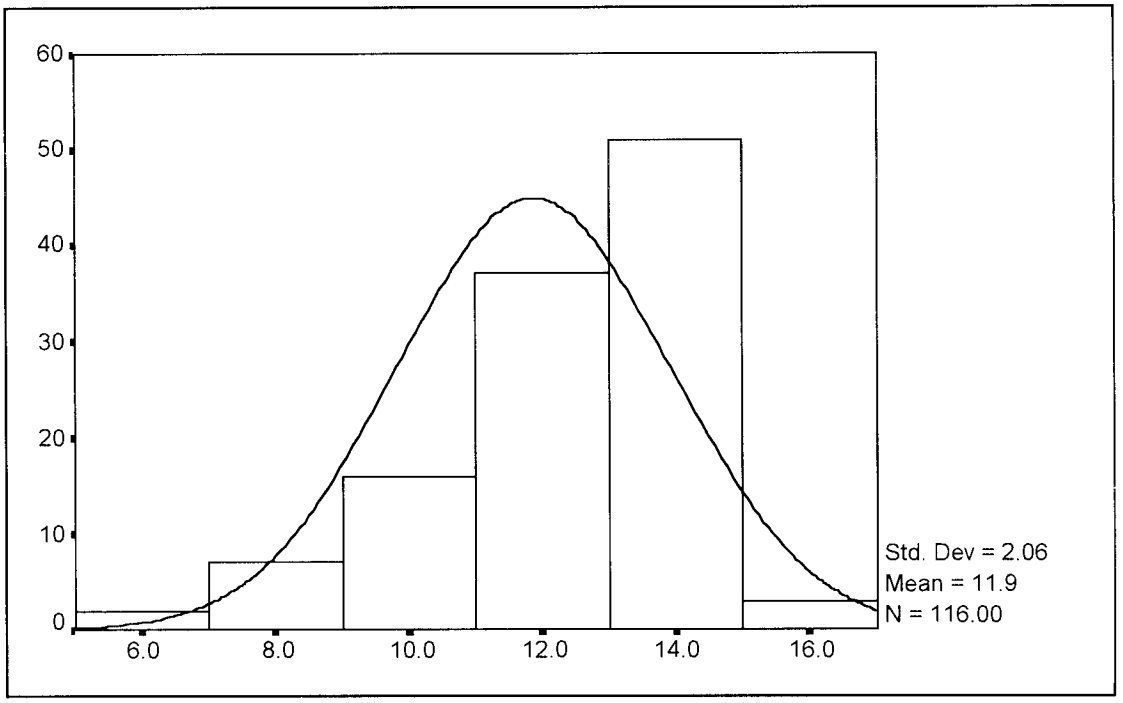
הֲלִימוּת　　הַצְלָחָה　　הָלַךְ　　מַגִּישָׁה

APPENDIX II

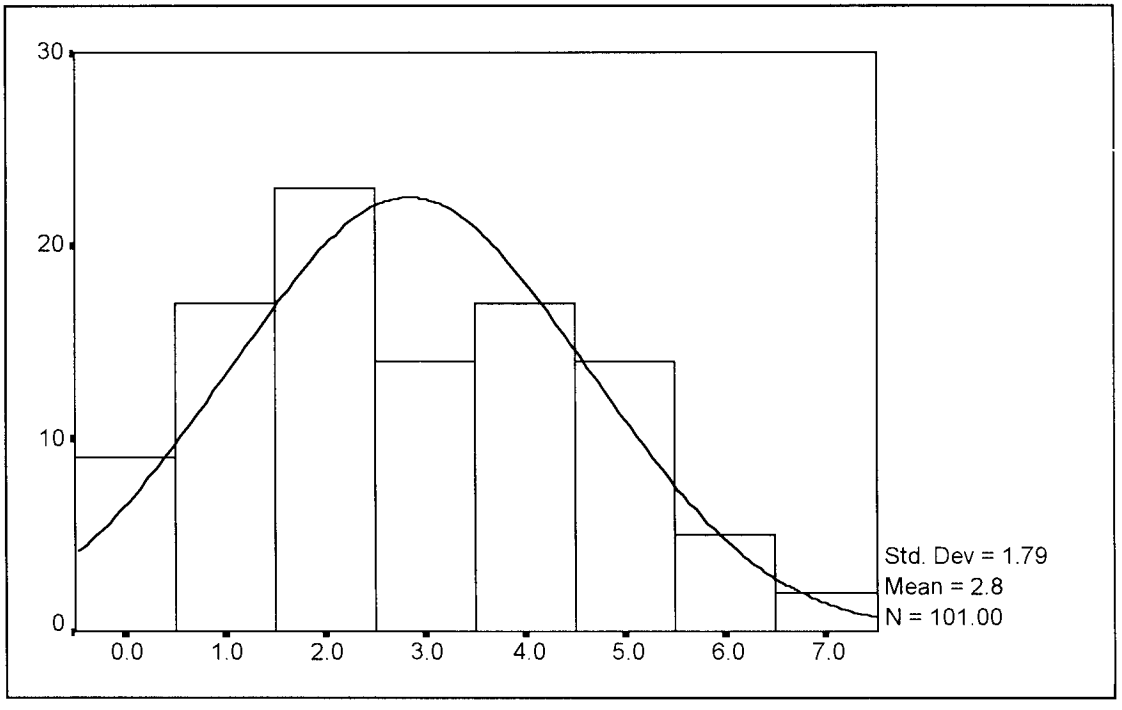
DISTRIBUTIONS OF SCORES AND DESCRIPTIVE STATISTICS FOR TASKS USED IN STUDY 1

Distribution of scores on the English Oral Cloze and Word Analogy tasks

English Oral Cloze



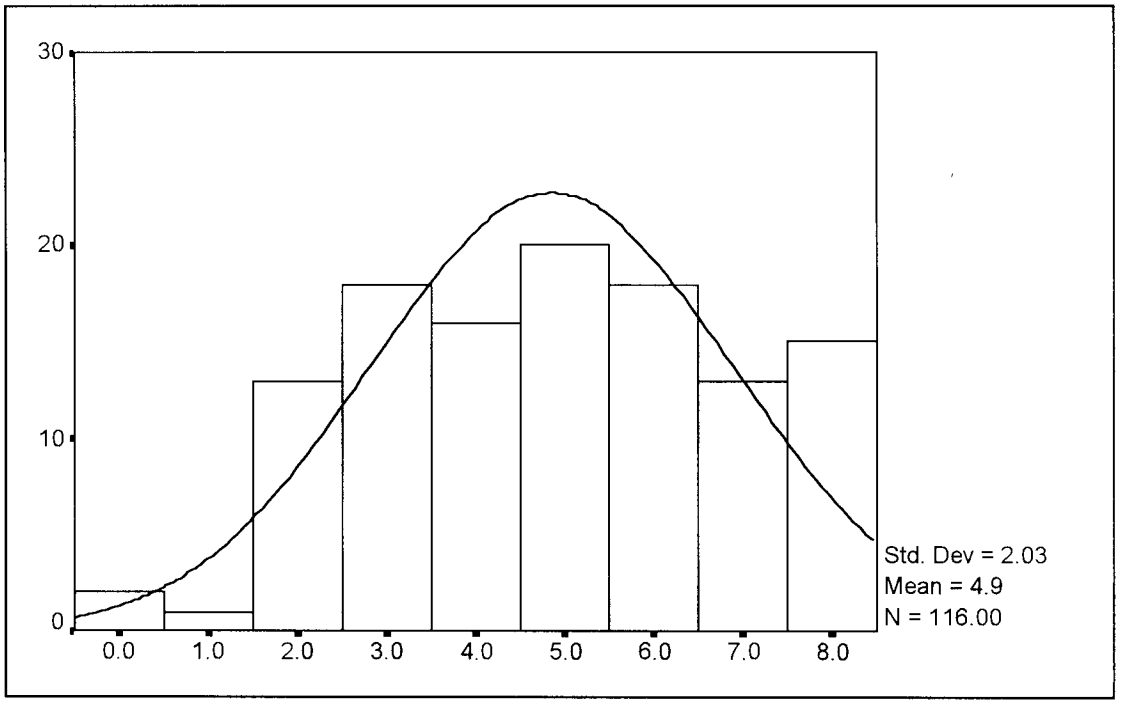
Word Analogy



Mean scores on Word Analogy task, by Year

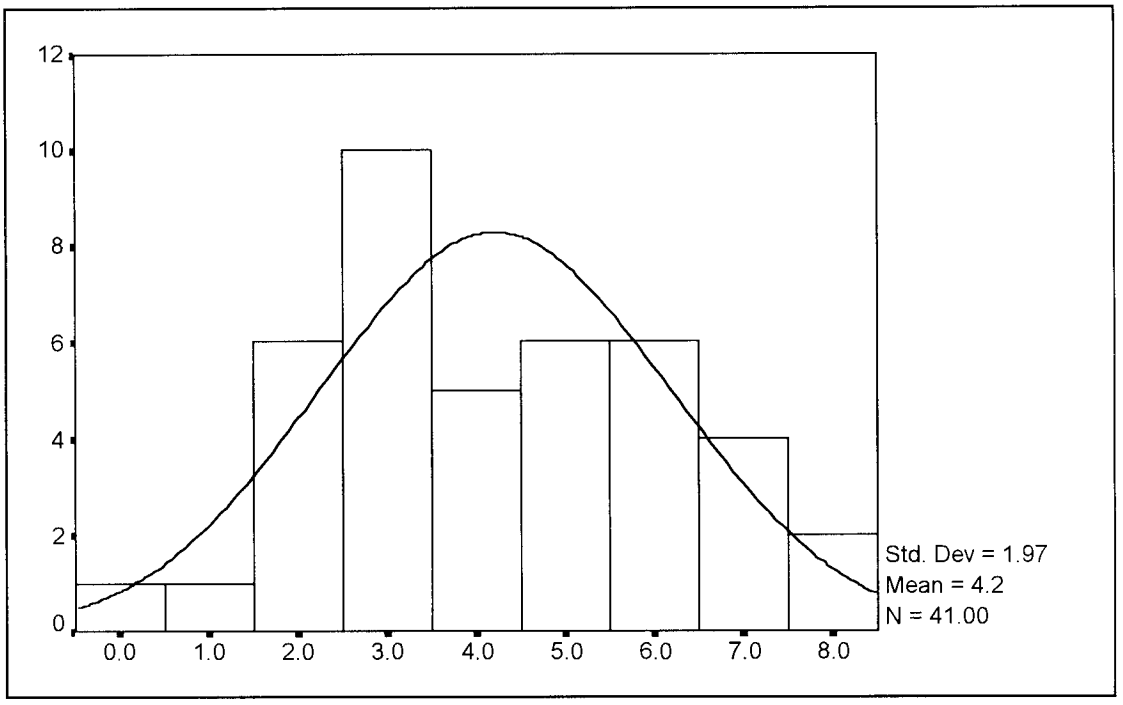
Year	Mean Score	SD	n
3	1.6	1.4	30
4	2.7	1.4	30
5	3.6	1.7	26
6	4.5	1.5	15

Distribution of scores on the Sentence Analogy task (both schools)

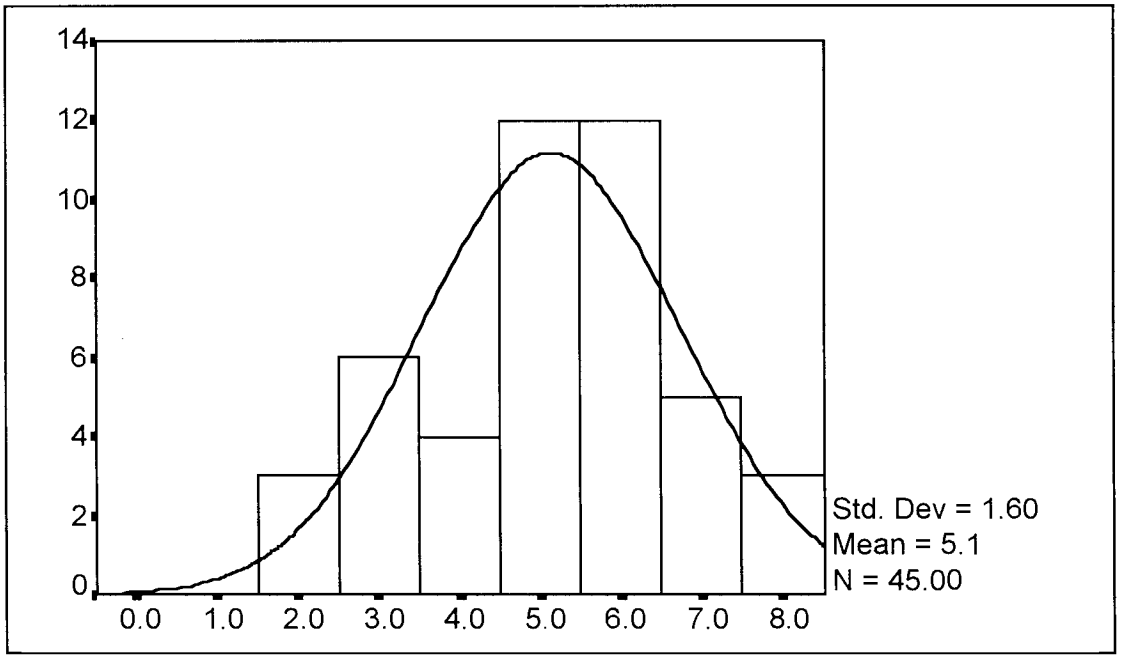


Distributions of scores on the Sentence Analogy task in each school

School 1 (Years Three to Five)



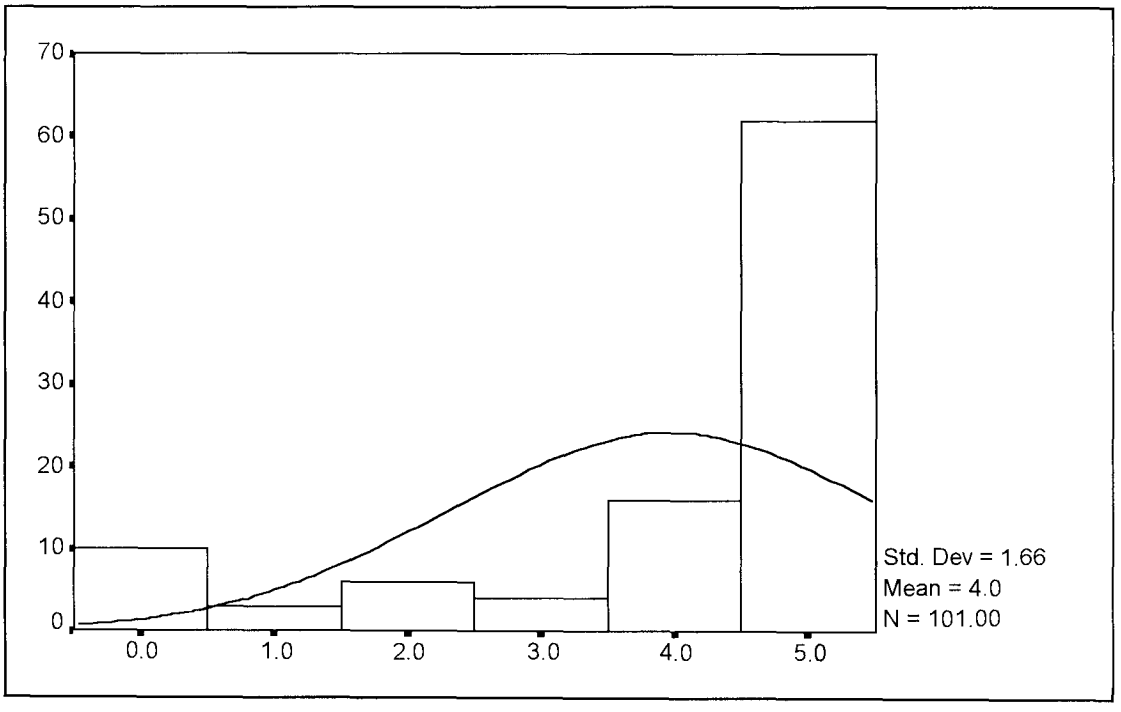
School 2 (Years Three to Five)



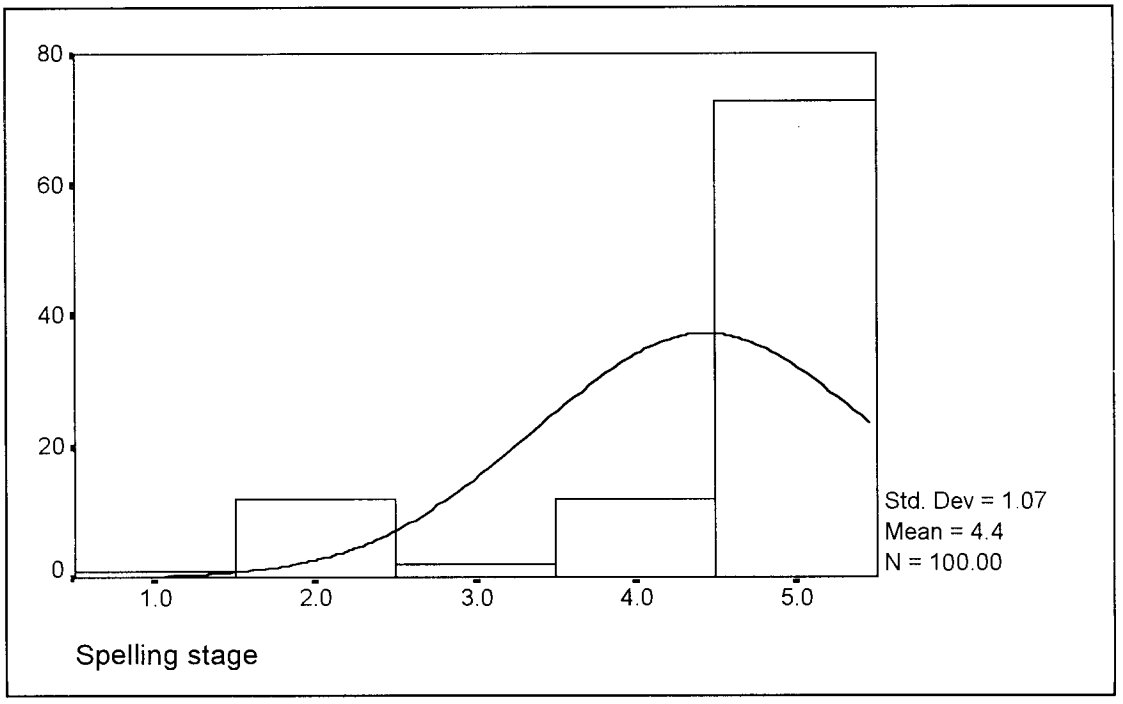
Mean no. of grammatical justifications for correct choices on the Rows task

Year	Mean	SD	n
2	0.6	1.3	14
3	0.9	1.0	30
4	1.9	1.5	30
5	2.0	1.2	26
6	2.7	1.3	15

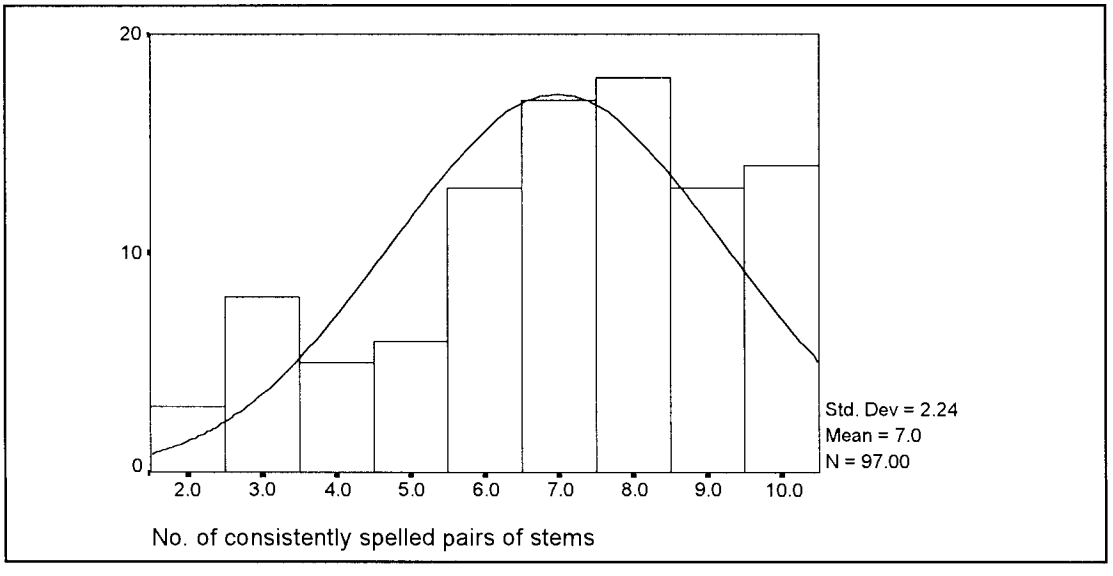
Distribution of the total number of 'ed' endings children used on regular past tense verbs



Numbers of children in each of the five 'ed' spelling stages

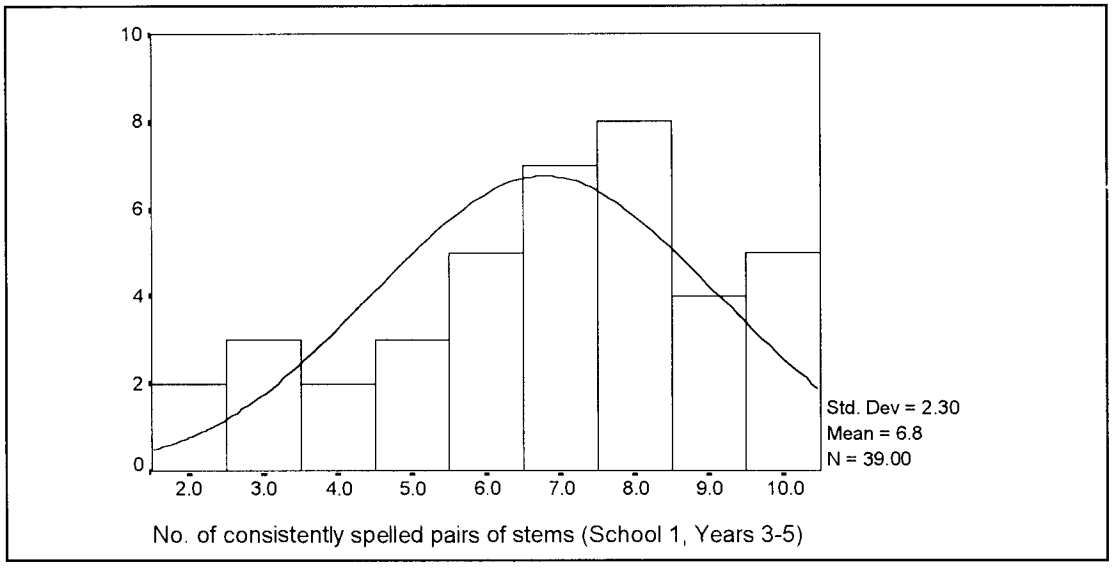


Distribution of scores on the spelling consistency task (both schools)

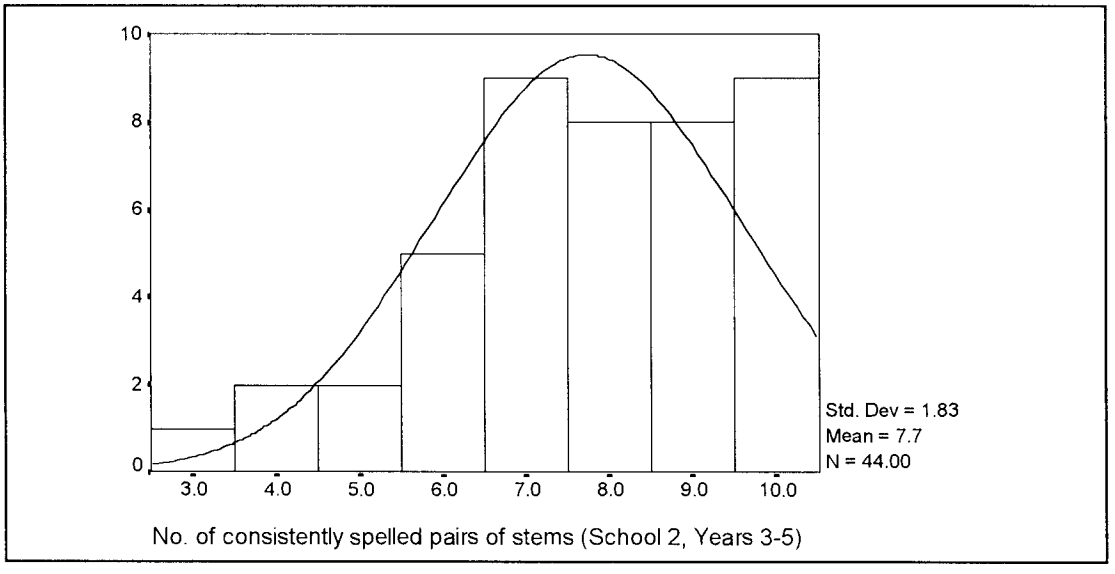


Distribution of scores on the spelling consistency task in each school

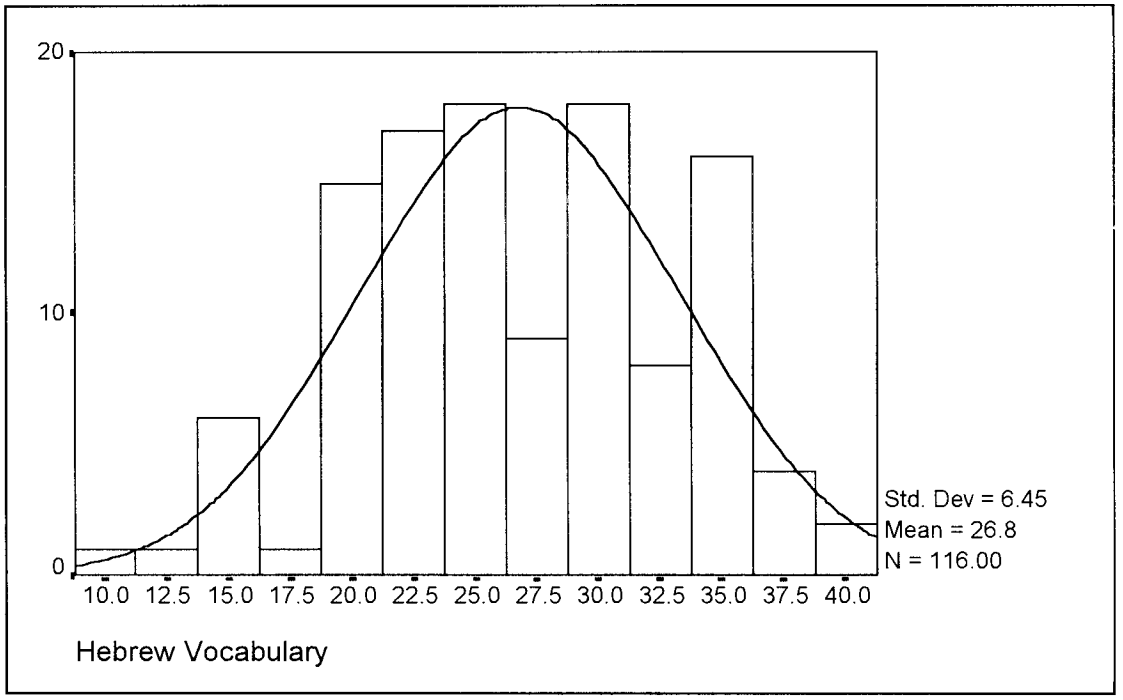
School 1



School 2

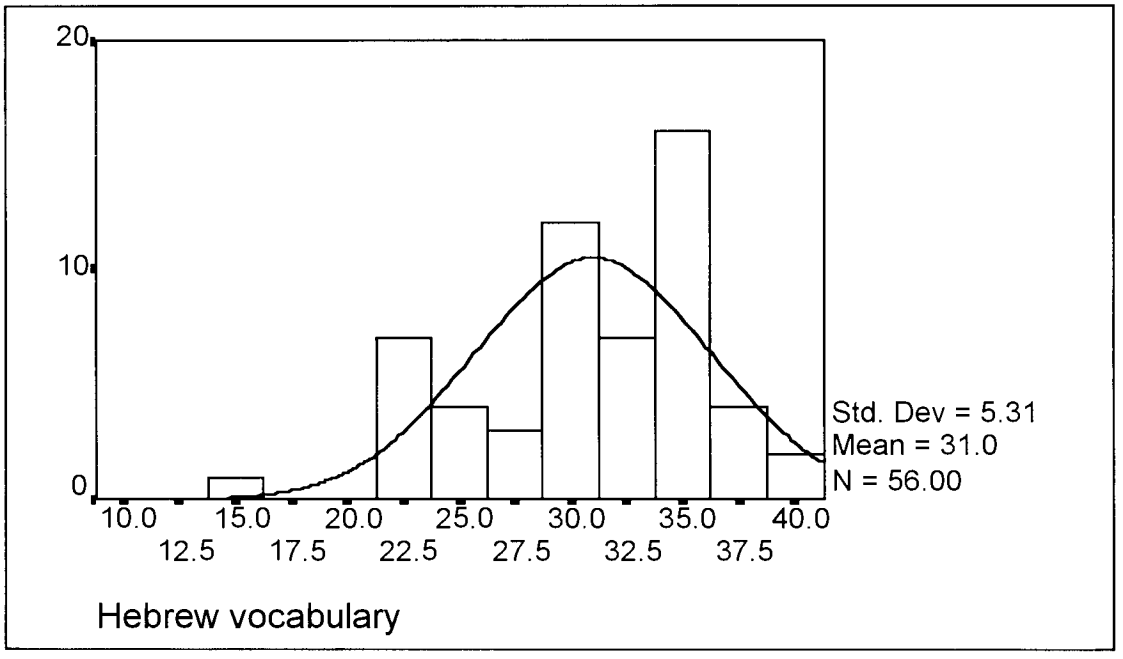


Distributions of scores on the Hebrew Vocabulary test (both schools)

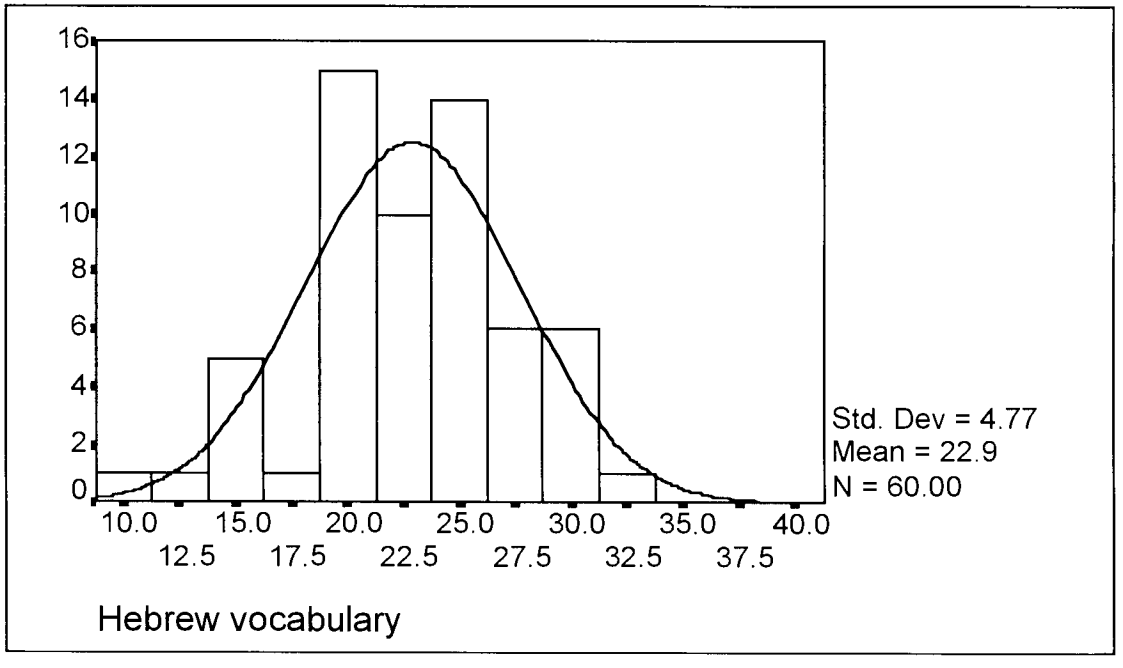


Distributions of scores on the Hebrew Vocabulary test in each school

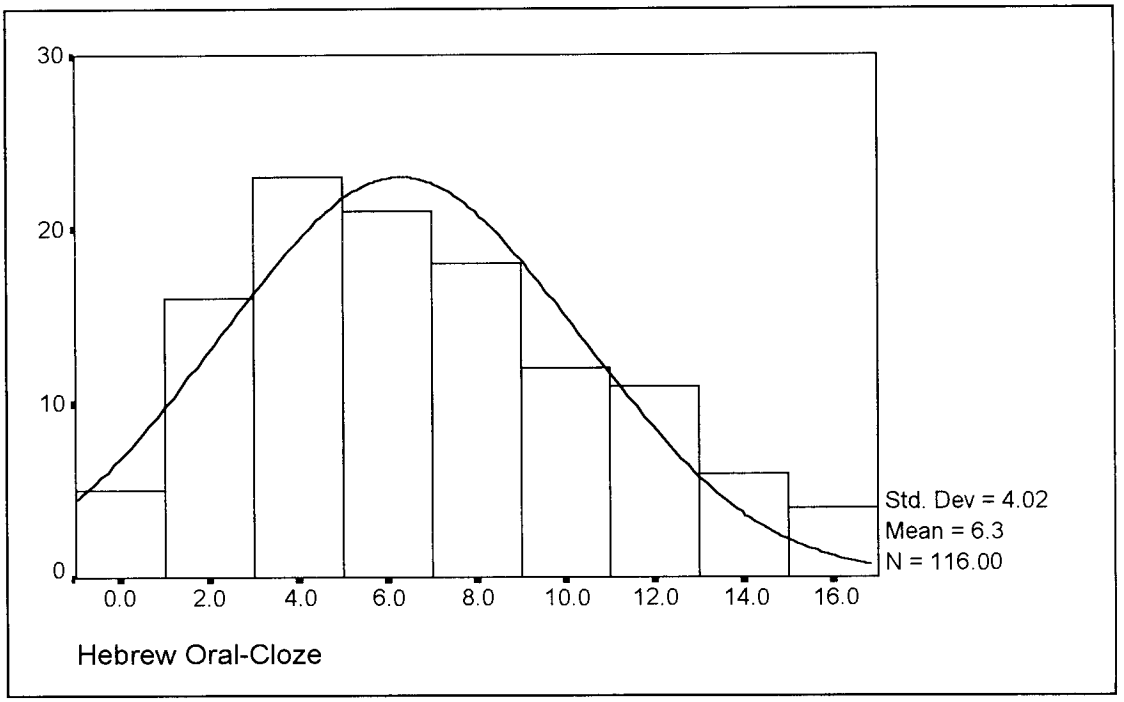
School 1



School 2

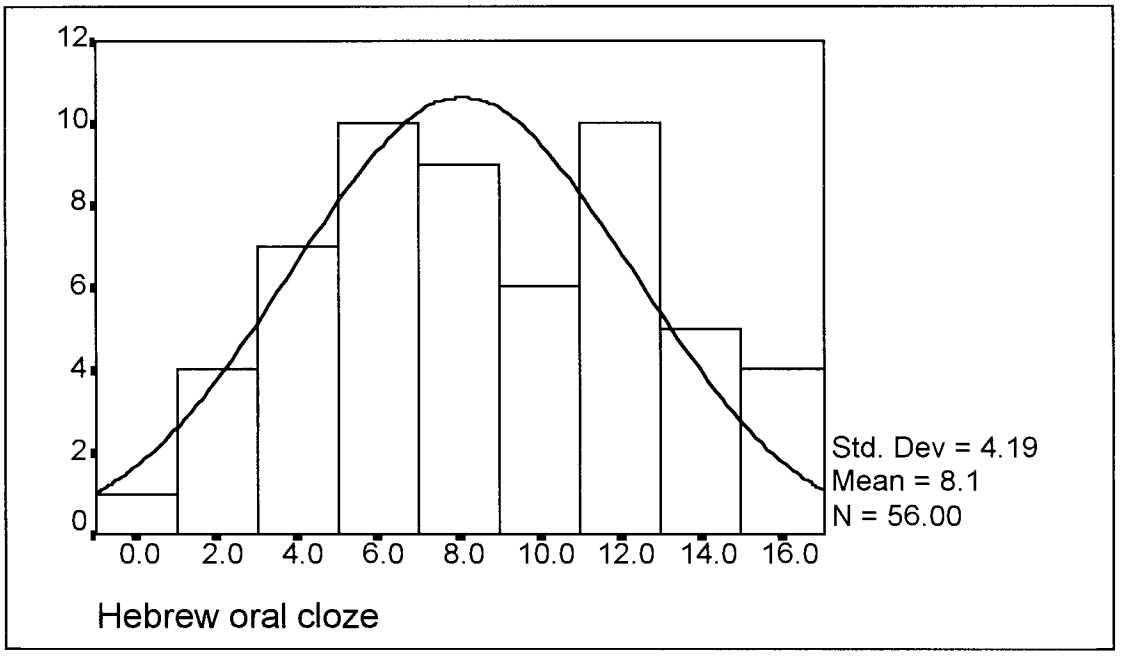


Distribution of scores on the Hebrew Oral Cloze task (both schools)

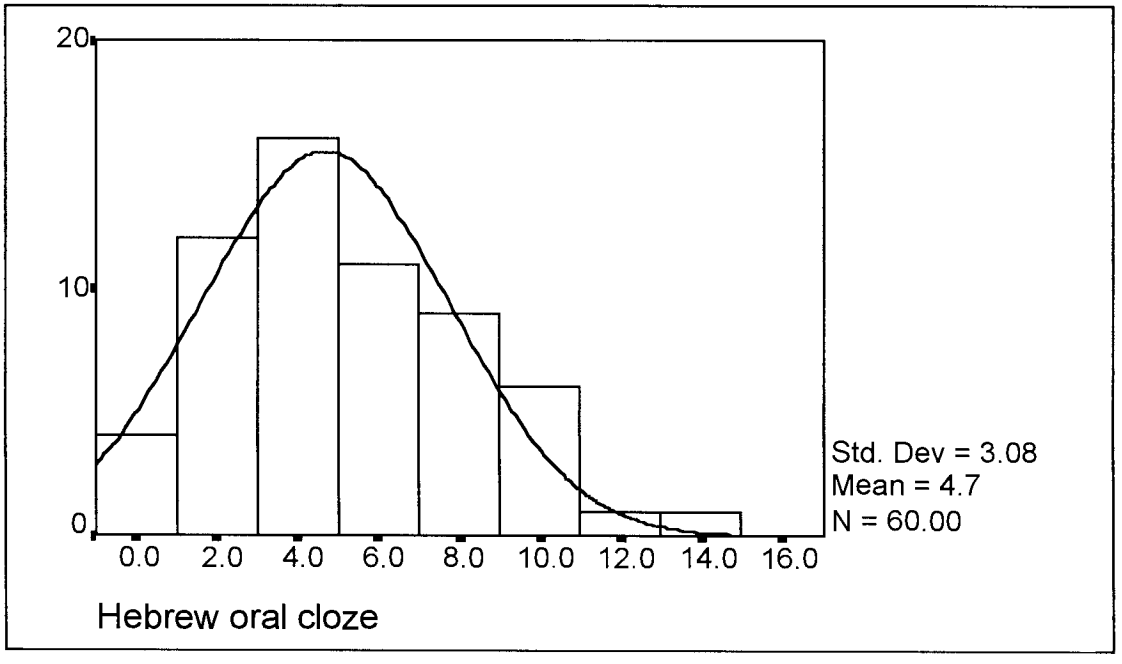


Distribution of scores on the Hebrew Oral Cloze task in each school

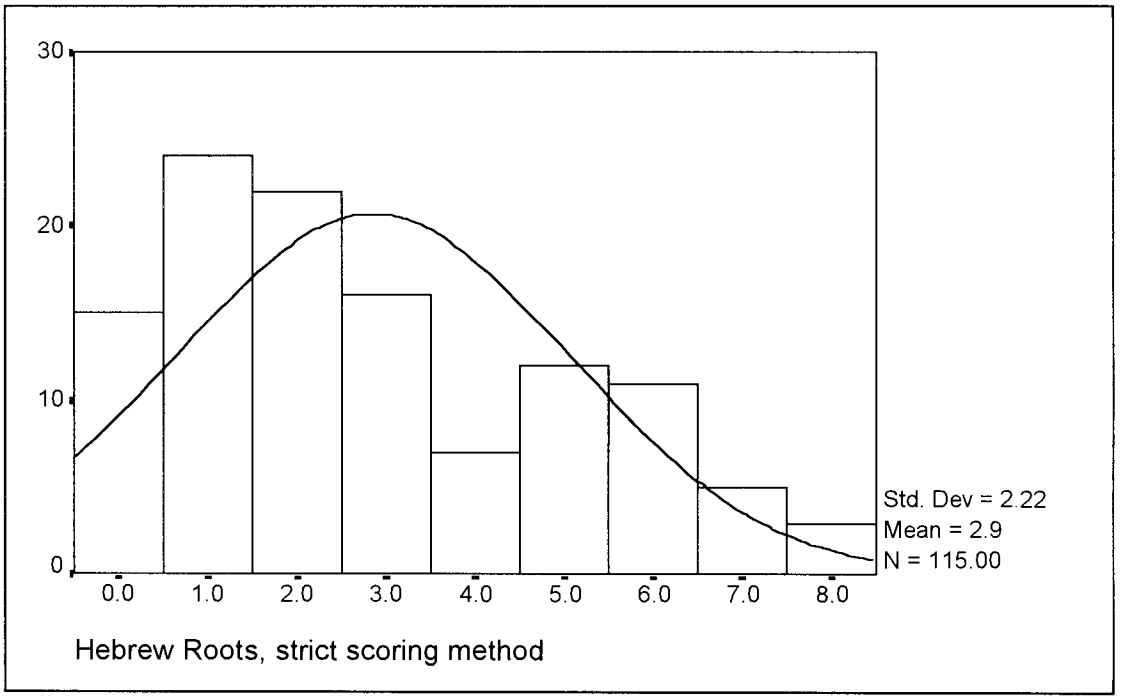
School 1

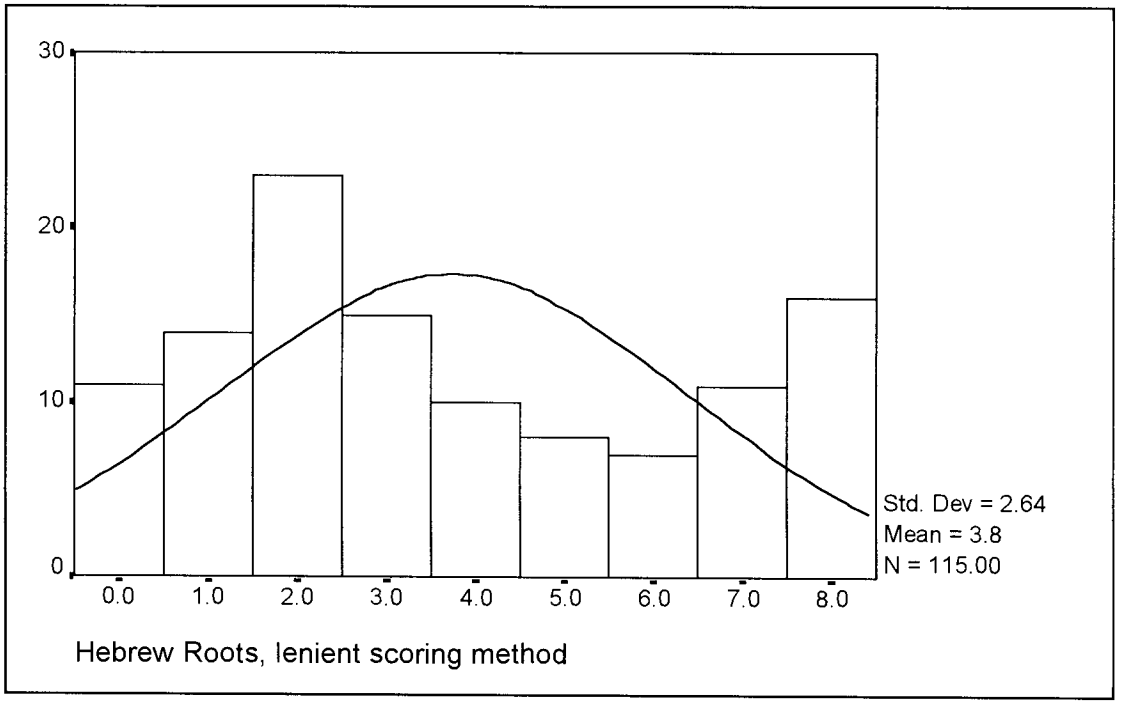


School 2



Distributions of scores on the Hebrew Roots task, strict and lenient scoring methods





APPENDIX III
RESULTS OF STUDY 1

Summary of fixed-order regression analyses measuring the relation between performance on the Hebrew grammatical tasks and the response variable English Sentence Analogy

	Variable	R^2 change	B	SE B	β
(N=116)					
Step 1	Age	0.33****	0.07	0.01	0.56
Step 2	English Vocab	0.15****	0.21	0.04	0.31
Final Step	Hebrew Oral-Cloze	0.05***	0.12	0.03	0.24
(N=115)					
Step 1	Age	0.33****	0.06	0.01	0.46
Step 2	English Vocab	0.15****	0.23	0.04	0.35
Final Step	Hebrew Roots	0.03**	0.18	0.07	0.2

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001
Since one child did not do the Hebrew roots task, the first two steps of the analyses involving this task produce slightly different results than the analyses for the Hebrew Oral-Cloze task. Therefore these steps are shown separately for the two tasks.

Summary of fixed-order regression analyses measuring the relation between performance on the Hebrew grammatical tasks and the response variable English Word Analogy

	Variable	R^2 change	B	SE B	β
(N=101)					
Step 1	Age	0.3****	0.07	0.01	0.53
Step 2	English Vocab	0.15****	0.2	0.05	0.32
Final Step	Hebrew Oral-Cloze	0.03*	0.09	0.04	0.19
(N=100)					
Step 1	Age	0.3****	0.06	0.01	0.43
Step 2	English Vocab	0.15****	0.2	0.05	0.34
Final Step	Hebrew Roots	0.04**	0.2	0.07	0.25

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001
Since one child did not do the Hebrew Roots task, the first two steps of the analyses involving this task produce slightly different results than the analyses for the Hebrew Oral Cloze task. Therefore these steps are shown separately for the two tasks.

Summary of fixed-order regression analyses measuring the relation between performance on the Hebrew Oral Cloze task and the response variable English Rows Justifications

	Variable	R^2 change	B	SE B	β
(N=115)					
Step 1	Age	0.21****	0.04	0.01	0.44
Step 2	English Vocab	0.18****	0.17	0.04	0.36
Final Step	Hebrew Oral Cloze	0.03*	0.06	0.03	0.18

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of regression analysis examining the relation between the interaction of Hebrew Oral Cloze and school, and performance on the English Oral Cloze task

Variable	B	SE B	t	β
(N=116)				
Age	.03	.01	3.27**	.26
English Vocab	.34	.05	6.91****	.50
Hebrew Oral Cloze	.22	.05	4.37****	.42
School	2.27	.56	4.08***	.55
Hebrew Oral Cloze x School (interaction term)	.28	.08	3.65***	.43

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of regression analysis examining the relation between the interaction of Hebrew Oral Cloze and school, and the response variable English Word Analogy

Variable	B	SE B	t	β
(N=116)				
Age	.06	.01	6.70****	.51
English Vocab	.14	.04	3.29**	.23
Hebrew Oral Cloze	.04	.04	.95	.09
School	.26	.49	.52	.07
Hebrew Oral Cloze x School (interaction term)	.19	.07	2.8**	.32

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order regression analyses measuring the relation between performance on Hebrew Oral Cloze and the response variable English Oral Cloze (School 1 only)

	Variable	R^2 change	B	SE B	β
(N=56)					
Step 1	Age	.08*	.03*	.01	.18
Step 2	English Vocab	.59****	.43****	.07	.59
Final Step	Hebrew Oral Cloze	.06***	.17	.05	.31

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order regression analyses measuring the relation between performance on Hebrew Oral Cloze and the response variable English Word Analogy (School 2 only)

	Variable	R^2 change	B	SE B	β
(N=60)					
Step 1	Age	.22***	.03*	.01	.27
Step 2	English Vocab	.13**	.12	.06	.19
Final Step	Hebrew Oral Cloze	.16***	.29***	.07	.49

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order regression analyses measuring the relation between performance on English morpho-syntactic tasks and English spelling of morphemes

Response variable: No. of 'ed' endings on regular past tense verbs

	Variable	R^2 change	B	SE B	β
(n=101)					
Step 1	Age	0.17****	0.04	0.01	0.33
Step 2	English Vocab	0.17****	0.12	0.06	0.21
Final Step	English Oral Cloze	0.04*	0.23	0.09	0.29

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Response variable: No. of consistently spelled pairs of word stems

	Variable	R^2 change	B	SE B	β
(n=97)					
Step 1	Age	0.28****	0.07	0.02	0.4
Step 2	English Vocab	0.05**	0.08	0.07	0.11
Final Step	Sentence Analogy	0.04*	0.31	0.12	0.27

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Response variable: No. of consistently spelled pairs of word stems

	Variable	R^2 change	B	SE B	β
(n=90)					
Step 1	Age	0.26****	0.07	0.02	0.39
Step 2	English Vocab	0.06**	0.07	0.08	0.1
Final Step	Row Justifications	0.04*	0.43	0.18	0.27

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order regression analyses measuring the relation between performance on Hebrew morpho-syntactic tasks and number of consistently spelled pairs of English word stems

Response variable: No. of consistently spelled pairs of word stems

	Variable	R^2 change	B	SE B	β
(n=97)					
Step 1	Age	.28****	0.1	0.01	0.54
Step 2	English Vocab	.05**	0.11	0.06	0.15
Final Step	Hebrew Oral Cloze	.04*	0.12	0.05	0.22
(n=96)					
Step 1	Age	0.29****	0.07	0.02	0.43
Step 2	English Vocab	0.05**	0.13	0.06	0.19
Final Step	Hebrew Roots	0.04*	0.23	0.1	0.22

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001
Since one child did not do the Hebrew roots task, the first two steps of the analyses involving this task produce slightly different results than the analyses for the Hebrew Oral-Cloze task. Therefore these steps are shown separately for the two tasks.

Summary of regression analysis examining the relation between the interaction of Hebrew Oral Cloze and school, and the number of 'ed' endings used on regular past tense verbs

Variable	B	SE B	t	β
(N=116)				
Age	.04	.01	3.59***	.31
English Vocab	.14	.05	2.84**	.26
Hebrew Oral Cloze	.16	.05	3.32**	.40
School	1.87	.54	3.5***	.56
Hebrew Oral Cloze x School (interaction term)	.16	.08	2.09*	.28

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order regression analysis measuring the relation between performance on the Hebrew Oral Cloze task and the response variable number of 'ed' endings on regular past tense verbs (School 1 only)

	Variable	R^2 change	B	SE B	β
(N=56)					
Step 1	Age	.14**	.05**	.02	.31
Step 2	English Vocab	.23***	.20*	.08	.32
Final Step	Hebrew Oral Cloze	.05*	.13	.06	.27

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

APPENDIX IV

TASKS USED IN STUDY 2

Consistency spelling task

List A

know	I **know** how to read Hebrew.
magic	The **magic** word is abracadabra.
strong	Drinking milk makes you **strong**.
naughtiness	My dad said 'Stop this **naughtiness**'.
special	David is a **special** friend.
cycle	Let's **cycle** over to your house.
decide	It's difficult to **decide** who to sit with.
courage	He doesn't have the **courage** to jump in the pool.
comforted	It **comforted** him to know his mother was there.
muscle	This **muscle** in my arm is hurting.
break	Don't throw that, it will **break**.
dream	I had a strange **dream** last night.
governed	The king **governed** his people.

List B

strength	She used all her **strength** to lift the heavy box.
magician	The **magician** pulled a rabbit from his hat.
comfortable	This chair is very **comfortable**.
naughty	My little brother is very **naughty**.
specialness	There is a feeling of **specialness** on Shabbat.
knowledge	His **knowledge** of cars is amazing.
decision	He made the **decision** to go immediately.
breakfast	What did you eat for **breakfast** this morning?
courageous	The knight was **courageous** and fought the scary dragon.
muscular	People who do a lot of exercise become very **muscular**.
dreamt	That night I had **dreamt** I could fly.
bicycle	I would like a **bicycle** for my birthday.
government	The **government** has decided that all eleven year olds must do tests.

Apostrophe sentence task

1. Did you eat the girl's/girls' cake?
2. Some birds fly away to a warmer place.
3. Oak trees grow very tall.
4. The dog's tail is wagging.
5. The shoe's heel is broken.
6. David is playing with his toys.
7. Look at the tree's/trees' branches.
8. I bought some black shoes.
9. Is this the boy's/boys' football?
10. The cups are empty.
11. The dogs are barking.
12. The toy's paint is peeling.
13. The girls are crying.
14. Look at the boys playing football.
15. The cup's handle is wet.
16. Is this the bird's/birds' nest?

Apostrophe production (picture task)

1. The girls drink.
2. The boy's hammer.
3. The girls cut.
4. The boy's garden.
5. The girl's swing.
6. The boys paint.
7. The carpenters saw.
8. The girl's cycle.
9. The boats sail.
10. The boy's cook.
11. The girl's iron.
12. The boys writing.
13. The girls shopping.
14. The girl's drive.
15. The rabbit's burrow.
16. The parrots perch.

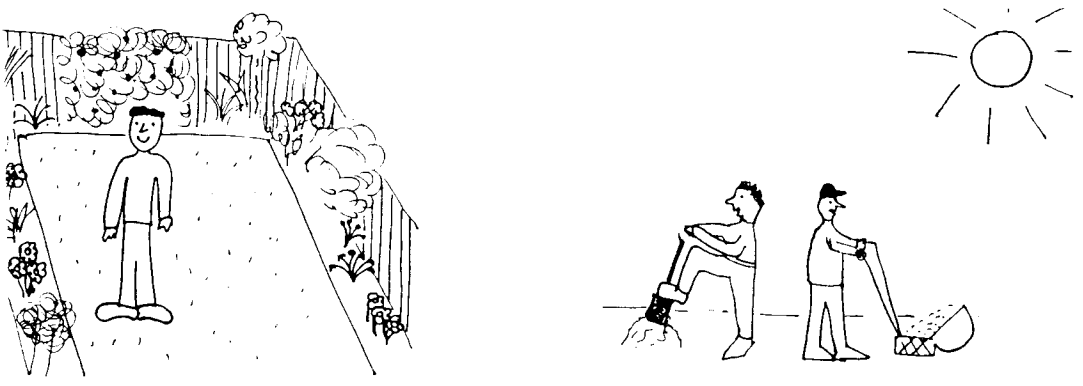
Apostrophe comprehension (picture task)

(Which picture shows...?)

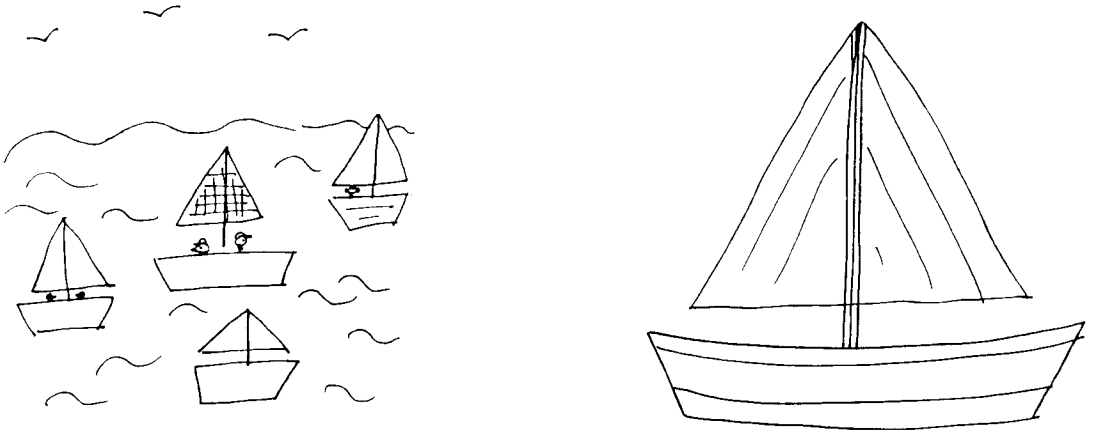
1. the boats sail
2. the boy's cook
3. the boy's garden
4. the boys writing
5. the girls shopping
6. the girl's drive
7. the rabbit's burrow
8. the parrots perch
9. the girls drink
10. the boy's hammer
11. the girls cut
12. the girl's iron
13. the girl's swing
14. the boys paint
15. the carpenters saw
16. the girl's cycle

The girls cut.

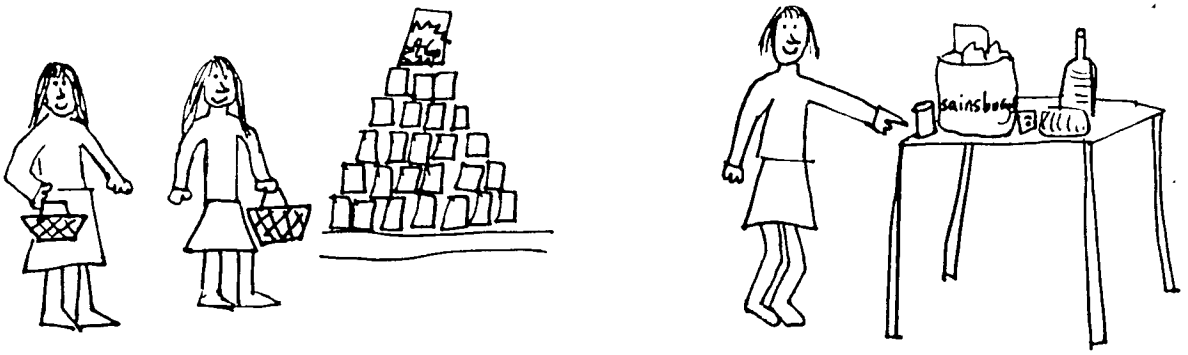
The carpenters saw.



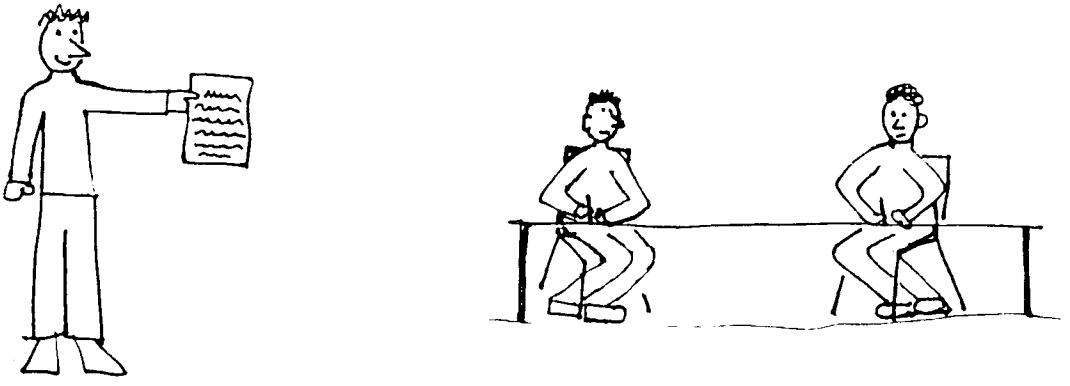
The boy's garden.



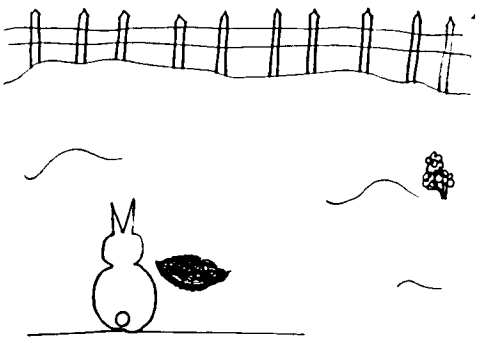
The boats sail.



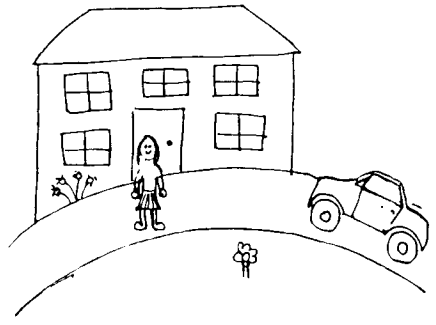
The girls shopping.

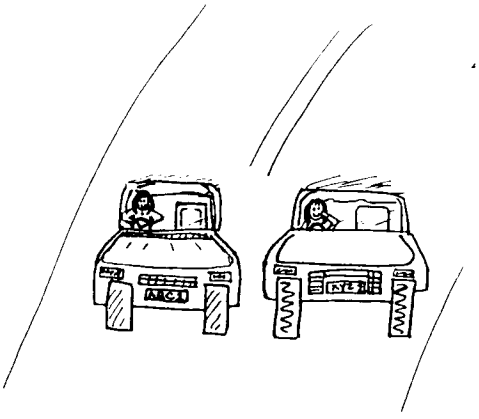


The boys writing.

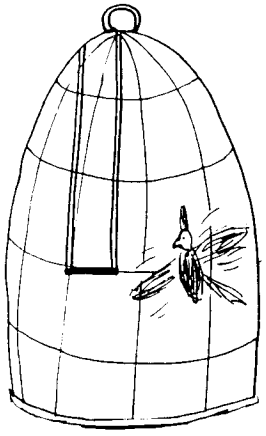


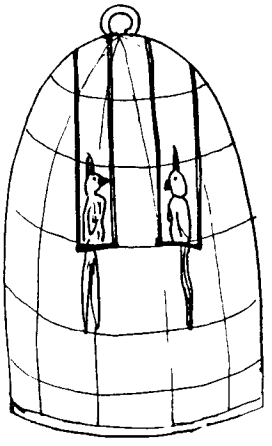
The rabbit's burrow.





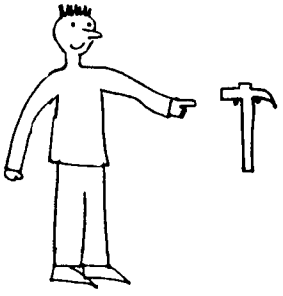
The girl's drive.

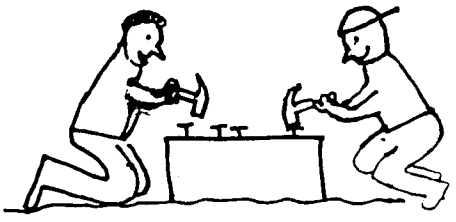




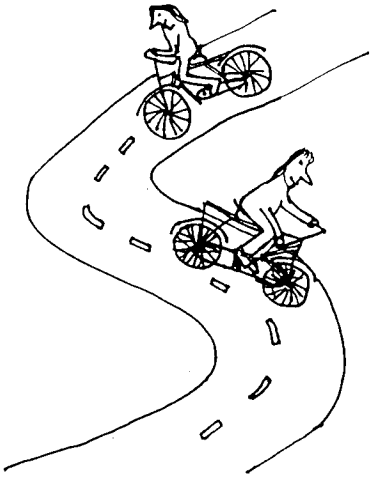
The parrots perch.

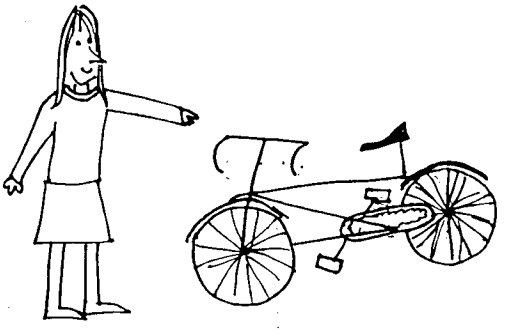
The boys paint.



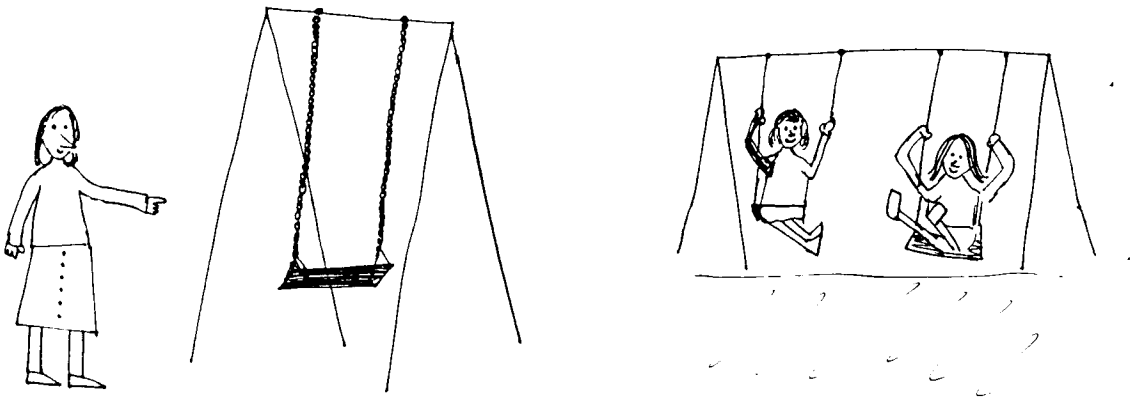


The boy's hammer.

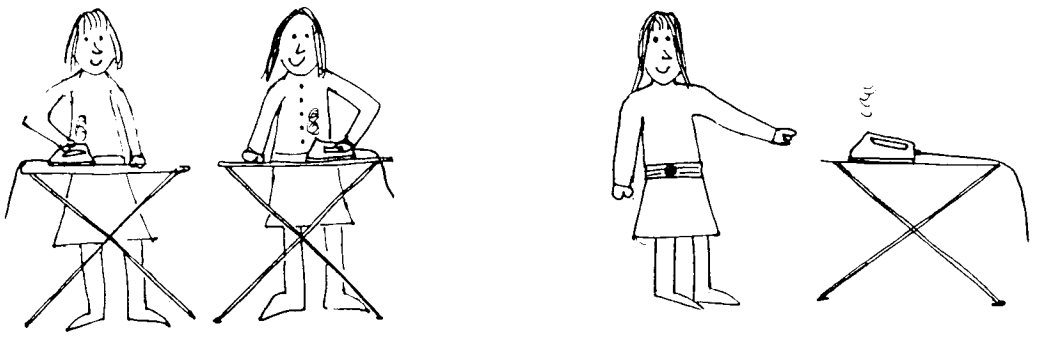




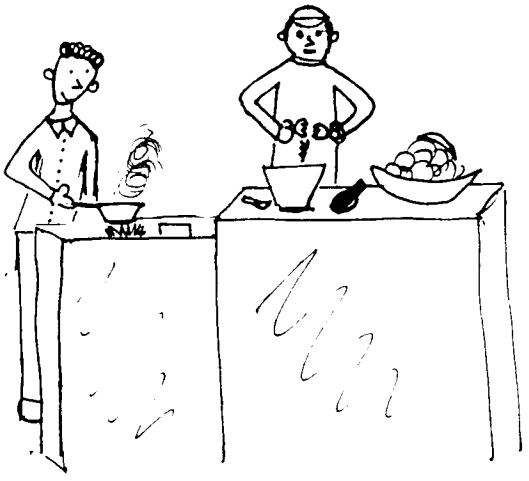
The girl's cycle.

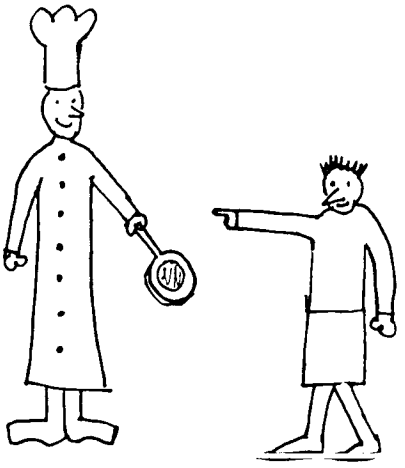


The girl's swing.

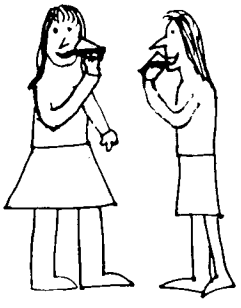


The girl's iron.





The boy's cook.



The girls drink.

Comprehension of Hebrew possessive pronoun suffixes task

Example 1. הנה הבית של משה. הנה ________.

ביתי
ביתנו
ביתו
בתים

Here is Moses' house. Here is/Here are _______. (my house, our house, his house, houses)

Example 2. הנה הבית שלי. הנה _________.

בית
ביתו
ביתה
ביתי

Here is my house. Here is _________. (a house, his house, her house, my house).

1. הנה המלך שלנו. הנה _________.

מלכנו
מלכים
מלכי
מלך

Here is our king. Here is/Here are _________. (our king, kings, my king, king)

2. הנה האחות של דויד. הנה _________.

אחותה
אחיות
אחותי
אחותו

Here is David's sister. Here is/Here are _______. (his sister, sisters, my sister, his sister)

3. הנה הנעליים של שרה. הנה _________.

נעל
נעלייה
נעליינו
נעלי

Here are Sarah's shoes. Here is/Here are ________. (a shoe, her shoes, our shoes, my shoe)

4. הנה המשפחה שלך. הנה _____.

משפחתי
משפחתך
משפחות
משפחתנו

Here is your (f.sg) family. Here is/Here are _____. (my family, your [f.sg.] family, families, our family)

5. הנה הילדים של האנשים. הנה _____.

ילדים
ילדיי
ילדיהם
ילדות

Here are the people's children. Here is/Here are _____. (children, my children, their children, childhood)

6. הנה הכוס שלי. הנה _____.

כוסות
כוסי
כוסו
כוסה

Here is my cup. Here is/Here are _____. (cups, my cup, his cup, her cup)

7. יש לך שם. מה _____?

שמו
שמך
שמות
שמך

You (m.sg.) Have a name. What is/What are _____? (his name, your [f.sg.]name, names, your [m.sg.] name)

8. הוא עושה מצוות. מה _____?

מצוותם
מצוותיו
מצוות
מצוותנו

He does *mitzvot* (good deeds). What are _____? (their *mitzvot*, his *mitzvot*, *mitzvot*, our *mitzvot*)

Hebrew genitive constructs analogy task

Example 1. בני-ישראל ← בנים של ישראל
אלוקי-יצחק ← אלוקים של יצחק

banim shel Yisrael → *bney Yisrael*
elokim shel Yitzchak → *elokey Yitzchak*

("children of Israel",
"god of Isaac")

Example 2. כיפת-הילד ← כיפה של הילד
מורת-עברית ← מורה של עברית

kipah shel ha-yeled → *kipat ha-yeled*
morah shel ivrit → *morat ivrit*

("the boy's skullcap",
"teacher of Hebrew")

1. סיפורי-סבתא ← סיפורים של סבתא
עצי-שדה ← עצים של שדה

sipurim shel savta → *sipurey savta*
etzim shel sadeh → *atzey sadeh*

("Grandma's stories",
"trees of the field")

2. קריאת-התורה ← קריאה של התורה
תפילת-בוקר ← תפילה של בוקר

kriyah shel ha-torah → *kriyat ha-torah*
tfilah shel boker → *tfilat boker*

("reading of the Torah",
morning prayer")

3. שמחת-תורה ← שמחה של תורה
בית-ילדם ← בית של ילדם

simcha shel torah → *simchat torah*
bayit shel yeladim → *beyt yeladim*

("rejoicing of the Torah",
"children's house")

4. תפוחי-עץ ← תפוחים של עץ
ילדת-יום-הולדת ← ילדה של יום-הולדת

tapuchim shel etz → *tapuchey etz*
yaldah shel yom-huledet → *yaldat yom-huledet*

("apples of the tree"
"birthday girl")

5. מגילה של אסתר ← מגילת-אסתר
אהבה של ישראל ← אהבת-ישראל

megilat ester → *megilah shel ester*
ahavat yisrael → *ahava shel yisrael*

("Esther's scroll"
"love of Israel")

6. העיניים של המורה ← עיני-המורה
הידיים של הילד ← ידי-הילד

ha-enayim shel ha-morah → *eney-ha-morah*
ha-yadayim shel ha-yeled → *yadey-ha-yeled*

("the teacher's eyes",
"the boy's hands")

7. ימים של השבוע	←	ימי-השבוע
עוגה של שוקולד	←	עוגת-שוקולד
yamim shel ha-shavua	→	*yamey-ha-shavua*
ugah shel shokolad	→	*ugat-shokolad*

("days of the week",
"cake of chocolate ")

8. הדלקה של נרות	←	הדלקת-נרות
נעליים של דוד	←	נעליי-דוד
hadlaka shel nerot	→	*hadlakat-nerot*
na'alayim shel david	→	*na'aley-David*

("lighting of candles",
"David's shoes")

Hebrew Word Analogy task

Example 1.

לעמוד	←	עומד
לעבוד	←	עובד
omed	→	*la'amod*
oved	→	*la'vod*
stands	→	to stand
works	→	to work

Example 2.

קריאה	←	קורא
שתיה	←	שותה
koreh	→	*kriyah*
shoteh	→	*shtiyah*
reads	→	reading (n.)
drinks	→	drink (n.)

1.

מספר	←	סיפור
מדבר	←	דיבור
sipur	→	*mesaper*
dibur	→	*medaber*
story	→	tells
speech	→	speaks

2.

לומד	←	תלמיד
עובד	←	עבד
talmid	→	*lomed*
eved	→	*oved*
pupil	→	learns
slave	→	works

3.

הליכה	←	הולך
עליה	←	עולה
holech	→	*halichah*
oleh	→	*aliyah*
walks	→	walking (n.)
goes up	→	going up (n.)

4.

אמר	←	אומר
הלך	←	הולך
omer	→	*amar*
holech	→	*halach*
says	→	said
goes	→	went

5.

גדול	←	מגדל
קדוש	←	מקדש
megadel	→	*gadol*
mekadesh	→	*kadosh*
grows	→	big
sanctifies	→	holy

6.

חוכמה	←	חכם
שמחה	←	שמח
chacham	→	*chochmah*
sameach	→	*simchah*
clever	→	cleverness
happy	→	happiness

7.

להדליק	←	הדלקה
לקרוא	←	קריאה
lehadlik	→	*hadlakah*
likroa	→	*kriyah*
to light	→	lighting (n.)
to read	→	reading (n.)

8.

לימוד	←	ללמוד
עבודה	←	לעבוד
limud	→	*lilmod*
avodah	→	*la'avod*
study (n.)	→	to study
work (n.)	→	to work

Sentences for the two Hebrew spelling tasks

1. הילד רוחץ את ידיו.
2. הילדה מתרחצת.
3. העבדים עבדו.
4. ברוך ה' אשר צונו על מצות-ציצית.
5. הוא נועל את נעליו.
6. אמא שלך כותבת מכתב.
7. אבא מברך את ברכת-המזון.
8. כולנו יודעי שמך ולומדי תורתך.
9. הילדים אומרים שלום.
10. ויאמר ה' לנח בא אל התיבה.
11. אח שלך רוצה לבא.

English translation

1. The boy washes his hands.
2. The girl washes herself.
3. The slaves worked.
4. Blessed art thou God who has commanded us to wear fringes (on our garments).
5. He puts on his shoes.
6. Your mother is writing a letter.
7. Daddy says Grace After Meals.
8. We all know Your name and learn Your Torah.
9. The children say hello/goodbye.
10. God said to Noah go to the ark.
11. Your brother wants to come.

1. הם אנחנו הוא אני

אתה
שלי
עלינו
לך

2. שלו שלך שלנו שלי

שלום
שלהם
שלג
שלוש

3. אוהב בא יודע מדבר

שולחן
כותב
אח
כיתה

4. לילה מורה ראש ילד

טלית
מדליק
מדבר
עומד

5. להדליק ללמוד לעשות לגור

לילה
לב
לשבת
לוח

6. טוב רשע יפה חם

חדש
כיפה
יד
יום

7. תורה תפוח בית בוקר

עץ
טוב
גדול
קשה

8. מדבר מברך מתפלל קורא

קטן
יושב
קר
מהר

English translation of Hebrew Rows task

1. they we he I

you
my
on us
to you

2. his yours ours mine

hello/goodbye
theirs
snow
three

3. loves comes knows speaks

table
writes
brother
class

4. night teacher head child

tallit (fringed garment)
lights (v.)
speaks
stands

5. to live to do to learn to light

night
heart
to sit
blackboard

6. hot beautiful evil good

new
skullcap
arm
day

7. morning house apple Torah

tree
good
big
hard

8. reads prays blesses speaks

small
sits
cold
quick

APPENDIX V

DISTRIBUTIONS OF SCORES AND DESCRIPTIVE STATISTICS FOR TASKS USED IN STUDY 2

Mean scores (*SD*) on the English Word Analogy task, by school year

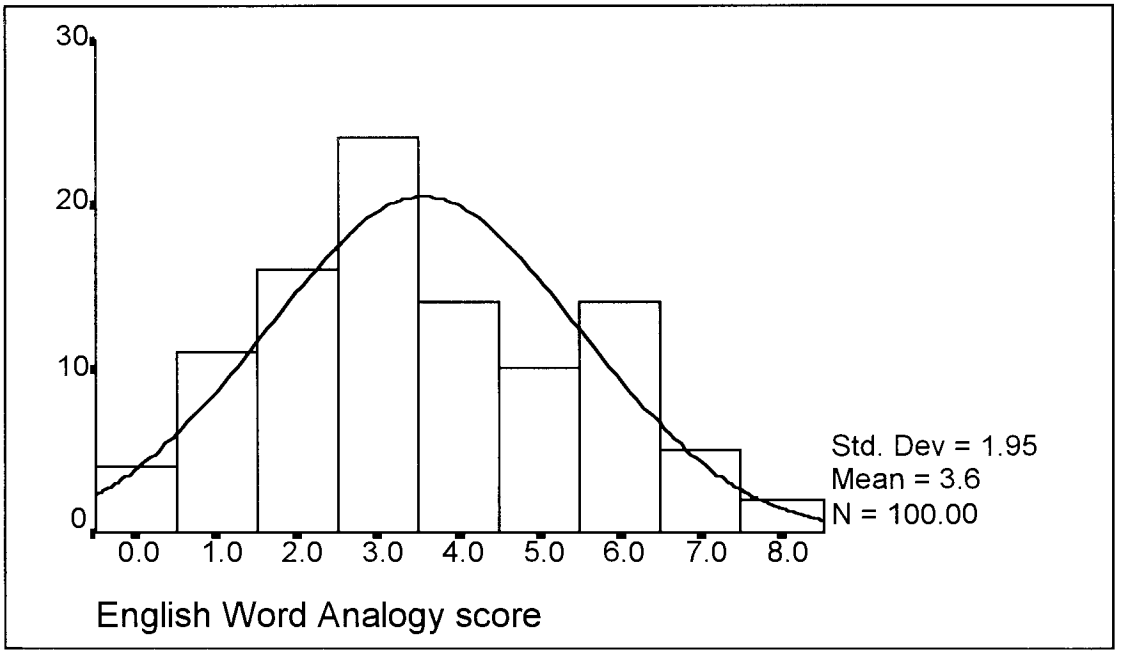
Year	$\bar{x}$	n
3	2.5 (1.7)	15*
4	2.8 (1.9)	30
5	4.0 (1.8)	28
6	4.6 (1.7)	27

*The number of children shown for Year 3 (n=15) is smaller than for the other Year groups because in School 2, Year 3 children did not carry out the task.

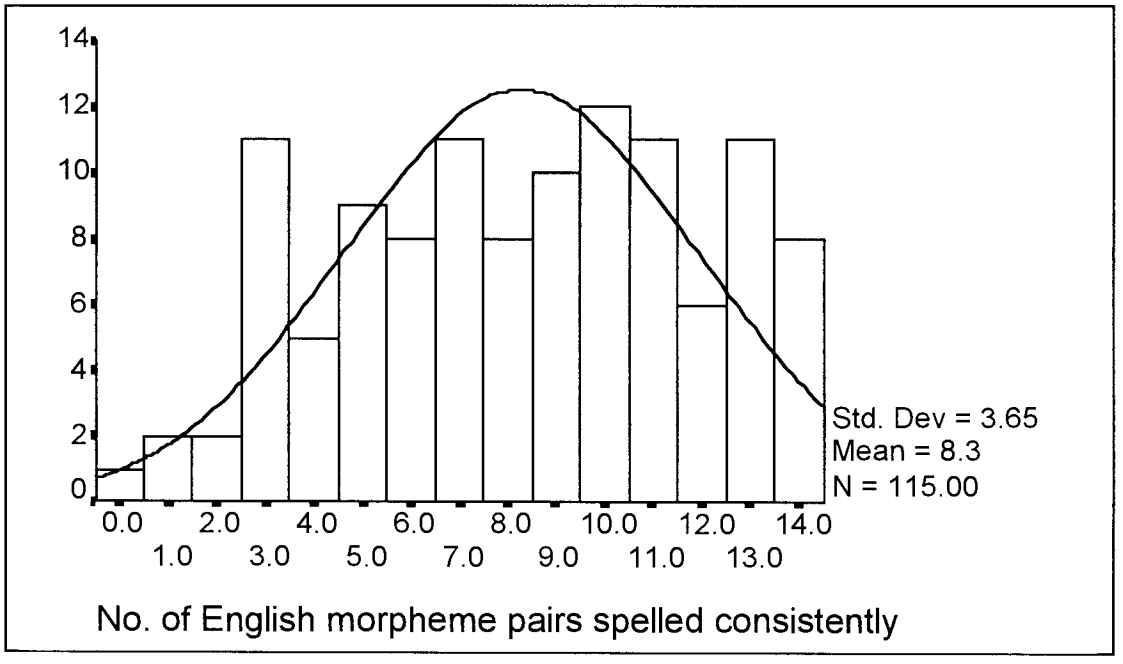
Mean no. (*SD*) of English morpheme pairs spelled consistently, by school year

Year	$\bar{x}$	n
3	5.6 (3.0)	30
4	7.8 (2.9)	30
5	8.5 (3.7)	28
6	11.6 (2.2)	27

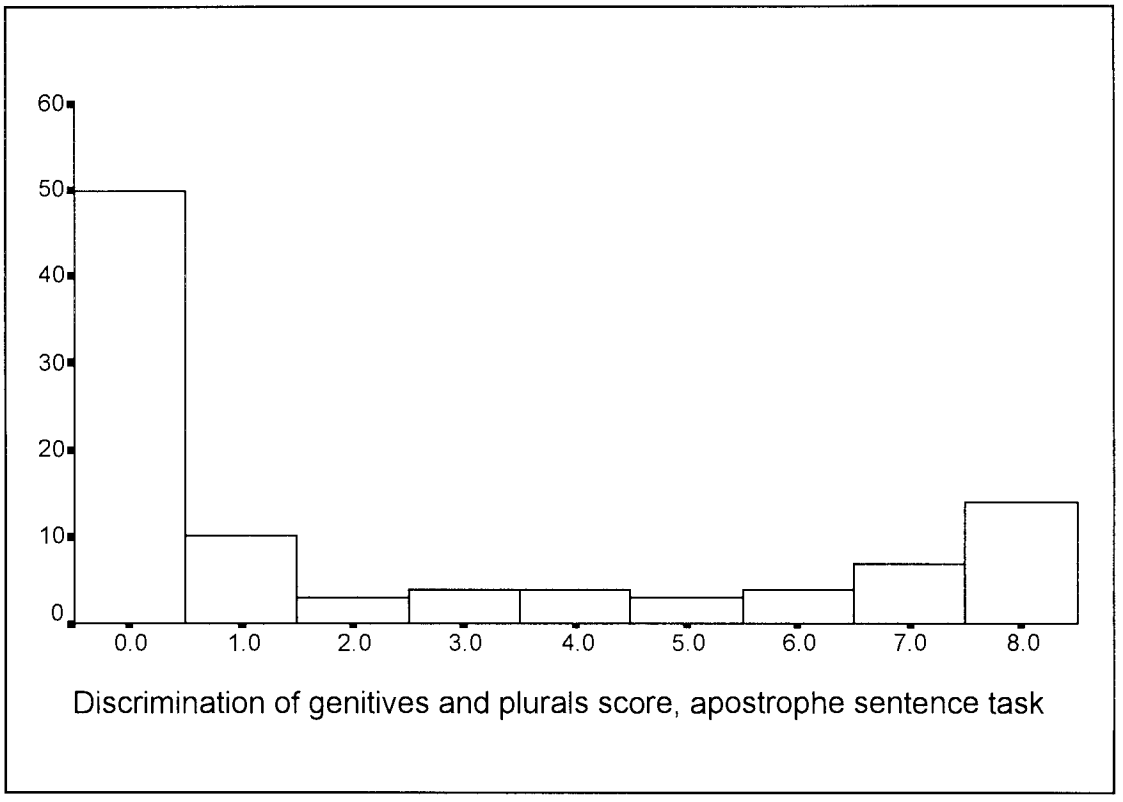
Distribution of scores on the English Word Analogy task



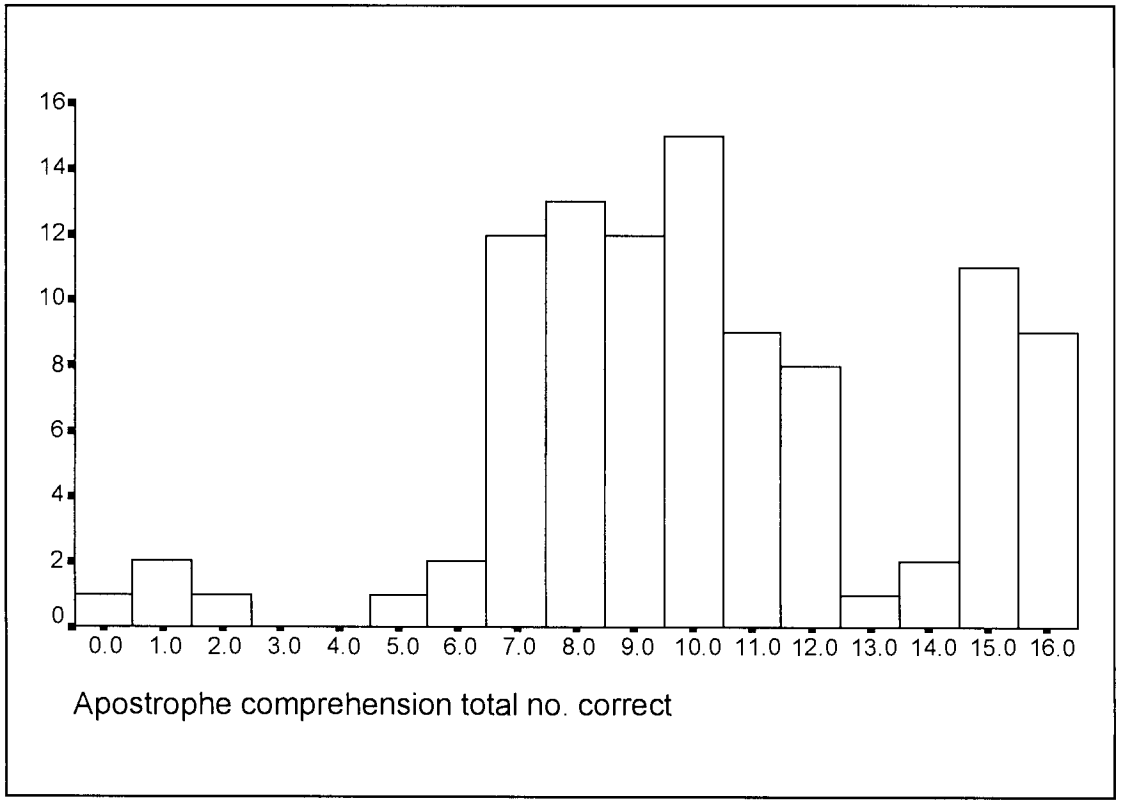
Distribution of scores on the English consistency in spelling morphemes task



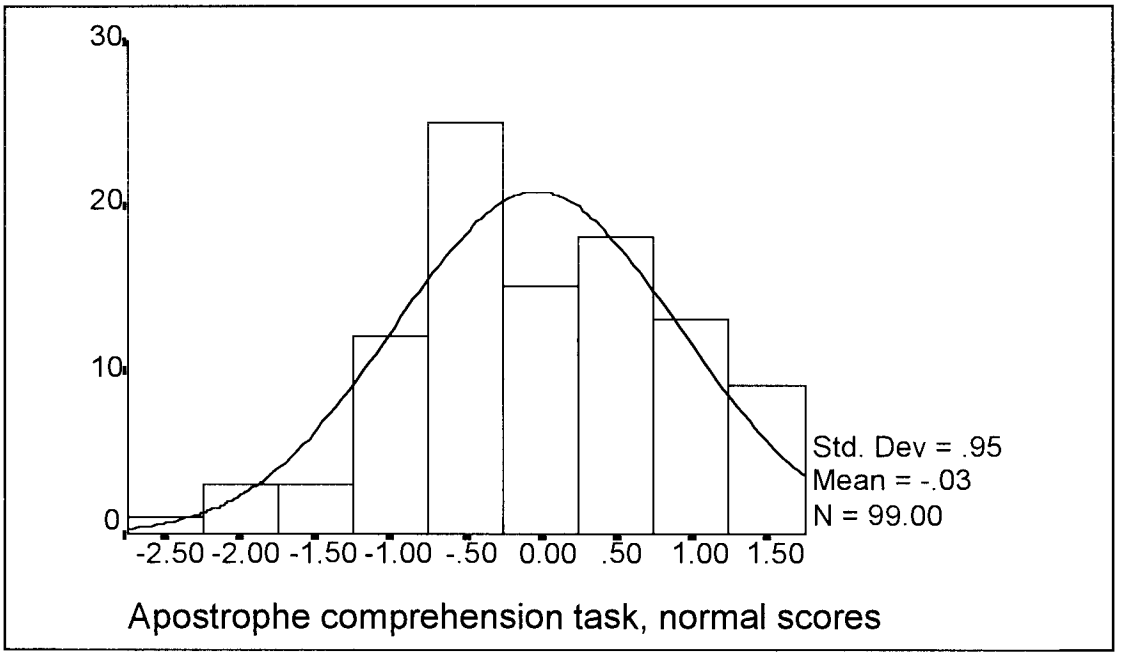
Distribution of scores on the apostrophe sentence task, 'discrimination' score



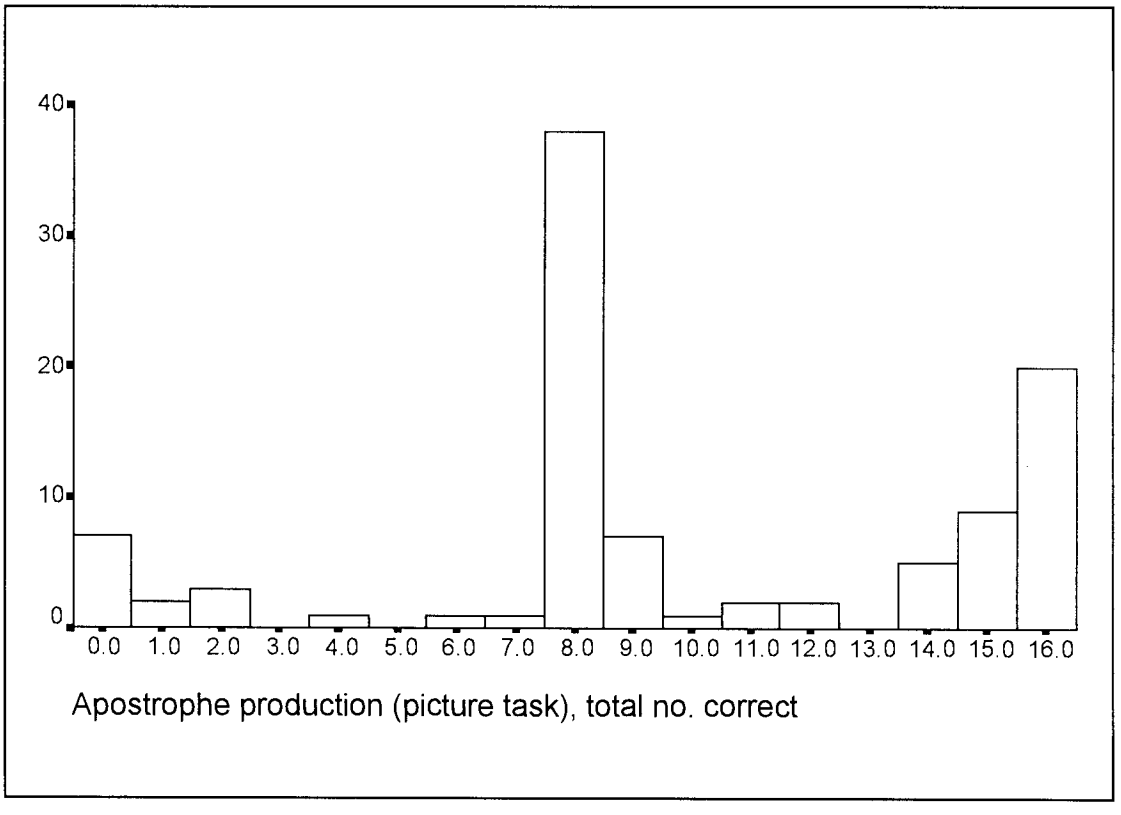
Distribution of scores on the apostrophe comprehension task



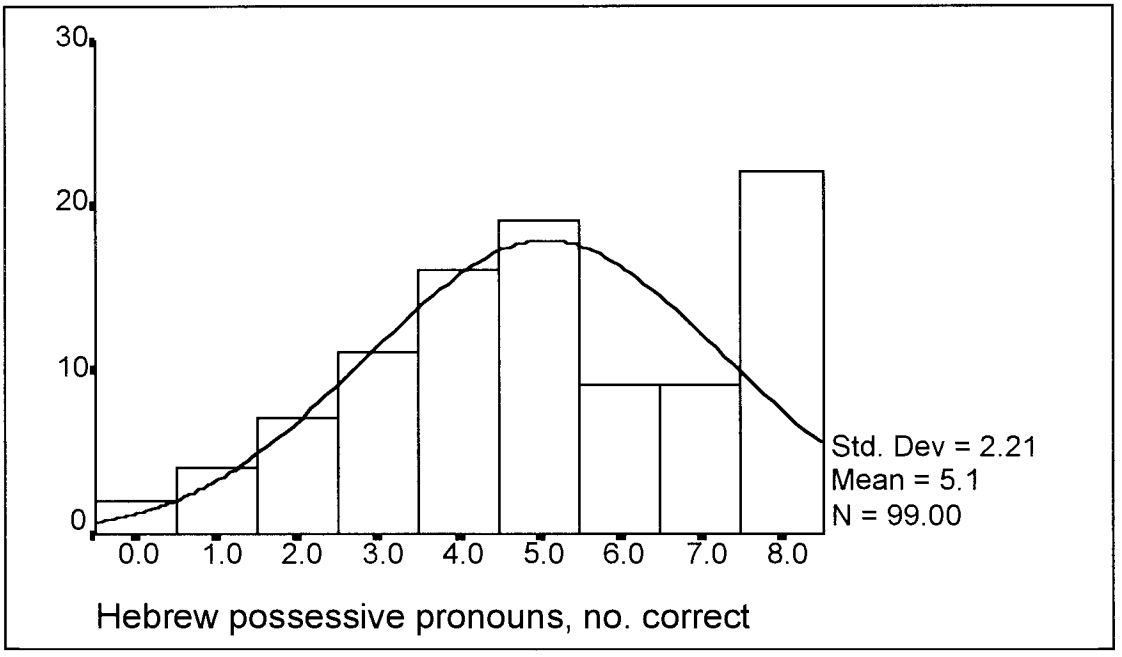
Distribution of scores on the apostrophe comprehension task, transformed normal scores



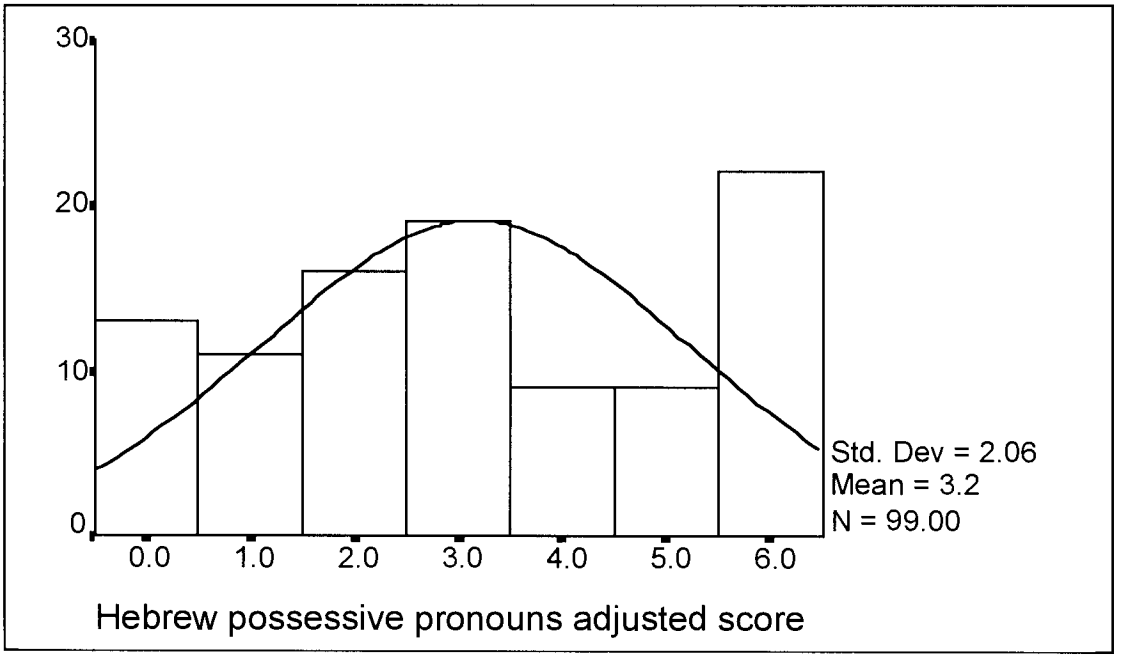
Distribution of scores on the apostrophe production task



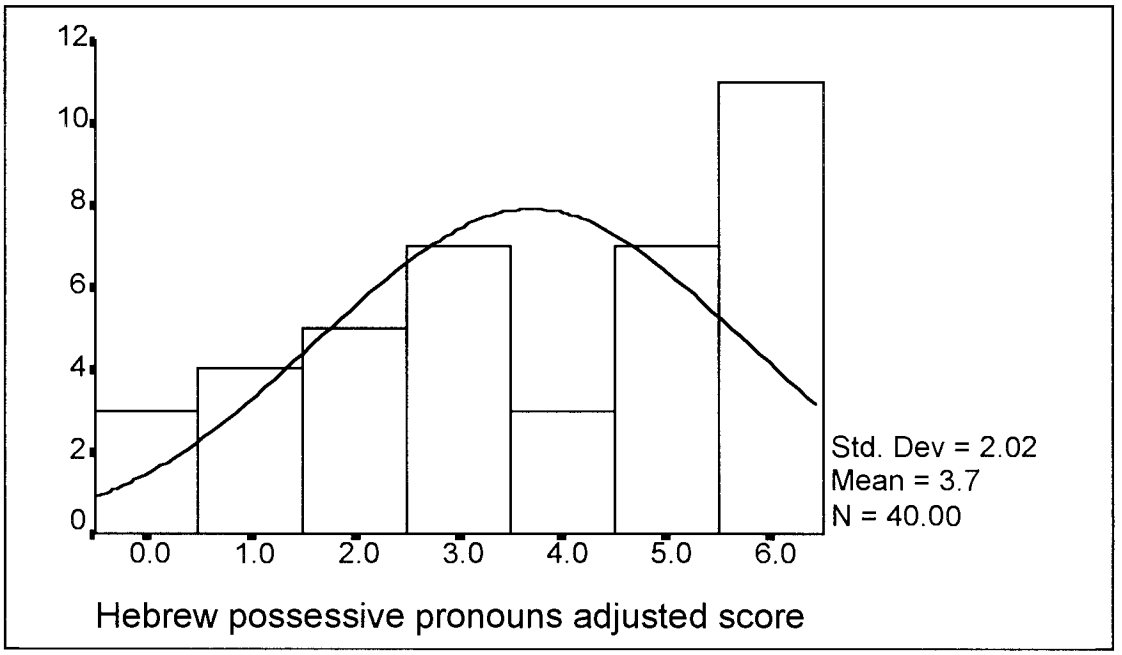
Distribution of scores on the comprehension of Hebrew possessive pronoun suffixes task, total no. correct (both schools)



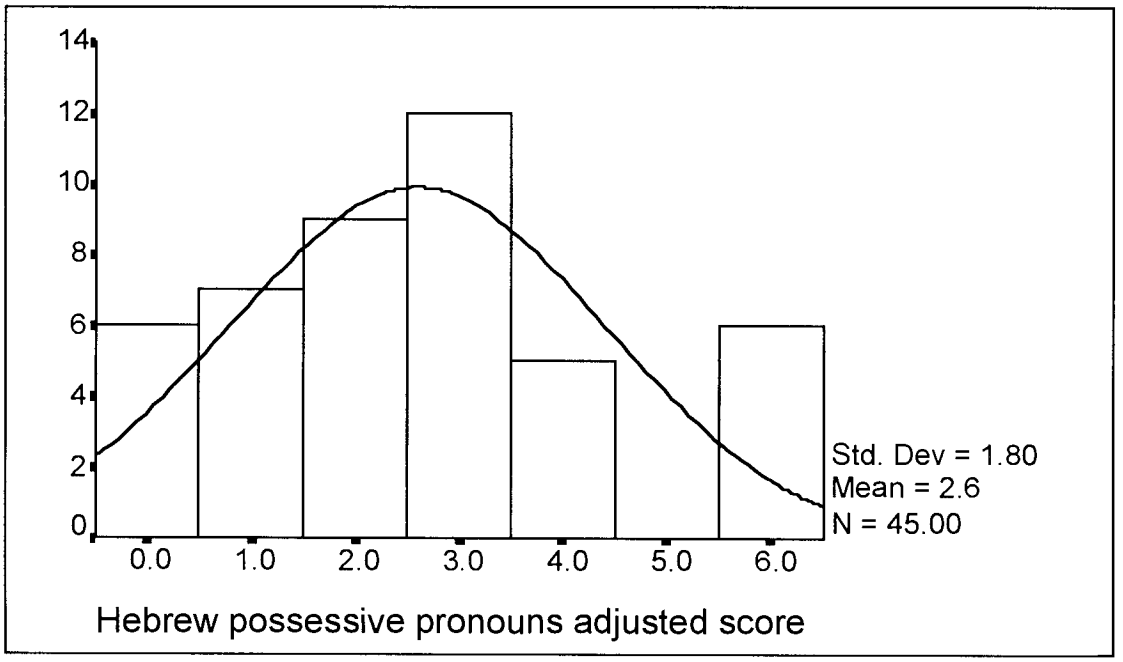
Distribution of scores on the comprehension of Hebrew possessive pronoun suffixes task, score adjusted for chance (all children)



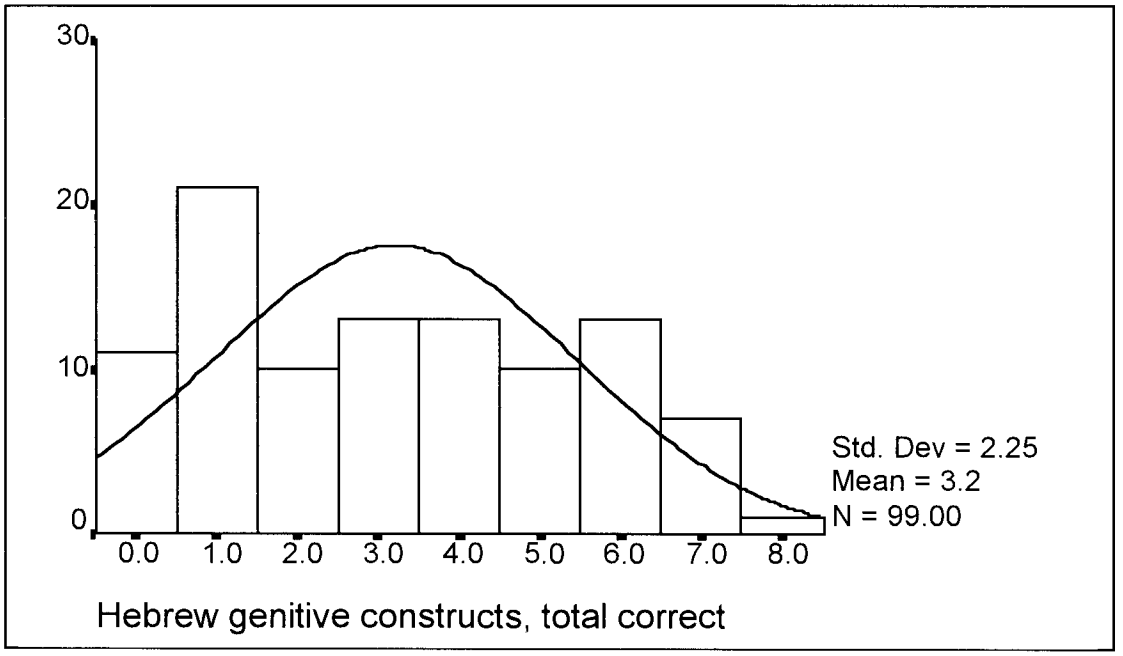
Distribution of scores on the Hebrew comprehension of possessive pronouns task, School 1 (Years 4,5,6)



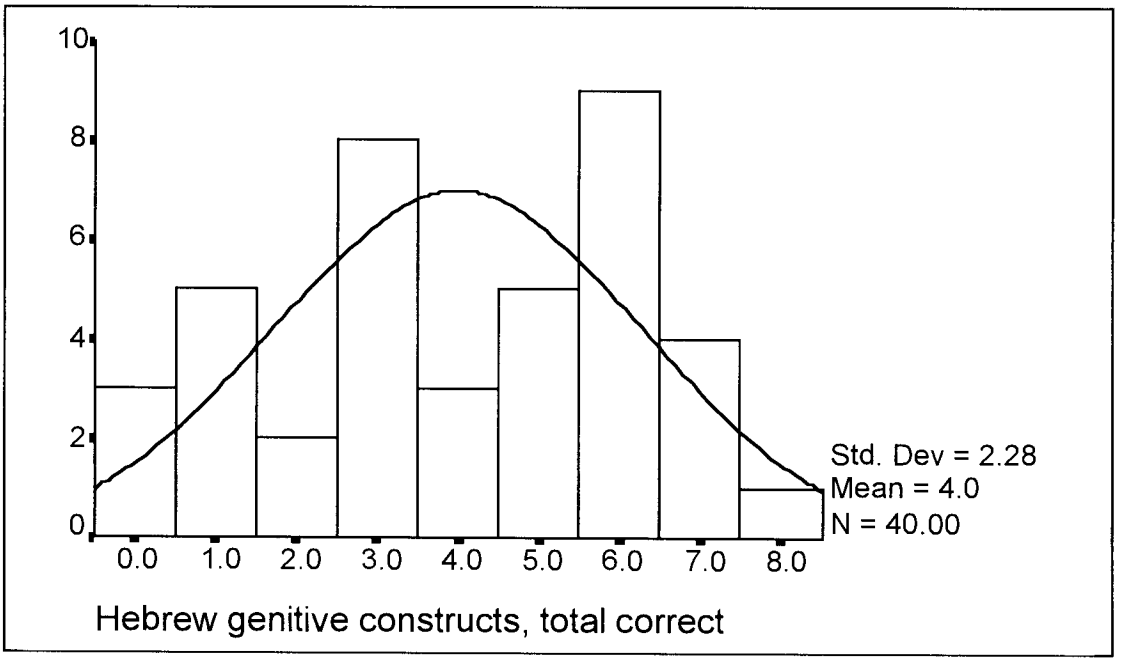
Distribution of scores on the Hebrew comprehension of possessive pronouns task, School 2 (Years 4,5,6)



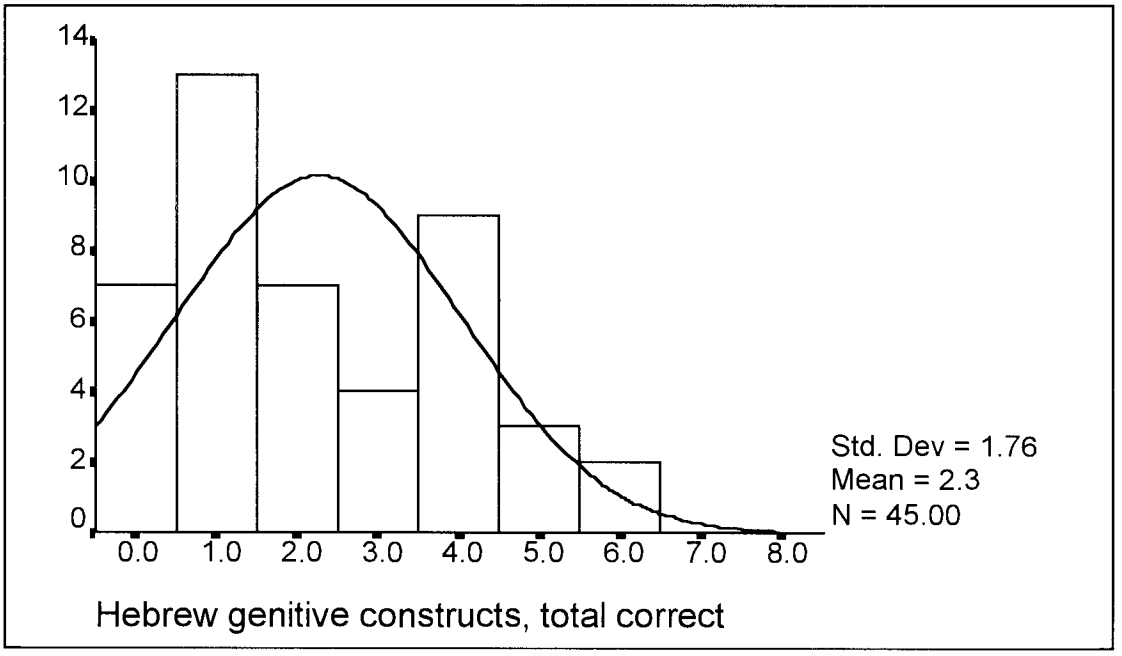
Distribution of scores on the Hebrew genitive constructs analogy task (both schools)



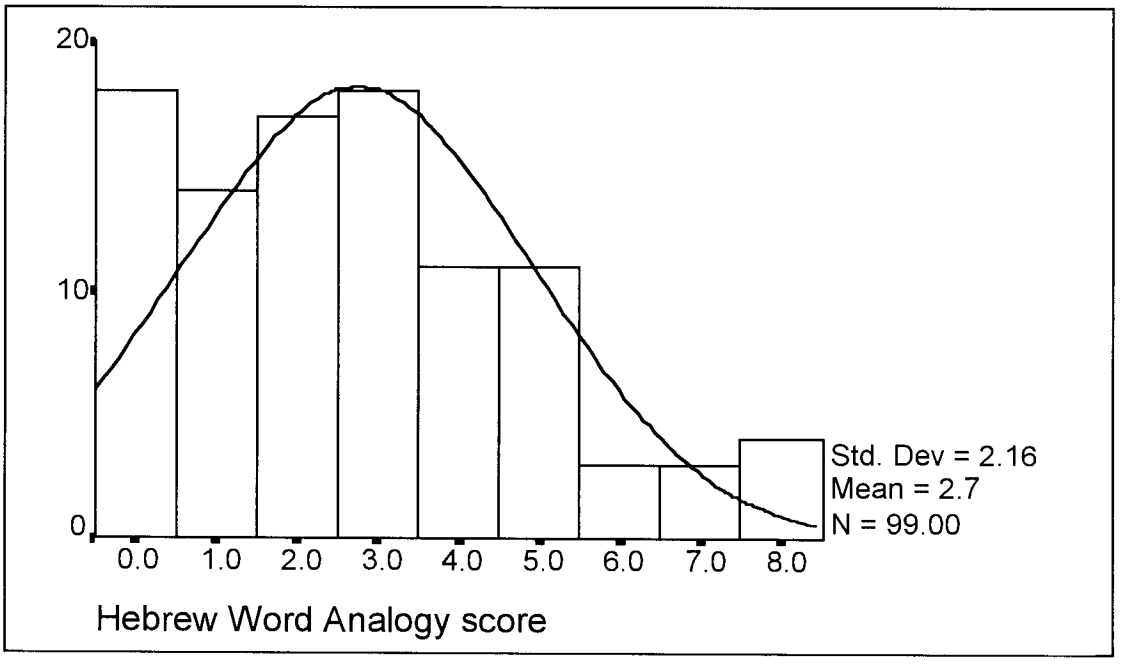
Distribution of scores on the Hebrew genitive constructs analogy task, School 1 (Years 4,5,6)



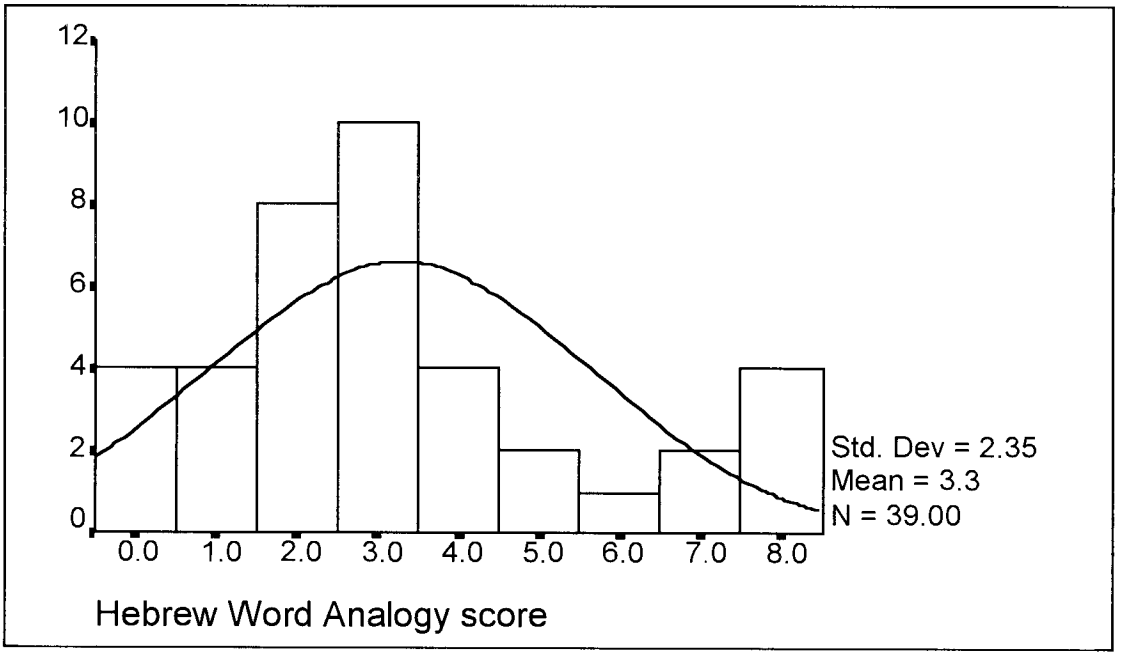
Distribution of scores on the Hebrew genitive constructs analogy task, School 2 (Years 4,5,6)



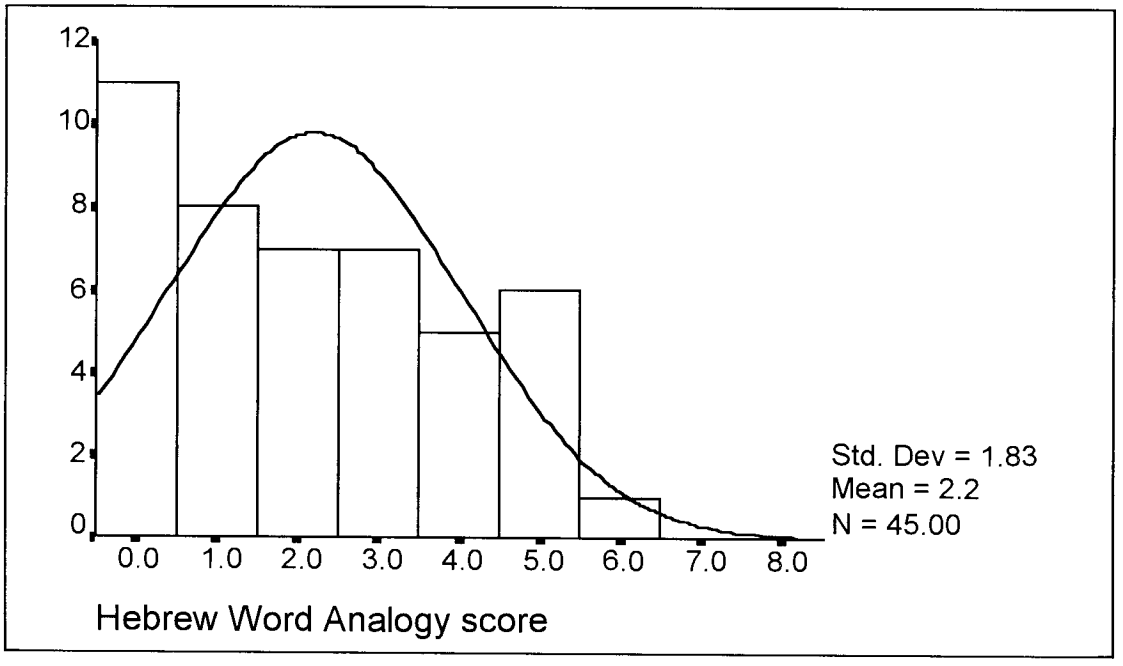
Distribution of scores on the Hebrew Word Analogy task (both schools)



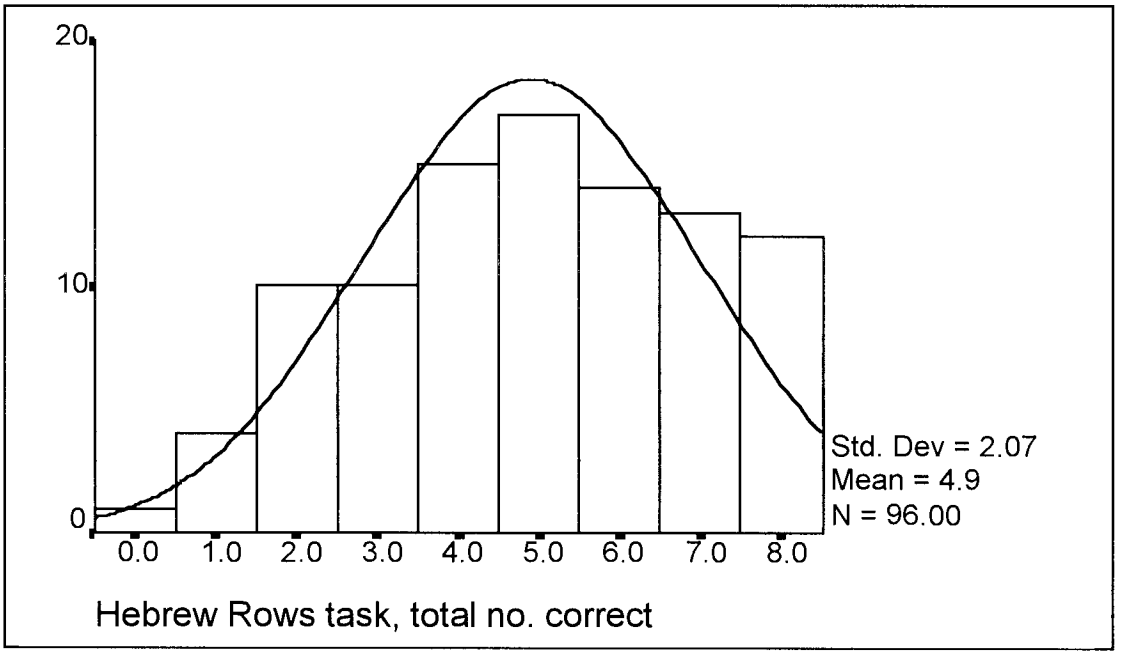
Distribution of scores on the Hebrew Word Analogy task (School 1, Years 4,5,6)



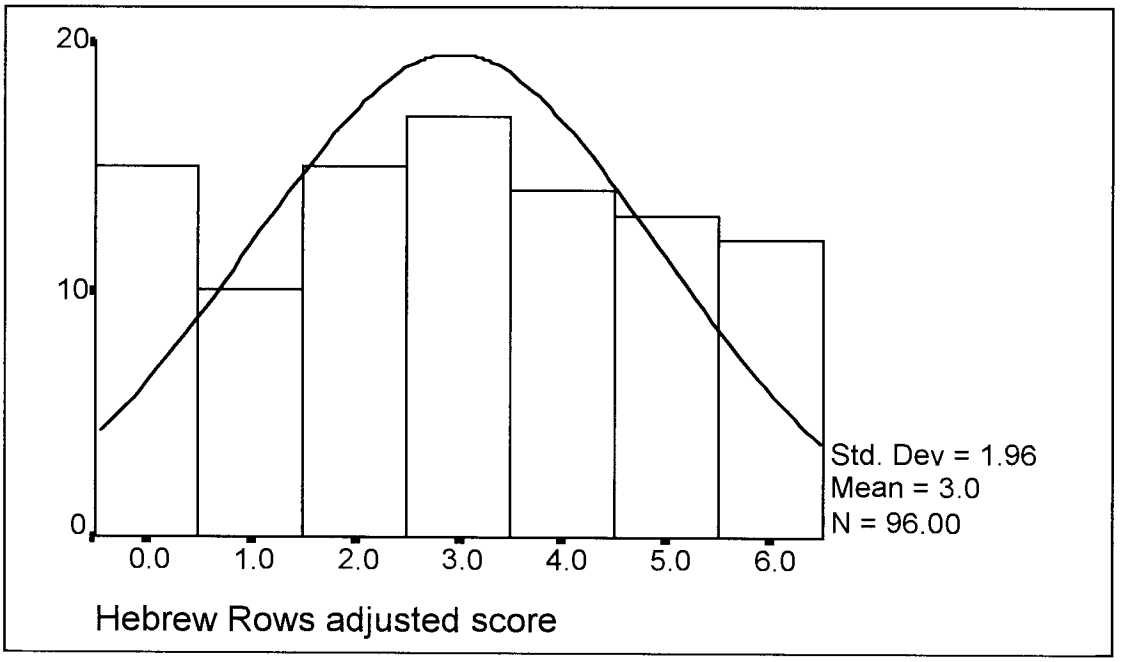
Distribution of scores on the Hebrew Word Analogy task (School 2, Years 4,5,6)



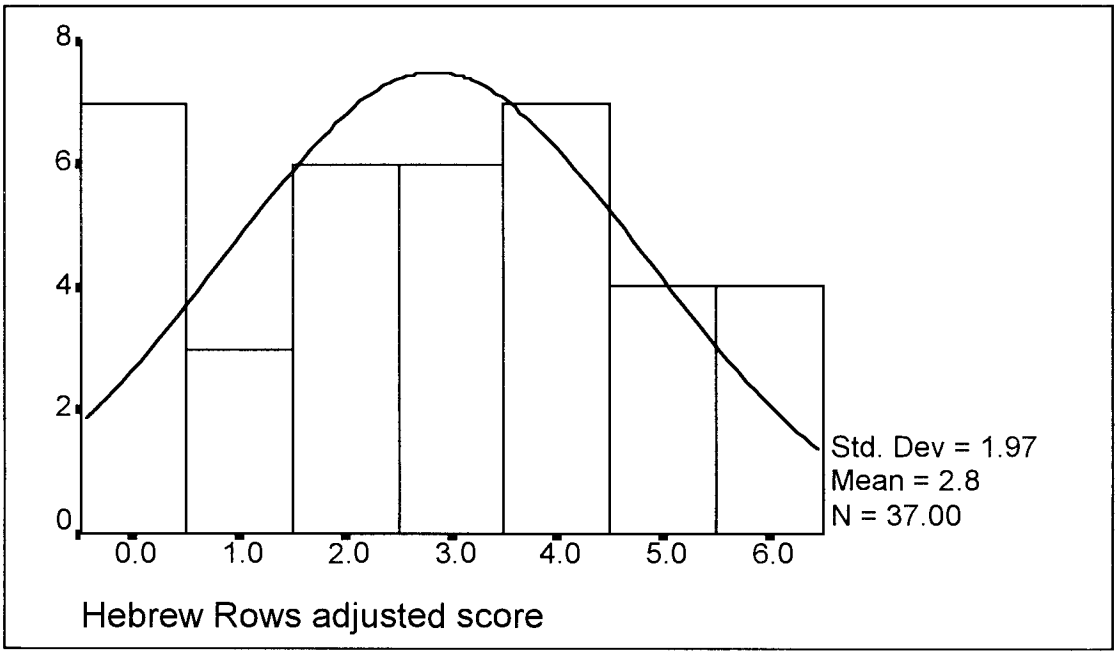
Distribution of scores on the Hebrew Rows task, total no. correct (both schools)



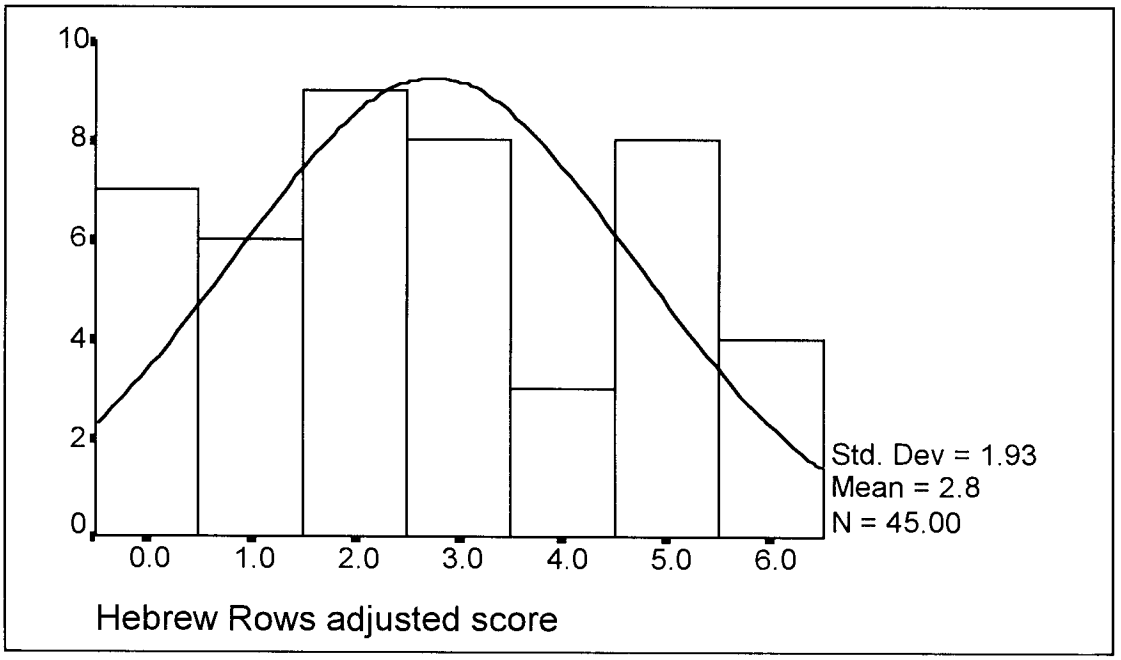
Distribution of scores on the Hebrew Rows task, score adjusted for chance (both schools)



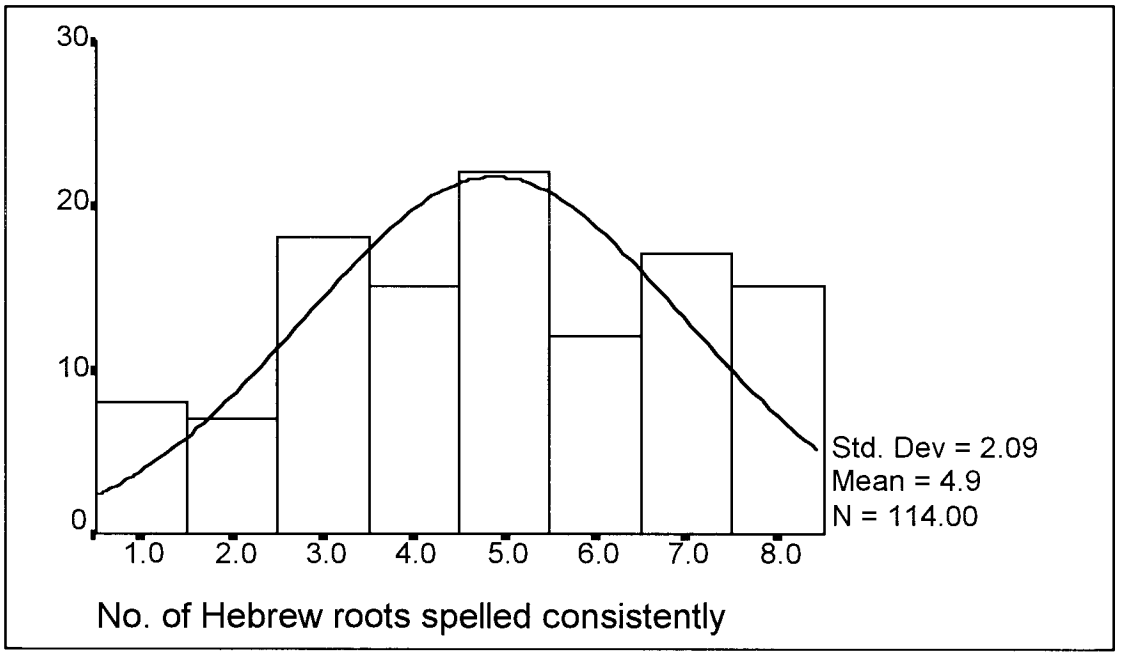
Distribution of scores on the Hebrew Rows task, score adjusted for chance (School 1, Years 4,5,6)



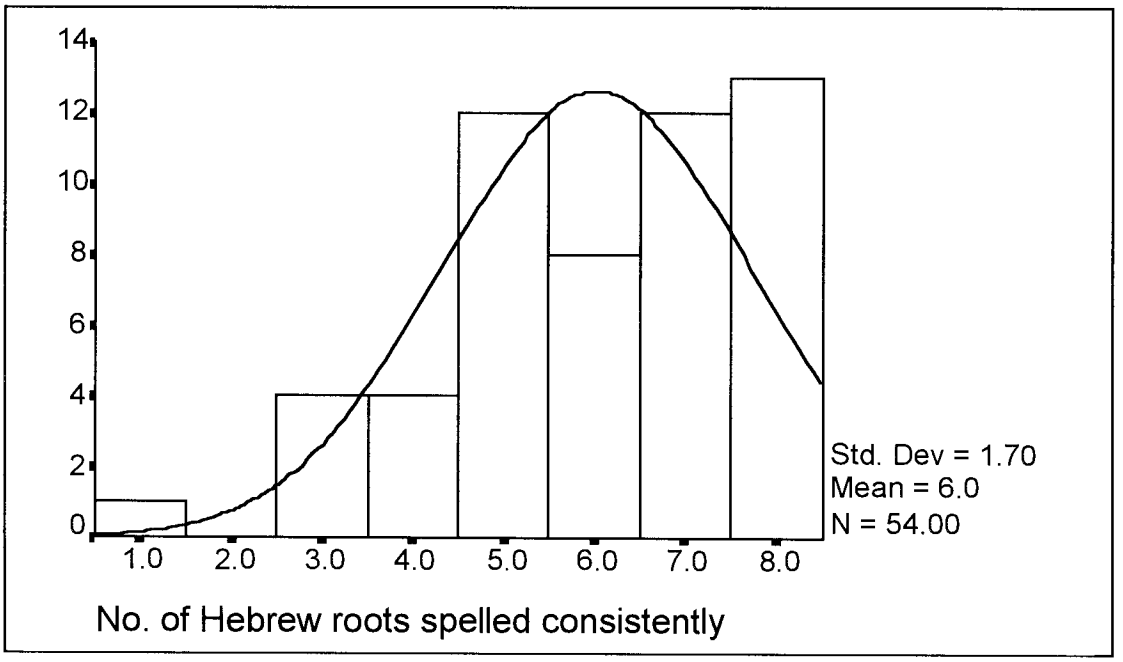
Distribution of scores on the Hebrew Rows task, score adjusted for chance (School 2, Years 4,5,6)



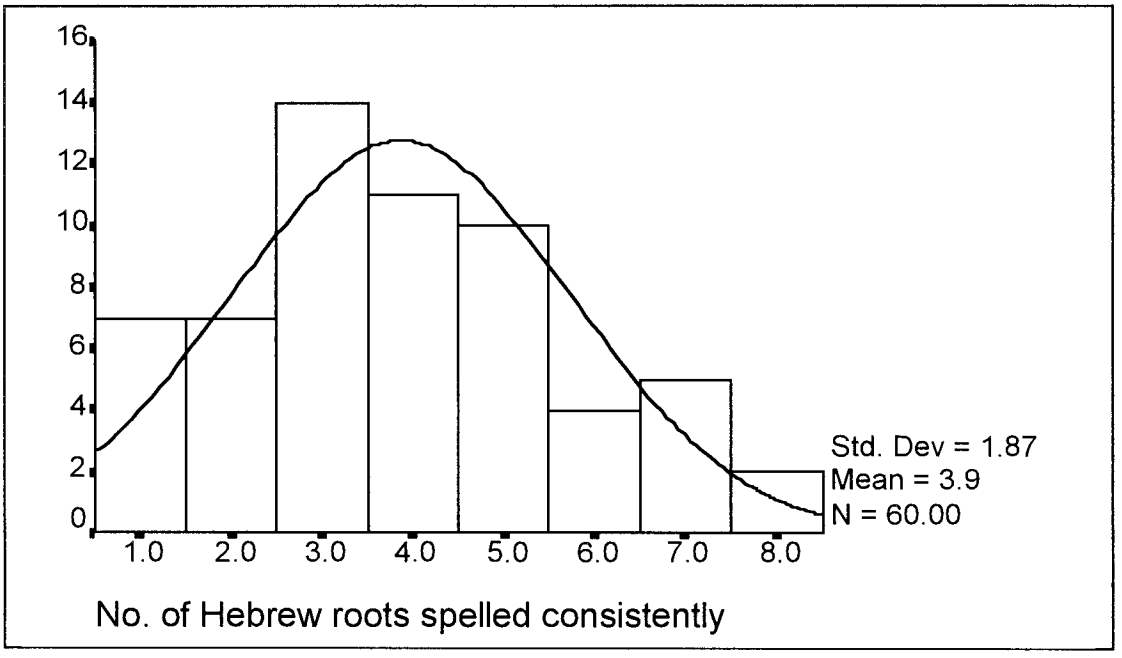
Distribution of scores on the Hebrew consistency in spelling roots task, both schools



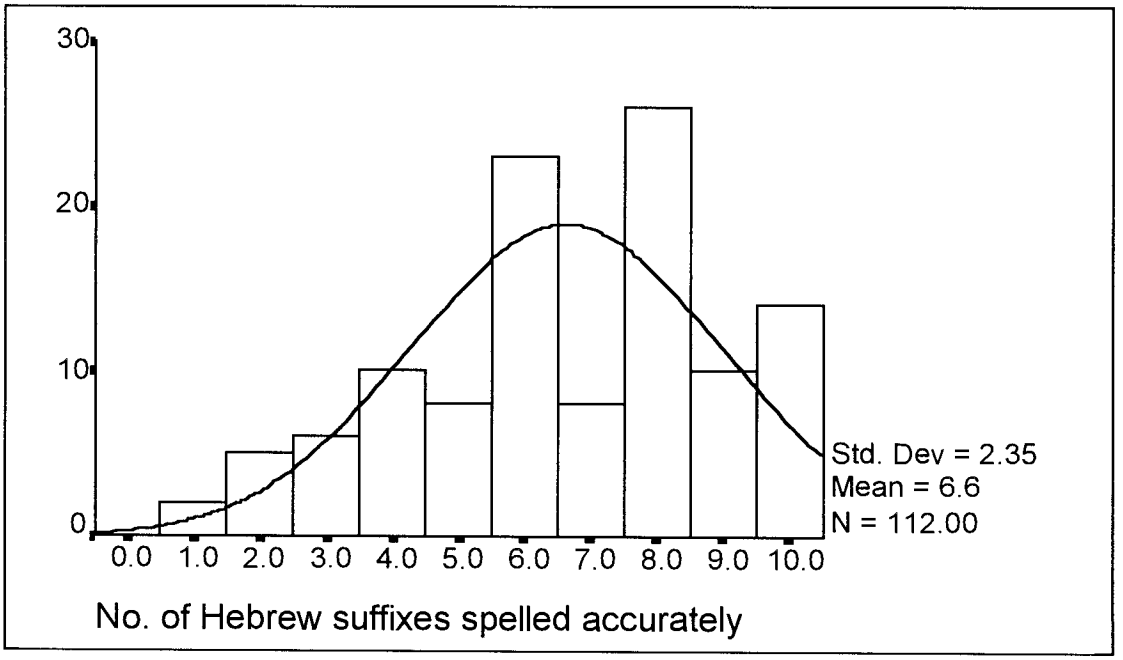
Distribution of scores on the Hebrew consistency in spelling roots task, School 1



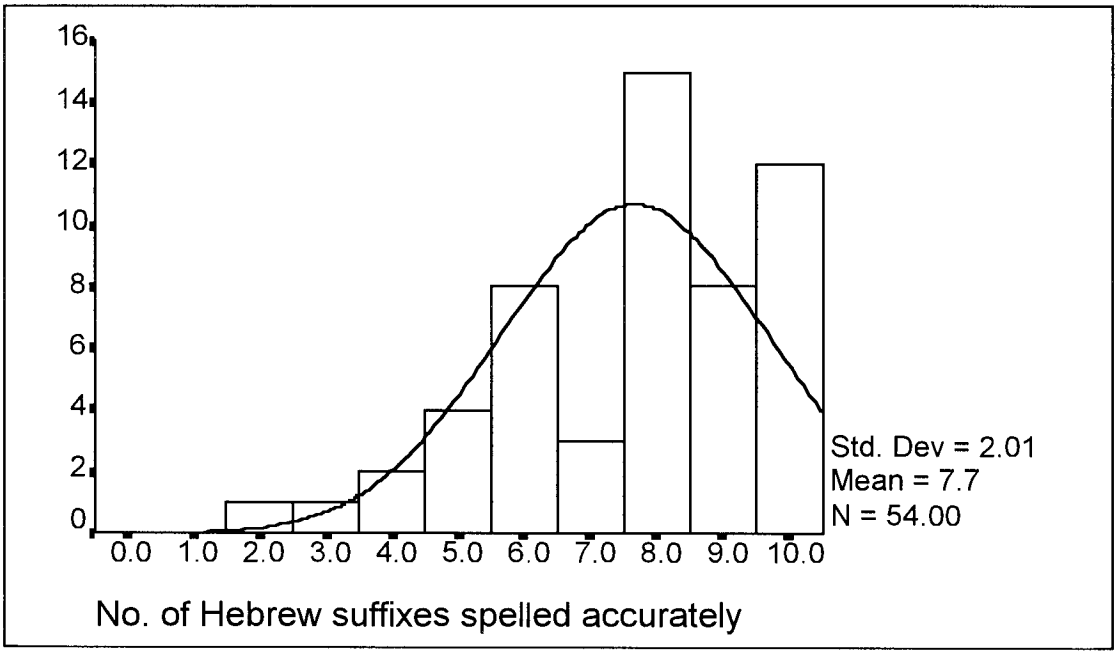
Distribution of scores on the Hebrew consistency in spelling roots task, School 2



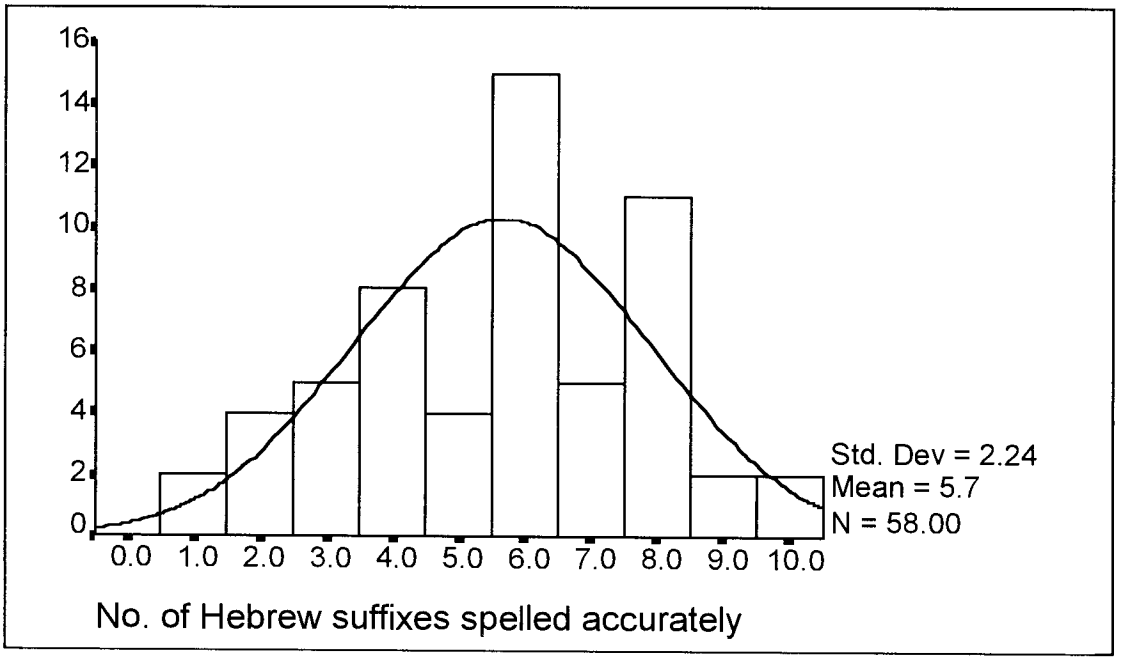
Distribution of scores on the accuracy in spelling Hebrew possessive suffixes task, both schools



Distribution of scores on the accuracy in spelling Hebrew possessive suffixes task, School 1



Distribution of scores on the accuracy in spelling Hebrew possessive suffixes task, School 2



APPENDIX VI

RESULTS OF STUDY 2

Summary of fixed-order multiple regression analysis measuring the relation between performance on English Word Analogy and comprehension of apostrophe (normal score; n=99)

	Variable	R^2 change	B	S.E. B	β
Step 1	Age	.07**	.02*	.01	.25
Step 2	WISC-III Vocab	.06*	.05	.03	.17
Step 3	School	.04*	.45*	.18	.24
Step 4	English Word Analogy	.03	.10	.06	.20

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order multiple regression analysis measuring the relation between performance on Hebrew genitive constructs and comprehension of apostrophe (normal score; n=99)

	Variable	R^2 change	B	S.E. B	β
Step 1	Age	.07**	.02**	.01	.31
Step 2	WISC-III Vocab	.06*	.06	.03	.18
Step 3	School	.04*	.21	.20	.11
Step 4	Hebrew genitive constructs	.04*	.10*	.04	.24

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order multiple regression analysis measuring the relation between performance on Hebrew comprehension of possessive suffixes and comprehension of apostrophe (normal score; n=99)

	Variable	R^2 change	B	S.E. B	β
Step 1	Age	.07**	.02**	.01	.31
Step 2	WISC-III Vocab	.06*	.07*	.03	.22
Step 3	School	.04*	.30	.19	.16
Step 4	Hebrew possessive suffixes	.03	.08	.05	.18

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order logistic regression analysis measuring the relation between performance on English Word Analogy and apostrophe production (picture task; n=99)

	Variable	χ^2	B	S.E. B	Wald statistic
Step 1	Age	5.79*	.03	.02	1.95
Step 2	WISC-III Vocab	15.29***	.21	.10	4.24*
Step 3	School	.21	-.44	.49	.78
Step 4	English Word Analogy	7.2**	.41	.16	6.56*

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order logistic regression analysis measuring the relation between performance on Hebrew genitive constructs and apostrophe production (pictures) tasks (n=99)

	Variable	χ^2	B	S.E. B	Wald statistic
Step 1	Age	5.79*	.05	.02	6.74**
Step 2	WISC-III Vocab	15.29***	.27	.1	7.65**
Step 3	School	.21	.17	.53	.1
Step 4	Hebrew genitive constructs	2.85	.20	.12	2.78

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order logistic regression analysis measuring the relation between performance on Hebrew comprehension of possessive suffixes and apostrophe production (pictures) tasks (n=99)

	Variable	χ^2	B	S.E. B	Wald statistic
Step 1	Age	5.79*	.05	.02	7.20**
Step 2	WISC-III Vocab	15.29***	.30	.10	9.92**
Step 3	School	.21	.06	.49	.01
Step 4	Hebrew possessive suffixes	1.29	.13	.12	1.27

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order regression analysis measuring the relationship between consistency in spelling Hebrew roots and consistency in spelling English stems

	Variable	R^2 change	B	SE B	β
(n=114)					
Step 1	Age	.34****	.13****	.02	.52
Step 2	WISC-III Vocab	.07***	.18*	.08	.16
Step 3	School	.01	2.3***	.58	.31
Final Step	Hebrew Roots	.12****	.75****	.14	.43

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order regression analysis measuring the relationship between accuracy in spelling Hebrew suffixes indicating possession and English apostrophe comprehension, normal score

	Variable	R^2 change	B	SE B	β
(n=96)					
Step 1	Age	.07**	.02**	.01	.29
Step 2	WISC-III Vocab	.05*	.06*	.03	.20
Step 3	School	.05*	.26	.21	.13
Final Step	Hebrew possessive suffix spelling	.04*	.09*	.05	.22

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

Summary of fixed-order logistic regression analysis measuring the relation between performance on Hebrew spelling of possessive suffixes and apostrophe production tasks (n=96)

	Variable	χ^2	B	S.E. B	Wald statistic
Step 1	Age	5.2*	.04	.02	4.4
Step 2	WISC-III Vocab	17.53****	.32	.11	9.0
Step 3	School	.75	.28	.57	.25
Step 4	Hebrew spelling	8.94**	.38	.14	7.56

Note: *=p<0.05, **=p<0.01, ***=p<0.001, ****=p<0.0001

APPENDIX VII

Written report on the aims and general results of Study 1, sent to the two Jewish schools and distributed among the teachers

Can learning Hebrew improve children's English language and literacy?

Miriam Bindman

Child Development and Learning, Institute of Education, University of London

Introduction

The Hebrew language is an integral part of our Jewish religious and cultural heritage, and teaching Hebrew to children has a vital role to play in Jewish education. Hebrew learning is a valuable goal in itself. However, research on second language learning shows that there may be a further bonus of learning Hebrew: the effect it has on children's language development.

There are many research studies which show that learning a second language helps children to think about language and how it works as system of rules. Even when two languages are unrelated and seem very different, children can transfer their language knowledge from one to the other. For example, research in various languages (e.g. Hebrew and English; Arabic and French) has shown that children who have learned to read in one alphabet can use this knowledge to help them to learn to read in another alphabet, even when these alphabets seem very dissimilar. They can apply what they have learned about how alphabets work to help them learn to read a second alphabet.

In my study, I investigated whether learning Hebrew helps children to think about the relationships between words, and whether in turn, this can help them become aware of similar word relationships in English. The study of this aspect of language is called morphology. Awareness of Hebrew morphology might also benefit children's spelling in English, because in English spelling, morphology is quite important. An example of Hebrew morphology is the Hebrew root (*shoresh*). In Hebrew, words which share the same three consonant root are related in meaning, even when they sound quite different from each other. For example, from the root כ.ת.ב (writing) come such different words as כותב (*kotev*: he writes) and מכתב (*michtav*: a letter). Even though these words sound quite different from each other, they are spelled with the same consonants in Hebrew because they come from the same root.

How could knowing about Hebrew roots possibly help children with English spelling? In English, we do not have three consonant roots. Yet, the concept that words which share meaning also share spelling applies to English too. For example, *know* and *knowledge* are spelled the same in the stem because their meanings are related. Knowing the spelling of one can help you to spell the other, if you understand the connection between the two words. In this way, English is similar to Hebrew. Learning about Hebrew roots might therefore make children reflect upon the connections between related words, and this in turn could improve their English spelling.

Method

In total, 116 children from two Jewish schools took part in my study. All of them spoke only English at home, and were between the ages of six and eleven. Hebrew teaching was slightly different in the two schools in that one school allocated more time to Ivrit in the timetable, and so the children's level of spoken Hebrew was higher in this school.

I worked with the children one-to-one, away from the classroom, on two separate occasions. First, I gave them tasks to do in English, and second, in Hebrew. They were told this was not a test and they would not get a mark (unless they really wanted one!), and that the purpose of working with me was to help me find out about how children learn languages.

In English, the children were asked to spell some words which are not spelled exactly the way they sound. Correct spelling of these words requires some understanding of word relations. A number of the words were connected in meaning and therefore shared stems (e.g. *know* and *knowledge*). Some of these spellings might have been learned by rote, and the child might not really understand that words which share meaning often share spelling. So, as well as the stems of real words, I gave the children some made-up 'dinosaur' names to spell. The child was shown a picture of, for example, a 'knotosaurus' (a cartoon dinosaur with a knot in its neck - see picture on last page) and had to try and spell its name. Some time earlier in the session, the child was asked to spell 'knot'. If the child understood that because the words meant similar things their spellings must be similar, then they wrote the beginning of 'knotosaurus' in the same way as they had written 'knot'. The rest of the words were given to test whether the child correctly used the 'ed' ending on past tense regular verbs (e.g. laughed) but not on other kinds of words which ended with a similar sound (e.g. soft).

They then played four different oral word games, designed to tap how well the children understood various aspects of word relations such as parts of speech (e.g. nouns vs adjectives), tense, and word roots. These word games did not require the children to have 'formal' taught knowledge of grammar, although of course children who had been taught about parts of speech and tense were better able to explain their answers. Many children demonstrated a degree of conceptual understanding even if they didn't yet know how to explain it. Finally I gave them a standardised vocabulary test.

In the Hebrew session, they did three tasks: a vocabulary test, and two morphology tasks. One of these tested the child's understanding of the concept of the Hebrew root *(shoresh).*

Results

I did two kinds of analysis.The first analysis looked at relationships between the children's English and Hebrew knowledge. If children can transfer their knowledge of word relationships between their two languages, then how well they do on the English tasks should be related to how well they do on the Hebrew tasks.

I found statistically significant correlations between the Hebrew morphology tasks and the English morphology and spelling tasks. In the school which allocated more time to Ivrit, the correlations between Hebrew and English were very strong (up to .75). These results show that in general, children who are good at reflecting upon Hebrew word relations are also good at doing so in English, and children who are not reflecting on these aspects of language in Hebrew are also not doing it in English. A further analysis was done to check that these English-Hebrew relationships were not just due to other factors such as age and general language ability. There were still significant relationships between Hebrew and English, over and above the effects of age and level of English vocabulary.

On the other hand there was no correlation at all between English and Hebrew vocabulary level. This is an aspect of language knowledge which cannot be transferred from one language

to the other, because it is specific to and different for each language.The fact that there is a relationship between English and Hebrew knowledge of word relationships, but not vocabulary, means that English-Hebrew relationship is more complex than that if a child is good at language in general he or she will be good at either language. It is understanding of underlying language concepts rather than overall language knowledge which children can apply to both their languages.

In a second kind of analysis, each child was 'matched' with a child from another school where only English was taught. Each 'match' was the same age, school year, and sex as the Hebrew learner and had the same level of English vocabulary. The aim was to see if children learning Hebrew were better at reflecting about language than children who only had experience of one language.

Overall, the Hebrew learners were better at one of the morphology tasks and both of the spelling tasks.This may be because of differences in the teaching received by the children in the Jewish schools and the other schools. It was not possible in this study to control for teacher and school effects. However, if the differences between the Hebrew learners and the English-only children were purely because of different English teaching received, and not due to learning Hebrew, then the advantage shown by the children in the Jewish schools would not be related to how much Hebrew particular children knew. I divided the Hebrew learners into three groups according to their level of Hebrew.

Generally, I found that children with a high level of Hebrew had a better understanding of word relationships and were better spellers than the children who only knew English, but children who only knew a little Hebrew had not learned enough for it to have enhanced their English abilities. The gap between Jewish children and matched monolingual children widened the more Hebrew the Jewish children knew.

Conclusions and implications

The results of the research show that not only is learning Hebrew valuable for its own sake, but it can also aid children's English development. This is in spite of the fact that on the surface Hebrew and English seem quite dissimilar, and that the children know far more English than Hebrew. Learning Hebrew helped children to reflect upon how the language system works and they were able to use this understanding in specific ways in both languages. For example, knowing about Hebrew roots helped children to spell English words which were connected in meaning and therefore had similar spellings. This suggests that in both Hebrew and in English it is worthwhile to draw children's attention to how words are constructed and related to each other. Not only will children then know something specific to that particular language, but they will be able to apply this understanding to their other language (or languages).

The findings of the study are preliminary, and only limited characteristics of English and of Hebrew were examined. Further research would tell us in more detail about the ways in which learning Hebrew can benefit children's language and literacy development. I hope to explore these issues in more depth in my next study.

knotosaurus

tronosaurus

drawings by Eldad Duks