Morphological awareness and literacy skills: a review

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ABSTRACT Metalinguistic ability has long been thought to have an impact on literacy acquisition (Mattingly, 1984). It is thus reasonable to assume that children's awareness of the morphological structure of words might affect the ease and speed with which they acquire spelling patterns based on grammatical distinctions. The scope of this review is to provide a synthesis of the existing empirical evidence on this topic from a cross-linguistic perspective. Recent developmental/correlational and intervention studies on the relationship between morphological awareness and reading and spelling are reviewed, along with the evidence supporting causality and specificity in this relation. Data for these issues are available for a range of alphabetic orthographies, including English, French, Danish, Norwegian, and Greek, and also for a morphographic orthography, Chinese. Therefore, recent research has provided empirical evidence for a strong relation between morphological awareness and literacy skills in both alphabetic and morphographic scripts.

Key words: Literacy acquisition, Metalinguistic ability, Morphological awareness.

1. Metalinguistics and Literacy Skills

The theoretical assertion of Mattingly (1984) that literacy is a language-based skill which places a direct demand and draws upon one's acquired knowledge –whether explicit or implicit– of spoken language has now been given ample empirical support. This ability of the speaker of a language to acquire knowledge of the underlying principles of oral speech and reflect upon not only its content but also its form and function, is known as *language* or *linguistic awareness*.

Metalinguistic activity is another broad term which, according to Gombert (1992), encompasses the speaker's active engagement in this type of *"...linguistic activity which takes language itself as its object"* (p. 2). The ability to intentionally reflect on and/or actually manipulate linguistic units is subject to "conscious" control, as Cazden (1976) defines *metalinguistic awareness* as *"the ability to make language forms opaque and attend to them in and for themselves"* (p. 603). However, beyond this state of "consciousness", which is manifested in speakers' verbal statements about their own linguistic processing, there is an implicit (or *epilinguistic*) level of awareness too. According to this line of argumentation, epilinguistic activities emerge at an early age and lack the conscious monitoring of language use (Gombert, 1992).

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Moreover, this "exploitation" of oral language or, in other words, the linguistic sophistication that the reader/speller of a language needs operates on several linguistic levels, and in particular those being represented by a language's orthography (Liberman et al., 1980). Such linguistic units involve mainly *phonemes* and *morphemes* in the case of a morphophonemic script. Awareness of language at the levels of phonology and morphology, that is, the awareness of and the access to the internal sound and morphemic structure of spoken words, has been identified as a cognitive skill, which contributes to success with reading and spelling.

First, the strong connection between *phonological awareness* and reading and spelling has been established beyond any doubt in a variety of European languages, including *English* (Bradley & Bryant, 1978, 1983; Bryant, MacLean, & Bradley, 1990; Bryant, MacLean, Bradley, & Crossland, 1990; Chliounaki & Boyle, 2004; Kirtley et al., 1989; Mann, 1986; Stanovich, Cunningham, & Cramer, 1984) [for reviews, see Adams (1990), Goswami & Bryant (1990), and Wagner & Torgesen (1987)], *German* (Wimmer et al., 1991; Wimmer, Landerl, & Schneider, 1994), *Swedish* (Lundberg, Olofsson, & Wall, 1980), *French* (Alegria, Pignot, & Morais, 1982), *Spanish* (Carrillo, 1994; Defior & Tudela, 1994), *Portuguese* (Morais et al., 1979), and *Greek* (Aidinis & Nunes, 2001; Nikolopoulos et al., 2006; Porpodas, 1991, 1999). The relation has been shown to run in both directions: phonological awareness predicts early success in learning to read and spell in an alphabetic orthography, but also appears to develop in the course of learning to read an alphabetic script. Overall, phonological awareness goes hand in hand with developing expertise in reading. This is because the ability to manipulate phonemes is essential for the development of grapho-phonemic correspondences, which, in turn, are required when children learn to read and spell using an alphabetic strategy.

Second, *morphological awareness* (also called "morphosyntactic awareness", "grammatical awareness", "morphological knowledge", and "morpheme recognition"), although less explored than phonological awareness and its connection to literacy, has been shown to make a significant contribution to spelling, particularly in alphabetic orthographies of morphophonemic nature. Awareness of morphemes in such scripts is thought to facilitate the understanding and appropriate application of the morphophonemic principle of spelling. This is exemplified in the case of Greek spelling, and in particular that of inflections, which is thought to make a heavy demand on beginning spellers' levels of morphological awareness. This is because the choice of spelling for particular vowel sounds in inflectional morphemes has to be based on specific rules of morphology. It seems perfectly reasonable, therefore, to assume that the application of these rules in written language is, in turn, dependent on the acquisition of morphology in the oral modality.

The suggestion of recent experimental research that awareness of the internal morphemic (both inflectional and derivational) structure of words is indeed linked to literacy acquisition and development in a variety of orthographic systems is of great interest for both theory and educational practice. Hence, the present review covers morphology broadly, including both its inflectional and derivational aspect. The studies reviewed are reported in the Appendix.

2. Research on Morphological Awareness

Morphological awareness and learning to read: Evidence from developmental/correlational studies

Morphological awareness and reading in normal readers/spellers

The majority of the studies exploring the association between morphological awareness and reading did so by measuring general reading performance (with standarised/standardized

tests) rather than competence in reading inflected and derived word forms. These studies can only establish a relation between knowledge of oral morphology and general reading success.

Brittain (1970) conducted the earliest of these investigations looking in particular at the relation between awareness of inflectional morphology in oral language and early reading achievement. Seven-year-old first-graders and 8-year-old second-graders were tested on a modified version of Berko's (1958) original *productive morphology* task requiring children to provide orally the missing word form in pseudo-words read aloud within sentence contexts (designed to include inflectional items only), and on a reading test measuring both decoding ability and reading comprehension. Brittain's correlational analyses revealed significant positive correlation coefficients for reading achievement and inflectional performance, even after controls for Lorge-Thorndike IQ. These results were taken as evidence for an association between oral inflectional morphology and general reading attainment.

Carlisle (2000) has recently provided further evidence for the relation between awareness of oral morphology and reading achievement at a general level, and also at a more specific level, that of multi-morphemic word reading. This investigation was limited to older children and to those aspects of derivational morphology related to the *structure* (relations of base and derived forms) and the *meaning* of derived words. Eight- and 10-year-old children's (in grades 3 and 5) general *morphological processing* abilities were examined with three experimental tasks, two assessing oral language (structure – meaning) and one assessing written language skills (reading derivationally complex words). Reading ability was also assessed at a general level (reading vocabulary and comprehension). Carlisle found that performance on orally producing opaque derived forms when the base was given (e.g., "permission" from "permit") was significantly correlated with the ability to read such complex words. Thus, the close association of oral derivational morphology with reading was confirmed when oral and written language tasks were designed specifically to tap the same type of morphological knowledge, which suggests that such tasks draw upon common linguistic resources. A second finding was that the three measures of morphological processing, when combined, accounted for significant portions of reading variance, with increasing contributions with increasing age. Therefore, even at the early age of 8, when children have not yet had as great an exposure to morphologically complex words in print as the older 10-year-olds, sensitivity to the morphemic components of derived words is an aid for them to extract the meaning of complex words, and thereby comprehend the material that they read.

While the two studies discussed have provided valuable insights into the link between sensitivity to inflectional and derivational aspects of morphology and reading, the possible confounding effects of other variables such as vocabulary, short-term memory, and phonological awareness were not controlled, and hence could not be precluded.

A series of recent studies addressed the issue of an *independent* contribution of oral morphology to reading by including such linguistic and memory measures in their designs. Mahony, Singson, and Mann (2000) designed an extensive study (Experiment 2) to examine the unique contribution of word relation sensitivity to decoding mastery in 9- to 12-year-old children (in grades 3 through 6), independent of vocabulary knowledge and phonological awareness effects. The test battery included standardised measures of vocabulary, phonological awareness (phoneme/ syllable omission in real words), and decoding ability (real words/pseudo-words), and also experimental tasks of phonological awareness with pseudo-words and of sensitivity to morphological relatedness (meaning/ derivation). Mahony et al.'s results documented a significant improvement with age in children's appreciation of morphological relations. Additionally, their

linear regression analyses revealed both the phonological and the morphological awareness measures as highly significant determinants of decoding success (accounting for 34% of the variance), when vocabulary knowledge was controlled for. What is most interesting, children's knowledge of derivational relatedness in and of itself contributed to decoding, independently of vocabulary and phonological skills (accounting for about 5%, a small but significant portion of the variance). Mahony et al. concluded that sensitivity to both the phonological and the morphological aspect of oral language plays an important part in the development of decoding skill in the upper primary school years.

In a second study (Experiment 1), Singson, Mahony, and Mann (2000) included in their set of predictor variables, apart from vocabulary, a standardised verbal short-term memory measure (the Digit Span subtest of WISC-R). Knowledge of derivational suffixes was assessed with a close task requiring children to complete sentences printed on paper and read aloud by making the correct choice among four derivationally related words. Both real words and pseudo-derived forms created by combining a real derivational suffix with a pseudo-stem (e.g., "mor-ious") were involved. Decoding ability was once again measured with standardized reading measures involving real words and pseudo-words. Singson et al.'s results indicated that children's performance on the morphological task had improved significantly by the sixth grade. Importantly, above and beyond the significant independent effect of short-term memory on decoding, children's sensitivity to the syntactic property of derivational suffixes added significantly to that prediction explaining an additional 5% of the total reading variance.

When Singson et al. (2000, Experiment 2) examined third- through to sixth-graders on a slightly modified version of the morphological task employed in their first experiment (a purely oral sentence acceptability or grammaticality judgement of "right" or "wrong") and controlled for vocabulary and phonological awareness with real words and pseudo-words, a similar picture as that obtained in Mahony et al. (2000) emerged. Phonological awareness remained a significant contributor to decoding skill, even after stringent controls for derivational knowledge and vocabulary (9% of the variance accounted for). Conversely, sensitivity to derivational morphology, even beyond the effects of vocabulary and phonological awareness, accounted uniquely for a significant (4%) portion of the reading variance. Path analyses confirmed the significant and unique contributions that these two different levels of linguistic awareness offer separately to reading performance.

The results of the latter two studies suggest that skills related to oral derivational morphology (as measured by recognition tasks) improve with age and are indeed important to decoding ability for older children (in the late primary school years). The magnitude of this contribution may be relatively small, but it is nevertheless significant and unique. Hence, these research findings point to the sensitivity to the derivational aspect of oral language as an independent reading contributor beyond the first two years of literacy instruction.

There is one study, however, which reached a similar conclusion but extended it to the early years of schooling. Carlisle and Nomanbhoy (1993) investigated the independent contribution of phonology and derivational morphology to word reading in a sample of 6-year-old first-graders tested on standardized phonological measures of syllable and phoneme deletion, and experimental judgement and production tasks of morphological awareness. In the *receptive judgement* task, children were asked to judge the meaningfulness of a sentence read aloud to them containing morphologically related (e.g., "wash"/"washer") and unrelated sound-alike (e.g., "doll"/"dollar") and sound-different (e.g., "moth"/"mother") word pairs. In the *expressive production* task, children were required to complete a sentence read aloud by producing the missing inflected or derived word form from the

base given. Multiple regressions with an experimental single word reading measure as the outcome revealed that the three linguistic awareness measures, taken together, explained a significant portion of the reading variance (37.2%). Of those three, however, only the phonological measure and the production measure of morphology contributed uniquely to the reading scores, accounting for 33.6% and 3.6% of the variance, respectively.

Carlisle and Nomanbhoy's (1993) results suggest that even as early as at the first grade level awareness of the morphemic structure of words has a limited but nonetheless unique role to play in reading acquisition. This is particularly interesting, given that beginning readers of English mainly encounter mono-morphemic words and also that learning to read at this stage is primarily focused on gaining mastery of the alphabetic code and memorising word-specific associations. It seems, therefore, that when children learn how to read and write they take advantage –to a certain extent– of some aspects of linguistic knowledge (i.e., semantic and grammatical roles) which are clearly distinct from phonology.

The studies reviewed above have looked at the connection in question without regard to the longitudinal contribution of linguistic awareness –in the two language domains discussed– to reading *development*. A first attempt to address the issues raised so far *longitudinally* is reported by Carlisle (1995), who designed a study following kindergarteners over a three-year period, with the objective to establish the relative contribution of early phonological and morphological sensitivity to later reading achievement, independently of vocabulary level. At the outset of the study, the kindergarteners' knowledge of language in the areas of vocabulary and grammar was tested with a standardized measure. A receptive-language (morphological judgement) task and an expressive-language (productive morphology) task (like the ones in Carlisle & Nomanbhoy, 1993) were also employed for the assessment of children's sensitivity to derivational relations. A standardized phoneme and syllable deletion test was given once at the beginning of the first grade, while reading was assessed with a standardized measure involving reading comprehension and phonetic analysis subtests in the spring of the second grade. Results showed that early performance on the morphological production task failed to add significantly to the prediction of reading success, once vocabulary knowledge had been controlled for. When predictors included measures taken at the first-grade level, productive morphology only emerged as a significant unique predictor of second-grade reading comprehension and phonetic analysis, accounting for 10% and 7% of the total variance, respectively. The standardized phonological measure predicted success in later phonetic analysis only, accounting for a unique 10% portion of the variance. Therefore, the unique contributions of the linguistic measures were modest, whereas, when considered together, they jointly accounted for a significant 34% and 33% of the variance in reading comprehension and phonetic analysis, respectively.

Carlisle (1995) concluded that there is indeed a relation between morphological awareness and reading achievement in the early stages of literacy. This is non-existent, however, earlier on, in the kindergarten year, when awareness of morphology has not presumably developed yet sufficiently enough to make a unique contribution to reading. Moreover, it is only the explicit level of morphological awareness that proves to be of predictive value. Judging word relatedness may not be a powerful indicator of morphological knowledge, as is the explicit manipulation of morphological relations.

The studies reviewed so far have examined the link between morphology and reading in one alphabetic script, that of English, and have generally focused on older children. There is a recent study, however, that has addressed the role of morphology in the early stages of literacy

acquisition in Greek, an alphabetic script of morphophonemic nature that is highly regular for reading but less transparent and deeply influenced by grammar for spelling.

Nikolopoulos, Goulandris, Hulme, and Snowling (2006) employed a *cross-sequential* design in exploring the role of phonological processing and grammatical skills in literacy development in Greek. The present review will be restricted to that aspect of the study referring to grammar, as this is of particular interest in this paper. Nikolopoulos et al. followed over a 15-month period 7- and 9-year-old children's (in grades 2 and 4, at the outset of the study) reading ability, as assessed with a timed single-word reading experimental task of words of graded difficulty. Two measures of grammatical skills were also administered at the start of the project, one requiring children to recall sentences varying in syntactic difficulty and one requiring the assembly of randomly presented words and phrases into meaningful sentences of correct syntactic structure. Results –applying structural equation modeling techniques– indicated that performance on the tasks of grammatical skills failed to predict reading ability, at least as measured with a task of speeded decoding, either at the same time or a year later.

In summary, the results of the studies reviewed in this section have clearly established an association between oral morphology and written language skills in English. The contribution of children's knowledge of oral morphological structure to reading success, although relatively small in magnitude, is nonetheless significant and independent of extraneous linguistic and other confounds such as phonological awareness, vocabulary knowledge, and short-term memory. However, the evidence provided by this line of research suggests that the link between morphological awareness and reading is of a general nature, since most of the studies reviewed (with the exception of Carlisle, 2000) measured general reading ability with standardised tests rather than children's reading of specific morphemes. Therefore, the question whether children's awareness of specific types of morphemes in oral language is related with their ability to read such morphemes is still open to research.

Morphological awareness and reading in poor readers/spellers

The investigation of the morphological processing skills of children who experience difficulties with literacy is of interest herein, given the abundant evidence establishing poor readers' phonological deficits (for reviews, see Bryant & Bradley, 1985, and Snowling, 2000). The study of a group of readers with pronounced phonological deficiencies provides another means of assessing the relative contribution of phonological and morphological awareness in reading. If sensitivity to morphology draws upon phonological resources, then poor readers will be expected to exhibit impairments in morphological processing, similar to the ones experienced in the language domain of phonology.

Leong (1989) conducted the earliest study reported in the literature on this area examining the productive knowledge of the relational property of derivational structure in 9- to 11-year-old poor readers (in grades 4, 5, and 6). Children were divided into three groups according to their performance on reading and spelling (better in both, worse in both, mixed performance). They were then asked to produce orally the derived form of a word given the base (Experiment 1), and conversely the base given the derived form (Experiment 2), under conditions of time pressure. The analysis of response times revealed three main findings. Firstly, those poor readers who were poor spellers too were significantly slower than the other poor reader subgroups in producing base and derived forms of morphology. Secondly, the older poor readers (in grades 5 and 6) outperformed their younger counterparts (in grade 4) in all measures of morphology. Thirdly, the morphological tasks in both experiments discriminated correctly the

three subgroups at all grade levels. Leong concluded that skills at producing base and derived forms have a role indeed in literacy achievement.

While this study set the ground for appreciating the effects of poor readers' derivational knowledge on their deficient reading and spelling performance, it was confounded with the plausible effects of reading accuracy and phonological competence. The written presentation of the sentences as well as the lack of control for phonological awareness differences limits the generalisability of the results. It seems likely that those readers with deficient both reading and spelling skills might have had difficulty in reading the sentences accurately and rapidly in the first place, and also that the presumably greater phonological deficits of the same group of readers might have induced a deficit in the morphological domain of language too.

The need to assess awareness of morphology in spoken language purely (with oral tasks) and to partial out any phonological confounding effects was addressed in a later study by Shankweiler et al. (1995), who explored the possibility of an independent morphological and syntactic deficiency in poor readers. These researchers designed a large-scale study examining the linguistic profiles of children aged between 7.5 and 9.5 years, classified into five groups: normal readers, poor readers with and without reading-IQ discrepancy, normal readers with math difficulties, poor readers with math difficulties, and children with attention deficit disorder. The metalinguistic test battery involved phonological, morphological, and syntactic measures. Awareness of derivational relations was assessed with an adaptation of the oral elicitation task originally developed by Carlisle (1988), variations of which have been used in other investigations too (see Carlisle & Nomanbhoy, 1993, and Carlisle, 1995). Syntactic processing was measured with a task requiring children to judge whether or not orally presented sentences matched with pictures depicting either correct or incorrect in terms of grammar interpretations. Shankweiler et al. found that both the phonological and the morphological measures accurately distinguished the groups of poor readers from all control groups. Furthermore, the morphological condition requiring a phonological change for the generation of the base or the derived form (e.g., "five"/"fifth") was more successful than the phonologically transparent condition (e.g., "four"/"fourth") in discriminating the two groups of poor readers from the three control groups of normal readers. Most importantly, regression analyses (controlling for age and IQ) revealed that the standardised test of syllable and phoneme deletion accounted for a unique 10.9% of the variance in word reading when morphology had also been entered into the equation, whereas the independent contribution of morphology to single word reading was estimated to be around 5.1%.

The latter two findings constituted the basis for Shankweiler et al.'s (1995) argument for the existence of a specific morphological deficiency in poor readers, which overlaps to a large extent, although not entirely, with poor readers' well-established phonological deficit. Shankweiler et al. further asserted that both deficits stem from a common underlying source of difficulty for poor readers, which is primarily phonological in nature. Lastly, the lack of a significant independent contribution of syntactic awareness to reading performance is noticeable in this study, as well as the lack of discriminating power in this measure. This led the authors to the conclusion that poor readers exhibit selective limitations within the language system, which are restricted to the domains of phonology and morphology.

Fowler and Liberman (1995) reached a much similar conclusion about the morphological weaknesses of poor readers arising from an underlying phonological source. Their selection of participants was carefully designed so that children –matched on verbal IQ– from across the range of reading ability would be included in the sample. Initially, they classified children from three

grade levels (2, 3, and 4) into two age groups (between 7;05 and 8;05, and 8;05 and 9;08 years of age). They then split each age group into three groups on the basis of word reading level (below average, average, and above average readers). Single word reading and spelling were tested with standardised measures involving real words and pseudo-words in the case of reading, whereas morphological awareness was measured with an adapted version of Carlisle's (1988) productive task of derivational relations. Fowler and Liberman found that the production of a base from the derived form when a phonological alteration is required (e.g., "courageous"/ "courage") emerged as the best predictor of reading (accounting for 42% and 34% of the real word and pseudo-word reading variance, respectively). After factoring out age and vocabulary, this particular morphological condition still remained a significant contributor to real word and pseudo-word reading. It seemed, therefore, that children's sensitivity to the derivational structure of words, particularly when a phonological transformation is involved, is significantly associated with reading performance, independently of vocabulary knowledge.

This finding, however, which holds for the whole sample, does not allow for examining which particular group of readers was mostly affected by the phonologically complex condition. To address this issue, Fowler and Liberman (1995) compared in a *chronological-age control* design the morphological performance of 8-year-old skilled and less skilled readers, matched on age and IQ. Results showed that the less skilled readers were at a disadvantage when producing either a base or a derived form in the phonologically complex condition, with no group difference in the phonologically neutral condition. This finding replicated Shankweiler et al.'s (1995) results, and, according to Fowler and Liberman, pointed to phonology alone as the source of poor readers' difficulties with oral morphology and reading. This kind of design, however, is limited in scope, as it does not preclude the possibility that poor readers' inferior morphological performance with phonologically complex items arises from their poor reading skill per se.

This latter possibility was explored in the same study in a *reading-level control* design, where older less skilled readers (aged on average 9;05 years) and younger more skilled readers (aged 8;02) were equated for reading/spelling and vocabulary knowledge, and then their performance profiles on the derivational measure were compared. Results revealed no significant difference between the two groups in their morphological attainment. Such a "negative" result (that of no effect) in a reading-level comparison presents certain interpretative ambiguities (Bryant & Goswami 1986), as it does not make clear whether morphological production is the *cause* or the *result* of reading. It could be that the older poor readers and the younger normal readers are indeed equally proficient at producing derivationally related forms as a result of their equivalent reading/spelling level. However, it could equally be that the younger normal readers were in fact better than the older poor readers on the morphological task, but this difference (which presumably led to poor readers' difficulties) was masked by the higher developmental level of the older readers who might be using additional strategies to compensate for their deficits. Fowler and Liberman (1995) acknowledged the two possibilities, but favoured the former interpretation stating that *"...it is less likely that a lack of awareness of derivational morphology contributes independently to early reading difficulties"* (p. 180).

Elbro (1989) provided evidence for a deficit in the morphological processing skills of poor readers of Danish, another morphophonemic European orthography, without, however, evaluating the question of its specificity. This study compared the morphological performance of severely dyslexic adolescents (aged on average 15;03 years) with that of younger normal readers from grades 2 and 3 (aged 9;04). The two groups were matched on reading age (a reading comprehension test) and IQ. The results of this reading-level design showed that the dyslexic adolescents performed worse than the normal

readers on three out of the five oral tasks assessing their morpheme analysis strategies. However, no difference was found between the two groups in a pseudo-word task (adapted from Berko, 1958) nor in a lexical decision task, which both involved inflections, derivations, and compounds. This latter negative result, however, was invalidated by Elbro, who attributed the lack of difference to extraneous factors such as the extensive instruction in grammar that dyslexics had received and their advanced vocabulary and overall developmental level which might have allowed them to compensate for their morphological deficiency. A second finding is that in the group of dyslexics the ability to generate orally the correct inflection in pseudo-words was associated with fewer errors in decoding inflectional suffixes in real words and pseudo-words. This is interesting, as it suggests that there may be a connection between awareness of a particular type of morpheme in spoken language and skill in reading the same written morpheme type, although in dyslexics only.

On the basis of these findings, Elbro (1989) argued for the existence of a severe morphological deficit in poor readers, which may be responsible for their reading underachievement. Whether or not this is specific, however, was not evaluated due to the lack of additional phonological controls. Moreover, it is likely that the tasks employed in this study were not purely morphological but rather made additional demands on phonology. For example, in the morpheme reversal task, the morphemes coincided with syllables, and thus phonological confounds may have been implicated.

Elbro and Arnbak (1996) in a later study (Experiment 1) set out to explore the role of the strategy of morphological analysis in word recognition in Danish. Dyslexic adolescents and younger normally achieving readers participated in a study employing a reading-level match design. The participants decoded two-morpheme words, which were either compounds or inflected forms, and one-morpheme words. Results, based on an analysis of response accuracy and latency, showed that poor readers read the morphologically transparent two-morpheme items with greater success and faster than the monomorphemic words, with no such difference for normal controls. Elbro and Arnbak concluded that poor readers rely on morphological analysis when reading single words, a strategy, which develops to compensate for their impaired phonological skills. However, dyslexics' decoding performance was slower and less accurate when compared to that of controls. This raises doubts on the validity of the reading-level matching procedure (reading comprehension), and makes the evidence provided inconclusive.

In summary, the evidence from the studies reviewed in this section points to the existence of a morphological deficit in poor readers of English and Danish. In particular, the evidence linking reading failure with poor levels of morphological processing holds for the derivational aspect of morphology. Whether or not, however, this is a specific deficit in the language domain of morphology is not clear yet, and several authors argue for a close connection between the phonological and morphological deficiencies of poor readers. Despite this controversy, there is a general agreement on the suggestion that the contribution of morphological awareness to reading ability is of a smaller magnitude compared to that of phonological awareness. Further study of the interdependency among different levels of oral language processing is needed to clarify the independent contribution of each type of linguistic awareness to poor literacy achievement.

Morphological awareness and learning to spell: Evidence from developmental/correlational studies

Morphological awareness and spelling in normal readers/spellers

Leong (2000) has recently examined the role of normally achieving children's productive

knowledge of the relation between base and derived word forms in general spelling achievement. The design of the study and the experimental paradigm followed the principles of his earlier 1989 study (see p. 255). Children in grades 4, 5, and 6 (9- to 11-year-old) were asked to vocalise the base form when presented with the derived word within written sentence contexts (Experiment 1), and vice versa (Experiment 2). Both accuracy and reaction time data were used in the analyses. Leong found that the production of the base from the derived form when no change was required (e.g., "royalty"/"royal") and the production of the derived form from the base when an orthographic change was involved (e.g., "glory"/"glorious") were most predictive of general spelling ability (as measured with a standardised test). Multiple regression analyses showed that the latency scores for the two conditions accounted for 35.9% and 4.7% of the variance in spelling, respectively. A developmental trend was also documented, as children improved with age in both morphological tasks, while the accuracy and the speed of their performance was a function of the depth of complexity of the morphological production. Leong suggested that accurate and rapid processing of derivational structure is a *correlate* of general spelling ability in the mid-to-upper primary school years.

While this research definitely establishes the existence of a general link between morphological awareness and spelling, it does not address the issue of a more specific connection between awareness of specific types of morphemes and spelling of these particular morphemes. Results from studies assessing the *specificity* of this relation are reviewed below. Such studies use the spelling of individual morphemes as the outcome variable rather than standardised measures of general spelling ability. Further, these studies attempt to preclude any influence from print induced by the written presentation of the morphological materials, and some also control for possible phonological confounds.

Carlisle (1988) investigated specifically how sensitivity to derivational morphology affects the spelling of morphologically complex derivational forms in normal readers/spellers aged between 9 and 13 years (in grades 4, 6, and 8). This researcher was the first to employ the oral derivational production paradigm, variations of which have been used in several other investigations (Carlisle, 1995, 2000; Carlisle & Nomanbhoy, 1993; Fowler & Liberman, 1995; Leong, 1989, 2000; Shankweiler et al., 1995). More specifically, the task required children to generate orally the derived form of a word given the base, and vice versa, under conditions of no change, phonological change, orthographic change, and both orthographic and phonological change. What is new to this study is that an experimental dictated spelling task was additionally included, measuring specifically children's ability to spell the same base and derived words that they were asked to produce orally. The inclusion of this test allowed Carlisle to directly compare children's performance on the oral and the written version of the morphological task. Carlisle found a strong developmental trend in the acquisition of morphological knowledge and also in the use of this knowledge in spelling. Both tasks of oral morphology and spelling also clearly distinguished children at the three grade levels. In relation to the morphological conditions of varying transparency, those conditions (in both the oral and the spelling task) that involved both a phonological and an orthographic change in the production of the derived form from the base (e.g., "expand"/"expansion") contributed the most to variations in performance at the three grade levels. In view of these findings, Carlisle emphasized the need for an explicit instruction in derivational structure as a means of improving children's skill in spelling derived words.

Derwing, Smith, and Wiebe (1995) adopted a slightly different approach to the study of morphological spelling in an attempt to explore the reverse effect of spelling on morphology. They tested university students' ability to judge whether

the two members of a word pair (e.g., "fame"/"famous") contained the same base. The spelling of the base word only was provided, while the derived word was presented orally. The word pairs conformed to four conditions: *true positive* (e.g., "heal"/"health"), *false negative* (e.g., "space"/"spatial"), *false positive* (e.g., "tail"/"tailor"), and *true negative* (e.g., "nut"/"neutron"). The participants also spelled to dictation the same derived words as those included in the morpheme recognition task. Results revealed a tendency for the "same spellers" to perform better on the oral morphological task than the "different spellers", but this pattern was not observed for all of the items in the different conditions. In the light of this weak evidence, Derwing et al. proposed a cautious interpretation of their results, and tentatively concluded that adults' spelling of derived words is related to their judgement of morphological relatedness. They acknowledged, however, that their study cannot provide firm evidence that it is spelling that drove decisions about relatedness, and thus the possibility of the relation running the other way round was not precluded. Nevertheless, the important contribution of this study is that it emphasized that the association between morphology and spelling can be *bidirectional*.

Rubin (1988) assessed the opposite directionality in the morphology-to-spelling relation, namely the effect of morphological knowledge on spelling proficiency in the early stages of literacy. This study classified kindergarteners and first-graders into "high" and "low" groups using as a criterion their implicit morphological knowledge, as measured by a standardised test following Berko's (1958) classic paradigm. The morpheme analysis test required children to identify the stem in a two-morpheme inflected word and to respond to the same question having an one-morpheme word as a target. The same words were also dictated in the spelling task. Rubin reported two main findings. Firstly, kindergarteners and first-graders, irrespective of their implicit morphological knowledge levels, were less likely to omit in their spelling the nasal consonant of the final consonant cluster in two-morpheme inflected words (e.g., /n/ in "lined") than in non-inflected words (e.g., /n/ in "kind"). Thus, even at the early age of 5 or 6 and regardless of implicit morphological sensitivity, children appeared to have an understanding of the distinction between inflected and non-inflected words. Secondly, the first-graders with high scores in implicit morphology were less likely to omit the inflectional ending in two-morpheme words (e.g., "jammed") than their morphologically less competent peers. Rubin concluded that children's awareness of morphology in the spoken language plays a part in their understanding of the morphemic structure of words and the use of this knowledge in spelling.

More recently, Nunes, Bryant, and Bindman's (1997b) large-scale longitudinal study directly addressed the issue of *specificity* as well as of *causality* in the relation between morphological awareness and spelling. The study looked specifically at how 6- to 8-year-old children gradually acquire the spelling pattern for the *-ed* past tense inflectional morpheme, as well as at the effect that children's growing awareness of morphosyntactic distinctions in spoken language might have on their progress with that particular spelling pattern. Children's general sensitivity to present and past verb tenses was measured with three oral tasks: pseudo-word morphological production (adapted from Berko, 1958), and two entirely novel tasks of *analogy* involving the manipulation of single words, which were presented either in isolation (word analogy) or within sentence contexts (sentence analogy). Nunes et al. argued that tasks based on analogy are measuring explicit recognition of the grammatical relation between two words or sentences, as they require children to manipulate language intentionally, whereas the task of producing grammatical transformations of pseudo-words involves less explicit levels of morphological processing. Sentence analogy involved only present to past tense (and vice

versa) transformations, whereas word analogy and productive morphology included a wider range of grammatical transformations involving mainly inflectional morphemes (i.e., past tense -ed, third-person singular -s, and plural -s), and a few derivations (i.e., -er and -ness). Results from multiple regressions showed that word analogy proved the most significant predictor of success in spelling the -ed inflection in regular verbs (accounting for a significant 4% and 1.5% of the variance seven months later and 20 months later, respectively). Once word analogy scores had been controlled for, sentence analogy explained a further 0.9% of the -ed spelling variance seven months later, with no significant contribution thereafter. Productive morphology, however, proved a non-significant predictor of spelling progress with -ed, when the effects of both analogy tasks had been partialled out. These results held true after stringent controls for differences in age, IQ, and initial "phonetic" spelling (i.e., irregular verbs and non-verbs).

Therefore, children's developing ability to adopt a morphological spelling strategy was shown to be based on their explicit sensitivity to grammatical distinctions in spoken language. In contrast, morphological awareness at a less explicit level did not appear to make any significant contribution to the appropriate use of "ed". This evidence led to Nunes et al.'s (1997b) postulation of a *constructivist* account of spelling development, according to which phonetic spelling strategies based on the alphabetic principle develop first and provide children with the necessary experience with literacy, which subsequently – along with children's developing morphosyntactic awareness – paves the way for the addition of morphological spelling strategies.

Overall, Nunes et al.'s (1997b) research provided the first convincing evidence for a causal connection between morphological awareness in spoken language and spelling success with a specific type of morpheme. Moreover, their novel approach to measuring morphological awareness clearly constitutes a methodological contribution, as their analogy tasks (especially the one dealing with single words) excluded any semantic confounds that may have been implicated in previous measures of morphology, such as the sentence completion task in Carlisle (1995) (e.g., *"Farm. My uncle is a _____"*).

A second longitudinal study by Nunes, Bryant, and Bindman (1997a) provided corroborated evidence that word analogy (as in Nunes et al., 1997b) accounted for a significant 2% of the variance in correctly spelling the "ed" ending in regular past tense pseudo-verbs, independent of age, IQ, and phonological analysis effects. This was a lasting effect, as it held true over a 21-month period. Phoneme oddity also made a significant, as well as unique, contribution of 1% to the same aspect of spelling, even after all the stringent controls.

Furthermore, in another longitudinal study, Bryant, Nunes, and Bindman (2000) tested the hypothesis of specificity in the link between children's early awareness of morphemes in general and their eventual spelling success with the apostrophe in genitive nouns. Their sample involved 6- to 8-year-old children in grades 2 to 4 (at the start of the project) tested in four sessions covering a period of 28 months. Children completed a series of explicit linguistic awareness tasks, namely syntactic/semantic awareness, phonological awareness, and morphosyntactic awareness, whereas in the final session they completed a spelling task measuring their ability to use the apostrophe appropriately. Results showed that despite the stringent controls (for chronological age, IQ, reading age, and phonological ability), word analogy accounted for significant portions of the variance in the correct use of the apostrophe 17 and 28 months later (4% and 2.2%, respectively). This was an important finding, especially as the word analogy task was not specifically designed to test awareness of the distinction between genitive and plural nouns. Further, the specificity of this relation was confirmed by the failure of the other linguistic awareness (syntactic/semantic and phonological)

measures to predict progress in learning how to use the apostrophe. Bryant et al. concluded that the enormous difficulty that 8- to 10-year-old children have in acquiring the orthographic rule for using the apostrophe can be attributed to their failure to understand the grammatical distinction involved. The causality documented in this study was tested in one direction only, and the alternative possibility of the relation running the other way around still awaits further research.

The research reviewed so far has focused on studies addressing the role of morphology in spelling in the alphabetic script of English. Strikingly similar findings have been reported for the morphophonemic orthographies of French and Greek too.

In relation to French, Plaza and Cohen (2004) set out to explore in a *retrospective* study whether second-graders' spelling skill, as measured with a pseudo-word (phonological strategy), a real word (phonological-lexical strategy), and a text dictation (phonological-lexical-morphological strategy) spelling task, was predicted by their performance a year earlier on a judgement/correction task (requiring them to judge whether or not a sentence read aloud was correct in grammatical terms and subsequently to correct any mistakes). Results of multiple regression analyses revealed that morphological/syntactic skill at the end of grade 1 uniquely accounted for a small but still significant portion of the variance in spelling scores at the end of grade 2 (4% for the use of a phonological strategy, and 1% for the use of a lexical strategy), after the effects of earlier performance on tasks of phonological awareness and naming speed had been controlled for. Plaza and Cohen concluded that morphological/syntactic skill does have a part in French-speaking children's learning to spell.

Sénéchal, Basque, and Leclaire (2006) also investigated (Experiment 2) the effects of morphological awareness on spelling accuracy in French, but at a more specific level, focusing on the derivational aspect of spoken and written language. It is important to note that the orthography of French is characterized by a predominantly *silent* written morphology, with morphological markers, which are silent in spoken language being represented in writing. Nine-year-old children in grade 4 were tested on a word analogy task (as in Nunes et al., 1997a, 1997b) measuring awareness of the derivative morphology of French, and also on an experimental spelling task containing phonologically transparent words (with consistent phoneme-grapheme patterns), morphologically transparent words (with a final silent consonant revealed by a derivative), and lexical words (with a final silent consonant that should be memorised). Results of multiple regression analyses revealed a clear and specific association between morphological awareness and morphological spelling, indicating that even after control for general spelling skill performance on the word analogy task uniquely accounted for 7% of the variance in spelling morphological words. This effect was specific to the morphological domain, as the same measure failed to contribute to the spelling scores for phonological or lexical words. This is an important finding, which, according to Sénéchal et al., needs to be replicated due to the small sample size of their study (N = 39), and certainly points to the need for teaching children how to make use of the morphological relations among words in spelling.

With regards to the evidence from Greek, Bryant, Nunes, and Aidinis (1999) tested in a cross-sectional study 7- to 10-year-old children (in grades 2 to 5) on a spelling task with real words involving inflectional morphemes, which contained one of three vowel sounds (i.e., /o/, /e/, and /i/). These vowels can be spelled with more than one phonetically plausible grapheme, and when occurring in inflections the decision between the alternatives is dictated by the word's grammatical status. Children's explicit awareness of grammatical distinctions was assessed with oral tasks of sentence and word analogy, following the paradigm of Nunes et al. (1997b). The two experimental tasks of morphology were

heterogeneous and involved a wide range of grammatical transformations. Inflectional, as well as derivational, morphemes were included in word analogy, whereas the analogy task with sentences was restricted to inflections. Bryant et al. also followed Nunes et al.'s (1997b) model in classifying children into spelling stages that reflected their growing understanding of when to use the alternative spellings for each of the three vowel sounds studied in inflections. Their claim was based on two types of evidence. Firstly, significant positive correlations (partialling out age and verbal IQ) were found between the stages the children were assigned to with the three sounds. Secondly, in discriminant function analyses the two analogy tasks proved to be good predictors of spelling stage for the /o/ and the /i/ sound, even after stringent controls for chronological age and verbal IQ, but for the /e/ sound only word analogy significantly predicted the children's stage assignment.

Harris and Giannouli (1999) also produced some evidence for the use of morphological knowledge in Greek spelling. In Experiment 2, they investigated the association between a number of linguistic awareness measures and spelling success. Six-year-old first-graders were given phonological awareness tasks (syllable counting, phoneme counting, and vowel substitution) at the very beginning and at the end of the school year, and a group of 5-year-old nursery school children were tested on the same tests on school entry. Spelling ability was measured three years later with measures including alphabetically regular words (simple sound-to-spelling rules), morphologically regular words (conforming to morphological spelling rules), and orthographically exceptional words (with unpredictable spelling patterns learned by rote). The effect of word frequency on spelling accuracy was also addressed, and words with varying levels of frequency (written vocabulary in school formed the basis for frequency judgements) were included in the spelling tasks. Results indicated that, apart from the alphabetically regular words, the spelling of the morphologically regular words was also well established by the end of the second grade (in the nursery group sample), with significantly more errors in the low-frequency words. Further, syllabic awareness proved a significant predictor of success with high-frequency morphologically regular words at the end of the second grade, even after controlling for the effects of IQ. The same prediction was confirmed for the low-frequency morphologically regular words at the end of the third grade too (in the first-graders' sample), although marginally. The task of syllable counting, as measured at the beginning of grade 1, predicted success with spelling low-frequency exception words three years later as well. A morphological analogy task requiring children to derive adjectives from verbs and vice versa, which was completed in the final session by the second-graders, was also found to correlate highly with spelling morphologically regular words at the same point in time.

The robust finding of a strong association between syllabic awareness and spelling in Greek from grade 1 through to grade 3 was interpreted by Harris and Giannouli (1999) as suggesting that syllable counting underpins the ability to divide multi-syllabic words into their constituent morphemes and subsequently apply the appropriate spelling rules. These authors speculated that indeed this is the period when the mastery of morphological spelling rules in Greek gradually takes place. Their interpretation was supported by the finding of a significant correlation between performance on syllable counting (measured on entry into nursery) and morphological analogy (measured at the end of the second grade). The results, overall, suggest that syllabic awareness plays the most important part in learning to spell in Greek at least during the first three years of formal literacy instruction, whereas phonemic awareness has little predictive power for spelling. The use of an alphabetic strategy was documented for spelling, as ceiling performance on alphabetic spelling (pseudo-

words) at the end of the first school grade indicated. On the other hand, experience with individual words was considered to be necessary for children to be able to apply morphological spelling rules (high-frequency morphologically regular words were easier to spell than the low-frequency ones) and to memorize spelling patterns in exception words. Presumably, this experience with print is gradually attained and requires time, as errors in spelling morphological endings were evident in the second grade and to a lesser extent even beyond that time.

On the whole, the results of the two studies on Greek spelling reviewed above have provided evidence in support of a connection between morphological awareness and children's morphological spellings for this highly inflected language in which spelling is heavily influenced by grammar. However, this finding was not corroborated by the more recent data of Nikolopoulos et al. (2006), who showed that grammatical skills (at least as assessed by measures of sentence assembly and sentence recall) did not appear to be predictors of spelling accuracy either concurrently or longitudinally (for details of the study see p. 251). Nikolopoulos et al. attributed this surprisingly negative result to the features of the spelling task employed, which mainly involved words that required knowledge of word stems spelling rather than inflections.

To summarize, research on morphological awareness and spelling in normally achieving readers of English has primarily focused on the derivational aspect of morphology. Such studies have documented the existence of a close connection between children's awareness of the derivational structure of words and their success in spelling derived words. By contrast, the link between children's awareness of inflectional morphemes and their ability to represent such morphemes in spelling has been addressed in fewer investigations, which have also provided evidence for a close association of this kind. Furthermore, apart from English, recent data from two other alphabetic scripts of morphophonemic nature, French and Greek, have also provided converging evidence, which documents the connection between oral and written language in the domain of morphology.

Morphological awareness and spelling in poor readers/spellers

Studies of poor readers and spellers can provide an insight into the role that morphological processing plays in reading and spelling development. This is because, if poor readers/spellers are found to exhibit impairment in their morphological processing profiles (independent of their phonological deficit) when compared to normal younger readers/spellers in a reading-level design, this can be attributed to differences between the groups in morphological knowledge. The inference would, therefore, be that sensitivity to morphology is related to reading/spelling achievement.

Fowler and Liberman's (1995) study of poor readers (see p. 255) was also concerned with predictors (among the morphological measures) of spelling, as measured with a standardized test. They found that the production of the derived form from the base under conditions of phonological alteration (e.g., "anger"/"angry") explained 34% of the variance in spelling scores, whereas the complex base condition (e.g., "combination"/"combine") accounted for a further 14%. After stringent controls for age, vocabulary, and the rest of the morphological conditions, the complex base condition explained a 4% of the spelling variance. Certainly, this was a much reduced contribution compared with that to reading, but was nonetheless significant. This study, therefore, provided evidence for a connection between sensitivity to derivational structure and general spelling ability. However, studies examining whether morphological awareness is specifically related to the spelling of either morphologically complex words or specific morphemes can be more informative. Such studies are reviewed below.

Shankweiler, Lundquist, Dreyer, and

Dickinson (1996) presented some evidence (Experiment 1) for a specific connection of this kind. These researchers examined the role of the so-called "alphabet-relevant" metalinguistic abilities (i.e., phonological and morphological awareness) in the spelling skills of older and experienced poor and average readers. Their sample involved 14-year-old ninth-graders of average literacy attainment and 16-year-old ninth- and tenth-graders of below average reading performance. These students' metalinguistic skills were assessed with a standardized phoneme deletion test, and the productive derivational task used by Fowler and Liberman (1995). Spelling measures included a general measure of orthographic conventions (e.g., the final "e" in "explode"), and also a specific measure of derived words produced either with a phonological alteration in the base (e.g., "music"/"musician") or with a phonological as well as orthographic change (e.g., "describe"/"description"). Shankweiler et al. reported two main findings. Firstly, the two groups of readers (who by definition differed in terms of word and pseudo-word reading skills) also differed significantly in spelling ability and metalinguistic performance. Secondly, multiple regression analyses revealed that phoneme deletion accounted for a significant 34% of the variance in orthographic spelling, while the respective portion of the variance explained by morphological awareness was 27%. With respect to the specific measure of spelling derived words, phoneme deletion and derivational production proved to be significant contributors to spelling accuracy, accounting for 31% and 32% of the variance, respectively. Beyond the effect of phoneme deletion, derivational production explained a unique 13% of the spelling variance. On the basis of this evidence, it was concluded that phonological analysis skills are indeed important in facilitating the learning of orthographic spelling sequences, and even the learning of spelling patterns for derived words. Nevertheless, beyond and above the contribution of phonological awareness to spelling, derivational analysis is also uniquely important for spelling success, particularly with derived words (13% vs. 8%), in both normally achieving readers and poor readers.

While Shankweiler et al.'s (1996) research is informative in assessing spelling success in relation to metalinguistic skills in older students of varying reading levels, the design was not a reading-level match, and thus no inference can be drawn about the underlying source of poor readers and spellers' difficulties.

Rubin, Patterson, and Kantor (1991) set out to answer the question whether the source of poor readers' difficulties with morphemic spellings lies in their implicit and explicit levels of morphological knowledge in oral speech. Their sample involved normally achieving 7-year-old and language impaired 8-year-old second-graders, and adults with literacy difficulties. Implicit morphological knowledge was measured with a standardized test following Berko's (1958) procedure, while explicit morphological knowledge was assessed with the morpheme analysis task used by Rubin (1988). Briefly, this task tests the skill in identifying the base morpheme in two-morpheme derived words (e.g., "funny"), and two-morpheme inflected words, which end either in a nasal consonant cluster (e.g., "'ined") or in a non-nasal cluster (e.g., "fussed"). Participants' ability to represent inflectional morphemes in writing was observed in their free writing, but was also experimentally tested with a dictated spelling task (including one- and two-morpheme inflected words). Rubin et al. found that children with language impairment exhibited the most deficient morphological profiles in both the oral and the written language domain. Adults with poor literacy skills were better than the language impaired children only at the oral tasks of morphology. On the basis of these findings, two main conclusions were supported. First, the fact that reading disabled adults performed similarly to normal second-graders on both tasks of oral morphology

suggests that maturation and experience with spoken language are not sufficient conditions for adult poor readers to develop adequate levels of implicit and explicit morphological analysis skills. Second, the omission of inflectional endings in two-morpheme words in dictated spelling reflects a deficit in language impaired children in terms of oral morphological skills, since such morphemic spelling errors were significantly associated with accompanying low levels of morphological knowledge in spoken language. However, the groups of participants in this study were not equated for reading level, and thus it is possible that the differences found might be attributable to their differing experiences with print.

Carlisle (1987) was the first to employ a *spelling-level control* design to address the issue of whether the difficulties that poor readers are experiencing when spelling derived words arise from their poor knowledge of derivational morphology and its rules or from their inability to actually use this knowledge in spelling. This study involved a carefully controlled experiment, with normally achieving 9-year-old readers in grade 4, matched on spelling ability (a standardized test) with 14-year-old students in grade 9 diagnosed with specific difficulties in written language. Two more groups of normal 11- and 13-year-old readers in grades 6 and 8 participated in the study as controls. The skill in analyzing the morphemic structure of derivationally complex words was assessed with the task of derivational production reported in Carlisle (1988). Also, the dictated spelling task consisted of the same base and derived items comprising the oral task of morphology. Carlisle's analyses revealed two main findings. First, the poor readers in grade 9 exhibited patterns of performance on oral morphological analysis that fell between those of controls in grades 6 and 8 in the base forms subtest, but were similar to those of normally achieving sixth-graders in the derived forms subtest. However, when poor readers spelled the same base and derived words their performance reached even lower levels and was equivalent to that of normally achieving fourth-graders. Second, the learning disabled group tended to produce different spellings for the base and derived form of each pair: they spelled correctly only one word of each base-derived pair more often than controls. This was interpreted by Carlisle as an indication that poor readers were not making use of their knowledge of the relation between base and derived words when spelling (as normal readers did), but were rather spelling such items as "whole words". Thus, although poor readers performed as well as fourth-grade controls on spelling base and derived words, it seemed that they did so without reference to the morphemic components of the words they spelled.

Carlisle (1987) concluded that learning about the morphemic structure of derived words certainly precedes use of this knowledge in spelling in both normal and poor readers, although the gap is more pronounced for poor readers. This is because spelling is, in general, a more demanding task which draws upon a variety of resources. Overall, poor readers' difficulties in spelling base and derived words were attributed to their poor morphological analysis skills and their failure to "exploit" their existing levels of morphological knowledge when spelling.

Furthermore, Bryant, Nunes, and Bindman (1998) examined "historically" the oral morphological abilities and the spelling skills of 9-year-old poor readers who were shown to have difficulties in using the conventional "ed" spelling in real words. The performance of these children 20 months earlier on measures of grammatical awareness (word and sentence analogy tasks) and on spelling regular past tense verbs, irregular past tense verbs, and non-verbs was compared to that of children of the same age who were at that time reading as well as them but had not developed reading difficulties later on. Bryant et al. found that those children who 20 months later became poor readers had initially performed considerably worse than the controls on spelling irregular past tense verb and non-verb endings,

with no such difference in their use of "ed" in regular past tense verbs. Additionally, the two groups exhibited virtually identical grammatical awareness profiles in the initial testing. Bryant et al. concluded that poor readers quite early on have difficulties with phonologically based spellings only, which hold them back in reading. This deprivation of reading experience subsequently hampers the development of their grammatical awareness and their eventual success with grammatical spelling patterns.

In summary, studies examining the underlying linguistic source of the spelling difficulties of poor readers of English have generally focused on that aspect of spelling which relates to derived word forms. These studies have documented the existence of a powerful link between sensitivity to morphological structure and the spelling of morphologically complex words, although the contribution of phonological analysis to such spelling measures was also found to be significant and unique in many cases too. However, most of the studies failed to include a strict reading- or spelling-control matching in their designs, and thus the conclusions drawn about the factors underlying spelling disability can only be limited.

Morphological awareness and learning to read and spell: Evidence from intervention studies

Lyster (2002) carried out an intervention study evaluating the effectiveness of training programmes focusing on the phonological and morphological aspects of oral language on reading development in Norwegian, a script of a relatively regular orthographic structure which makes certain morphopohonemic demands (e.g., the articles -en and -et at the end of nouns have silent letters). Lyster randomly assigned 6-year-old non-readers attending kindergarten to two experimental groups, one receiving phonological instruction (identifying/blending/segmenting phonological units, and rhyme/alliteration detection) and one receiving morphological instruction (compounding, derivational prefixes and suffixes), and a control group receiving no instruction. The instructional programmes in both areas of language awareness always included some exposure to print as a means of making the link between oral and written language explicit. Lyster's analyses of treatment effects (using verbal IQ as a covariate) revealed some interesting findings. First, training in phonological awareness increased children's sensitivity to the morphological structure of words in oral language, and conversely morphological awareness training had a facilitatory effect on children's levels of phonological awareness. Second, training had an immediate effect on reading development: both intervention groups performed significantly better than controls on reading single words at post-test, immediately after the intervention, as well as at school entry. Moreover, this effect on reading was long-lasting, as it held true for text reading at the end of the first school year. With regards to single word reading, however, only the group receiving training in morphological awareness retained a long-lasting advantage. These results suggest that morphological awareness training is most effective in fostering growth in reading attainment. Third, the intervention effect was specific to literacy, as no such effect was observed on mathematics performance.

Lyster (2002) concluded that there is a close and reciprocal relation between the two different language awareness skills and that, among the two, morphological awareness has the strongest impact on reading, even in the early stages of reading development. The overall smaller magnitude of the phonological training effect on reading was attributed by Lyster to the transparency of the Norwegian orthography and to the phonics approach adopted for the teaching of literacy. On the educational level, Lyster proposed that "*...teachers should be encouraged to emphasise the teaching of morphological awareness and knowledge as soon as the*

children have developed a phonological base that helps them to handle morphemes" (p. 290). In general, results from intervention studies provide valuable insights into the underlying processes that exert causal influences on literacy development, and as such the results of this study are particularly robust.

Nunes, Bryant, and Olsson (2003) evaluated the hypothesis of causality, as well as specificity, in the relation between morphological awareness and literacy attainment. In a large-scale training experiment, they provided either morphological or phonological training to 7- and 8-year-old children (in grades 3 and 4), while a control group of children of the same age received no instruction. The experimental group was further split into four subgroups: two subgroups of children were trained in phonological awareness (with one group further instructed on the use of phonological knowledge in writing), and similarly two experimental subgroups were trained in morphological awareness, again with or without reference to written language. Training (blending, classification, and analogy activities) aimed at increasing children's explicit linguistic knowledge and their understanding of how this kind of knowledge is connected with spelling. Nunes et al.'s results showed that both types of instruction –either associated with writing or not– significantly improved children's general reading but not spelling achievement, as measured by standardized tests. Furthermore, although only the children who had been trained in oral morphology and its use in writing used this knowledge to spell derivational morphemes in real words (but not in pseudo-words), none of the intervention groups benefited from the specific instruction when reading. The phonological intervention had also no specific effect on the use of conditional phonological rules in either reading or spelling. Finally, no contribution to mathematical reasoning was made by any of the specific interventions.

Therefore, it was shown that when training in morphemes is associated with morpheme use in writing children's skill in spelling morphemes in real words improves (although no such effect was present for pseudo-word morpheme spelling). This positive result for a specific connection between morphology and spelling, according to Nunes et al. (2003), is of great educational value, and points to the need for specific instruction on morphological spelling rules as a means of enhancing children's success in learning to spell morphemes. The unexpected negative result with respect to phonological training, however, was attributed by Nunes et al. to the short length of the intervention (conditional rules are too difficult for children of this age range), or alternatively to the fact that phonological awareness training was part of the formal literacy instruction that all children (including those in the control group) had received.

Moreover, Bryant, Devine, Ledward, and Nunes (1997) have reported an intervention study (Experiment 2) on children's use of the apostrophe for denoting possession, with results supporting the existence of a strong relation between 9- and 10-year-old fifth- and sixth-graders' (matched on spelling age) use of the apostrophe in spelling and in oral language. The participants were divided into three groups for each grade level: an intervention group trained (with a 30-minute tuition session) in the apostrophe and its use in spelling as a marker of possession, a taught control group trained to differentiate homophones on the basis of their meaning, and an untaught control group. Children were tested before and shortly after the intervention on a spelling task requiring the completion of a sentence where a singular genitive noun or a plural nominative/accusative noun was missing. In addition, an experimental spelling task of using the apostrophe in contracted words was also given. Further, two metalinguistic tasks measuring children's explicit awareness of the grammatical distinction in speech between singular genitive and plural nominative/accusative noun forms were introduced orally. In the analogy task children

had to transform a sentence involving possession into a genitive phrase, and vice versa. In the oddity task, children were asked to select the odd sentence among three sentences in each trial, two but one of which shared a noun in either the singular genitive or the plural nominative/accusative form.

The results of this experiment showed that the metalinguistic task of analogy contributed significantly to children's appropriate use of the apostrophe with genitive words prior to the intervention (accounting for a significant 7% of the variance, once chronological and spelling age had been controlled), whereas oddity did not. Also, none of the metalinguistic tasks made a significant contribution to the correct use of the apostrophe with contracted words in the pre-test, after controlling for differences in chronological and spelling age. Bryant et al. (1997) concluded that the link between children's awareness of the grammatical distinction between singular genitive and plural nominative/accusative nouns in oral language and their ability to use the apostrophe correctly when they spell words denoting possession is a specific one.

Apart from the studies reviewed exploring morphological awareness effects on literacy attainment in the *alphabetic* orthographies of English and Norwegian, an intervention study of such treatment effects has also been reported by Packard et al. (2006) for Chinese, a highly systematic in its structure *morphographic* writing system in which single characters usually represent individual morphemes bound together to form words. In this study an experimental group of first-graders, apart from the traditional literacy instruction, received additional training in the orthographic properties of written Chinese (phonetic and semantic radicals in characters) and also in its morphological structure (with character-morphemes contributing to the meaning of multi-morpheme words). By contrast, the control group was offered only the traditional instruction focusing on rote memorization techniques (copying characters and writing them by rote as unanalyzed wholes). Results showed that the intervention improved children's ability to write Chinese characters. Packard et al. concluded that learning to write in a non-alphabetic orthography like Chinese draws upon sensitivity to the morphological structure of words and also to the orthographic structure (semantic-phonetic features) of characters.

In summary, research to date has shown that the representation of morphological relations in spelling is particularly challenging for young spellers. However, the encouraging finding of intervention effects in English and Chinese points to the need for linking grammatical knowledge and spelling explicitly in the classroom. It is now widely accepted that it is only through a combination of convergent evidence from longitudinal and intervention studies that strong claims for causal effects can be made (Bryant & Bradley, 1985). This type of combined evidence is available to date for one orthography, English, and is strongly suggestive of a *causal linkage* between awareness of morphological distinctions in oral language and learning about morphemically based spelling patterns.

3. Conclusions about Morphological Awareness and Literacy Skills

Despite the fact that morphological awareness has received considerably less attention than phonological awareness in the psycholinguistic and reading/spelling literature there is mounting evidence to date indicating morphological influences on literacy skills in a variety of orthographies. Indeed, the empirical evidence linking morphological awareness with literacy acquisition and development is now sound and ever growing. The investigations reviewed in this paper have resulted in a consensus that morphemes are acquired in oral language and are used in reading and spelling not only in alphabetic scripts of varying degrees of orthographic transparency but also in a

morphographic script, that of Chinese. The evidence for the role of morphology in Greek spelling in particular comes from relatively few investigations, which have shown that children's early attempts at inducing the morphological (inflectional) spelling principle are facilitated by their growing awareness of the morphemic structure of the oral language. Further research on this area –by means of longitudinal and intervention studies– is certainly needed for firm conclusions to be drawn with both theoretical and educational implications. On the whole, recent empirical studies on the link between morphological awareness and literacy skills in a variety of scripts converge in suggesting that knowledge of the phoneme-to-grapheme correspondence rules (alphabetic principle) and mere rote memorization of spelling patterns (word-specific learning) are not sufficient resources for acquiring proficiency in spelling.

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APPENDIX

Review of Studies Examining the Link between Morphological Awareness and Literacy Skills

Investigation Area	***Studies Reviewed***
Morphological Awareness and Reading: Developmental/Correlational Studies	
(A) Morphological Awareness and Reading in Normal Readers/Spellers	Brittain (1970) Carlisle (1995) Carlisle (2000) Carlisle & Nomanbhoy (1993) Mahony, Singson & Mann (2000) Nikolopoulos, Goulandris, Hulme & Snowling (2006) Singson, Mahony & Mann (2000)
(B) Morphological Awareness and Reading in Poor Readers/Spellers	Elbro (1989) Elbro & Arnbak (1996) Fowler & Liberman (1995) Leong (1989) Shankweiler et al. (1995)
Morphological Awareness and Spelling: Developmental/Correlational Studies	
(A) Morphological Awareness and Spelling in Normal Readers/Spellers	Bryant, Nunes & Aidinis (1999) Bryant, Nunes & Bindman (2000) Carlisle (1988) Derwing, Smith & Wiebe (1995) Harris & Giannouli (1999) Leong (2000) Nikolopoulos, Goulandris, Hulme & Snowling (2006) Nunes, Bryant, & Bindman (1997a) Nunes, Bryant, & Bindman (1997b) Plaza & Cohen (2004) Rubin (1988) Sénéchal, Basque & Leclaire (2006)
(B) Morphological Awareness and Spelling in Poor Readers/Spellers	Bryant, Nunes & Bindman (1998) Carlisle (1987) Fowler & Liberman (1995) Rubin, Patterson & Kantor (1991) Shankweiler, Lundquist, Dreyer & Dickinson (1996)
Morphological Awareness and Learning to Read and to Spell: Intervention Studies	
	Bryant, Devine, Ledward & Nunes (1997) Lyster (2002) Nunes, Bryant & Olsson (2003) Packard et al. (2006)

Μορφολογική επίγνωση και δεξιότητες ανάγνωσης και ορθογραφημένης γραφής: βιβλιογραφική ανασκόπηση

ΚΑΛΛΙΟΠΗ ΧΛΙΟΥΝΑΚΗ[1]

ΠΕΡΙΛΗΨΗ

Η μεταγλωσσική ικανότητα έχει θεωρηθεί για δεκαετίες ότι επιδρά στην κατάκτηση των δεξιοτήτων ανάγνωσης και γραφής (Mattingly, 1984). Με βάση αυτή τη διαπίστωση, προκύπτει η υπόθεση ότι η επίγνωση εκ μέρους των παιδιών σχολικής ηλικίας της μορφολογικής δομής των λέξεων της μητρικής τους γλώσσας ενδέχεται να επιδρά τόσο στην ευκολία όσο και στην ταχύτητα με την οποία κατακτούν την ορθογραφημένη γραφή λέξεων βάσει γραμματικών διακρίσεων. Η παρούσα εργασία επιχειρεί μια ανασκόπηση της διεθνούς βιβλιογραφίας που εξετάζει μέσω εξελικτικών/συσχετιστικών μελετών όσο και μέσω παρεμβατικών μελετών τη σχέση ανάμεσα στη μορφολογική επίγνωση αφενός και στην ανάγνωση και ορθογραφημένη γραφή αφετέρου. Επίσης, η ανασκόπηση επεκτείνεται σε έρευνες που υποστηρίζουν την ύπαρξη αιτιότητας στη σχέση αυτή. Δεδομένα για τα ερευνητικά αυτά αντικείμενα υπάρχουν διαθέσιμα για μια σειρά αλφαβητικών ορθογραφικών συστημάτων, όπως της αγγλικής, γαλλικής, δανικής, νορβηγικής και ελληνικής γλώσσας, καθώς και για το σύστημα γραφής της κινεζικής γλώσσας. Συνεπώς, πρόσφατες ερευνητικές μελέτες έχουν παράσχει εμπειρική υποστήριξη για την ύπαρξη ισχυρής σχέσης ανάμεσα στη μορφολογική επίγνωση και τις δεξιότητες ανάγνωσης και γραφής, τόσο σε αλφαβητικά όσο και σε μορφογραφικά ορθογραφικά συστήματα.

Λέξεις-κλειδιά: Κατάκτηση δεξιοτήτων ανάγνωσης-γραφής, Μεταγλωσσική ικανότητα, Μορφολογική επίγνωση.

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