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Phonological Awareness & Early Bilingualism:

A comparative study on the metaphonological skills of Wallonian and Flemish school children in regular vs. immersion programmes

Proeve ingediend voor het behalen van de graad van Master in de Taal- en Letterkunde: Engels - Spaans

Written by Anneleen Malesevic
Supervisor: Prof. Dr. Alex Housen

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Ik verklaar plechtig dat ik de masterproef, Phonological Awareness & Early Bilingualism: A comparative study on the metaphonological skills of Wallonian and Flemish school children in regular vs. immersion programmes, zelf heb geschreven. Ik ben op de hoogte van de regels i.v.m. plagiaat en heb erop toegezien om deze toe te passen in deze masterproef.

Datum Naam + handtekening

Abstract

Author: Anneleen Malesevic

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The present study investigated the acquisition of metaphonological skills amongst children exposed to early second language learning within the Wallonian immersion context. The primary aim was to determine whether bilingualism has selective rather than universal effects on metaphonological development. Of secondary interest was to specify whether an observed effect is best explained in terms of cross-linguistic transfer or the structural sensitivity theory. To this end, the metaphonological abilities of bilingual French-Dutch children enrolled in a Dutch immersion programme were compared with those of French and Dutch monolingual children receiving traditional education. The tasks were designed to assess phonological awareness in terms of shared and unshared features of the two languages analytically acquired. The results reveal language specific as well as universal trends, which leads to the conclusion that the exact nature of a bilingual effect on phonological awareness is conditioned by various factors, such as the languages that are being acquired, the degree of bilingualism and the timing of assessment.

Summary

A good educational system is representative of all members of society. As a multilingual society is becoming the norm, bilingual educational programmes are becoming more popular. The implementation of such programmes has increased the interest in bilingualism and its effects on child development, especially the impact of second language learning in relation to cognitive and linguistic domains. In line with these recent developments, the present dissertation wanted to contribute to the existing body of research relating bilingualism to metaphonological development. Of specific interest was to confirm previous claims that bilingualism has selective, rather than universal effects on the development of phonological awareness. A corollary aim was to clarify whether an observed bilingual effect was best explained in terms of cross-linguistic or structural sensitivity. To this end, an experiment was set up which compared the metaphonological skills of bilingual French-Dutch first grade school children enrolled in Dutch immersion programmes with a population of French monolingual and Dutch monolinguals peers receiving regular education. Such a group set up not only allowed for the assessment of language-specific effects in bilingual acquisition by comparing bilingual acquisition to the monolingual norm, but also enabled assessment of universal metaphonological acquisition trends. The children were presented with an initial syllable task and initial phoneme deletion task designed to contain features exclusive to either French or Dutch and features common in French and Dutch. It was hypothesised that the bilingual children would display levels of syllable awareness comparable to the Wallonian children enrolled in regular French educational programmes and superior to the Flemish children enrolled in regular Dutch educational programmes Similarly, the study expected to find levels of onset-rime and phoneme awareness superior to the French monolinguals and comparable to the Dutch monolinguals. Although the results did not confirm the hypotheses, evidence was found for a differential metaphonological development in bilinguals as well as for a universal development sequence.

Firstly, the French monolinguals displayed levels of syllable awareness superior to the bilingual and Dutch monolingual children on the typically French items. However, this advantage disappeared when comparing abilities on the shared features items. The subsequent error analysis indicated that the majority of bilinguals' inaccurate responses could be attributed to exposure to Dutch. Therefore, it seems that the knowledge of French and Dutch interfered with the acquisition of dissimilar sound structures. However, the bilinguals' linguistic knowledge simultaneously aided the acquisition of similar features, allowing the bilinguals to attain

comparable levels of syllable awareness on the shared feature items. As such, the present study provides support for the more hybrid hypothesis that bilingual children can exhibit characteristics of transfer and structural sensitivity at the same time.

Secondly, the groups did not differ significantly on the initial phoneme deletion task in its entirety. However, a more detailed analysis revealed that the Dutch monolingual participants outperformed the francophone children on the consonant cluster items, which indicates that Dutch monolinguals had enhanced levels of phonemic awareness in the Dutch monolingual in comparison with the French monolingual and immersion children. This finding was attributed to the Dutch monolinguals' knowledge of a more transparent orthography. As for the bilinguals, the mean scores did indicate that the French-Dutch bilinguals performed better than their monolingual French speaking peers at both the level of the onset-rime as the level of the phoneme. The individual variance at the developmental stage under investigation was, however, too large to speak of a significant effect.

Lastly, the findings of the present study were in line with the current conceptualisation of phonological awareness as a compilation of skills that develop in a hierarchically fashion from large to small, although there are overlapping stages in which one than more skill is acquired simultaneously.

The findings led us to conclude that the wide variety of contradictory outcomes which characterises the field of bilingualism research in relation to phonological awareness, is inducted by language specific effects as well as irregularities in terms of the degree of bilingualism and the time of assessment. It seems that encountering a bilingual advantage in terms of phonological awareness depends on looking at the right component skill at the right moment in the developmental stage, while taking into account the degree of bilingualism and language specific qualities.

Keywords: phonological awareness, early bilingualism, bilingual education, second language acquisition, immersion programmes in Wallonia, cross-linguistic transfer, structural sensitivity theory, French phonology, Dutch phonology

Samenvatting

Een goed onderwijssysteem hoort representatief te zijn voor alle lagen en facetten van de gemeenschap. Gezien het meertalige en multiculturele klimaat van de hedendaagse maatschappij heeft tweetalig onderwijs dan ook aan populariteit gewonnen. De introductie van dergelijk onderwijs binnen het huidige onderwijssysteem heeft de interesse in de effecten van tweedetaalverwerving op de cognitieve en linguïstische ontwikkeling exponentieel doen groeien. Daarom werd er in deze masterproef gekozen om bij te dragen aan de bestaande kennis inzake de effecten van tweetaligheid op de verwerving van fonologisch bewustzijn. Het doel van het huidige onderzoek is tweeledig. Ten eerste wordt er onderzocht in hoe verre de stellingen gemaakt door Bruck & Genessee (1995) en Bailystok et al. (2003) gegrond zijn. Op basis van hun onderzoek, hebben zij namelijk geconcludeerd dat tweetaligheid eerder taal specifieke dan wel universele effecten heeft op de ontwikkeling van fonologisch bewustzijn. Ten tweede wordt er nagegaan of mogelijke aangetroffen metafonologische verschillen tussen een- en tweetaligen het best te verklaren zijn aan de hand van cross-linguïstische transfer of aan de hand van de structurele sensibiliteitstheorie.

Om het onderzoeksdoel te verwezenlijken, werd het fonologisch bewustzijn van tweetalige kinderen uit Nederlandstalige immersie programma's in Wallonië vergeleken met een eentalige populatie van Fransprekende en Nederlandssprekende kinderen uit het traditionele onderwijs. Een dergelijk groepssamenstelling maakt het mogelijk om zowel taal-specifieke als universele trends op te merken in de een- en tweetalige participanten. De deelnemende kinderen moesten zowel een initiële syllabe isolatie taak als een initiële foneem isolatie taak oplossen. Drie reeksen test stimuli kunnen binnen deze taken onderscheden worden, namelijk test stimuli die eigenschappen bevatten typisch voor het Frans of het Nederlands en test stimuli die eigenschappen bevatten gemeenschappelijk in het Frans en het Nederlands. Er werd verwacht dat de tweetalige kinderen een beter syllabe bewustzijn zouden ontwikkeld hebben in vergelijking met de Nederlandstalige kinderen alsook een beter onset-rime en foneem bewustzijn in vergelijking met de Franstalige kinderen. Hoewel de resultaten deze hypotheses niet bevestigden, werd er wel bewijs geleverd voor een differentiële verwerving bij tweetaligen alsook voor een universeel ontwikkelingsverloop van fonologisch bewustzijn.

Op de eerste plaats vertoonden de eentalig Franssprekende kinderen een hoger niveau van syllabisch bewustzijn in vergelijking met de andere twee groepen, maar uitsluitend voor de typische Franse test items. De foutanalyse gaf vervolgens aan dat het merendeel van de incorrecte antwoorden gegeven door de tweetaligen geïnterpreteerd konden worden als

negatieve taaltransfer van het Nederlands naar het Frans. Op grond daarvan werd besloten dat de interactie tussen de twee taalsystemen de verwerving van niet-gedeelde klankstructuren verhinderden. De linguïstische kennis van de tweetaligen bevordert echter tegelijkertijd de verwerving van gedeelde klanken, waardoor de tweetaligen niet slechter presteerden dan de eentalige op de test items die gezamenlijke karakteristieken bevatten. Deze bevinding staaft de hybride hypothese dat het ontwikkelingsverloop van tweetaligen tegelijkertijd tekenen van taal transfer alsook van structurele gevoeligheid kunnen vertonen.

Ten tweede werden er geen significante groepsverschillen in fonologisch bewustzijn op subsyllabisch niveau voor de initiële foneem isolatie taak. Een meer gedetailleerde verkenning liet echter blijken dat de eentalige Nederlandssprekende kinderen een superieur fonemisch bewustzijn hadden in vergelijking met de andere twee groepen. Deze bevinding kan verklaard worden door de transparante orthografie die eigen is aan het Nederlands. Wat betreft de presentaties van de tweetaligen viel op dat de gemiddelde scores aangeven dat zij beter presteerden dan de eentalig Franssprekende kinderen. Deze verschillen werden echter niet significant bevonden omwille van een grote individuele variatie.

Ten laatste wijzen de resultaten van de huidige studie op een universeel ontwikkelingspatroon. De kinderen lijken namelijk op hiërarchische wijze gewaar te worden van linguïstische structuren, d.w.z. van groot naar klein. Een dergelijke bevinding staaft de huidige conceptualisatie van fonologisch bewustzijn als een constructie van verschillende vaardigheden die in hiërarchische volgorde ontwikkelt.

Op basis van deze bevindingen concludeert het huidige onderzoek dat de grote variëteit aan uitkomsten die het onderzoek naar de effecten van tweetaligheid op fonologisch bewustzijn kenmerkt, te wijten zijn aan verschillende factoren. Ten eerste wordt fonologisch bewustzijn beïnvloed door taal-specifieke eigenschappen. Ten tweede verschillen onderzoeken inzake de taalvaardigheid bereikt door de tweetalige participanten. Ten laatste is ook het moment binnen het ontwikkilingsverloop waarop de kinderen getest worden bepalend voor de uitkomsten van het onderzoek.

Trefwoorden: fonologisch bewustzijn, tweetaligheid, tweetalig onderwijs, tweedetaalverwerving, immersie programma’s in Wallonië, cross-linguïstische transfer, structurele gevoeligheid, Franse fonologie, Nederlandse fonologie.

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Introduction

In the contemporary society, bilingualism is becoming the rule instead of the exception, since more than half of the world's population speaks more than one language in everyday life. Therefore, interest in bilingual language acquisition should be applied to all domains within the field of psycholinguistics, including bilingual acquisition of metaphonological abilities, which has been relatively neglected thus far (Goetry, Kolinksy and Mousty, 2002). During the past decades, research concerning phonological awareness has mainly focussed on its role within literacy development (e.g. Bus & van Ijzendoorn, 1999; Castles & Colheart, 2003; Hoien et al., 1995; Hogan et al., 2005; Stahl & Murray, 1994; Tunmer et al., 1988; Wagner, 1988; etc.). Only after a reciprocal relationship between phonological awareness and literacy development had been established, researchers have become gradually more interested in bilingual development of phonological awareness.

Phonological awareness is a metalinguistic ability that enables one to detect, access and manipulate the sound structure of spoken language. (Anthony et al., 2004; Stahl & Murray, 1994; Smith et al. 1998; Tunmer et al., 1988; Wagner & Torgesen, 1987). Early on, the idea that bilingualism might facilitate metalinguistic development was proposed by researchers such as Vygotsky (1962). Over the past decades, research has explored this hypothesis, mainly with affirmative results (Bialystok, 2003). However, most of the studies relating bilingualism to metalinguistic awareness have focussed on the assessment of lexical and syntactic awareness (Bialystok, 2003; Goetry, Kolinsky and Mousty, 2002). In order to provide a clear insight into current phonological awareness research trends, it is firstly important to contextualise the role of phonological awareness within studies on metalinguistic abilities.

Metalinguistic ability refers to a set of skills that enables one to solve metalinguistic problems by reflecting on and manipulating the structural features of language (Bailystok, 1985; Tunmer et al., 1988). Metalinguistic skills emerge alongside the cognitive as well as metacognitive growth of a child and require the ability to structure and access specialized knowledge in particular ways (Bialystok, 1985; Smith at al., 1998). This entails that metalinguistic activities involve high demands on two cognitive dimensions, namely analysed knowledge and cognitive control (Bailystok, 1985). Thus, metalinguistic skills call for control processing, unlike normal language operations, which require automatic processing (Tumner et al., 1988). Metalinguistic ability manifests itself into four categories, namely phonological, lexical, syntactic and pragmatic awareness. These different kinds of metalinguistic abilities should be considered as a construct of significantly interrelated, but independent abilities. In turn, each independent ability consists of component skills that are exclusive to the tasks designed to measure it (Tumner et al., 1988).

Research concerning metalinguistic ability has mainly focused on its role within literacy development. The link between metalinguistic ability and literacy development becomes apparent when considering the deficiencies at the basis of literacy problems. Metalinguistic abilities and literacy development may seem to arise simultaneously when looking at the progression of successful young learners. However, evidence from experimental studies suggest that young struggling learners benefit from training in metalinguistic skills. For example, one study (Bradley & Bryant, 1983) indicated that the training of segmenting skills – a component skill of word and phonological awareness – leads to a significant advantage in reading achievement. Another study by Short & Ryan (as cited in Bailystok, 1985: p 240-241) showed a greater percentage of story recall in poor readers after a brief training in story grammar strategy. Another example of the importance of syntactic awareness is that research (e.g. Tunmer et al., 1988) suggests that it may help beginning learners to discover and understand homographic spellings. Tunmer et al.'s (1988) correlational study further indicates that each metalinguistic ability plays a role in different stages in one's literacy development, although phonological awareness seems to be of key importance, especially for early reading and writing acquisition.

The relationship between metalinguistic ability and bilingualism has gradually become of interest due to the central role it fulfils in literacy development. Research on this topic, conducted over the past 30 years, provides evidence of differential metalinguistic development in monolingual and bilingual children. One of the earliest indications of bilinguals' superior metalinguistic skills is that bilingual children are more aware of the arbitrary relation between words and their allocated meaning (Leopold, as cited in Bailystok, 2001: 171). Bailystok (2001) also noted that bilinguals outperform their monolingual peers in tasks which require segmentation of meaningless sentences into words. In addition, a study by Galambos & Hakuta (as cited in Bailystok, 2001) compared the syntactic awareness of monolinguals and bilinguals on tasks that assessed grammatical judgement and the ability to correct errors and detect grammatical ambiguity. The study found a bilingual advantage, although the advantage on the ambiguity task was limited to only older bilingual children. In sum, the majority of studies report a metalinguistic advantage for bilingual individuals, although few studies have examined the acquisition of phonological awareness in bilingual and monolingual individuals. Moreover, the outcomes of research that focused on phonological awareness have been contradictive, with some studies supporting and others contradicting an advantage for bilingual speakers. For example, Rubin & Turner (1989) found that the English speaking kindergarteners enrolled in French immersion programmes outperformed their peers enrolled in regular programmes However, Bruck & Genesee (1995) conducted a similar study in which the children were not only tested in kindergarten, but also in first grade. Despite of the initial bilingual advantage in kindergarten, the results further indicate that by first grade the pattern of group differences had become more complex causing the overall bilingual advantage to disappear. Another study by Bialystok et al. (2003) compared the phonological awareness of monolingual English children with two groups of bilingual children, namely bilingual Spanish-English and bilingual Chinese-English. The three groups showed different levels of phonological awareness with an bilingual advantage for the Spanish-English bilinguals. However, this advantage was not observed in the performances of the Chinese-English bilinguals. Instead, the performances of said group revealed a bilingual delay in phonological awareness development. Therefore it was concluded that the effect causing the group differences in performance could not to be attributed to bilingualism. Bialystok et al. (2003), hence, ascribed the observed effect to language specific qualities. The Spanish-English bilingual advantage was attributed to the simple phonetic structure of Spanish, which promotes early access to phonological awareness. In contrast, Chinese, being a non-alphabetical tonal language, which differs significantly in phonetic structure from English may have caused a delay in the acquisition of phonological awareness. As these examples illustrate, bilingualism in se does not affect phonological awareness. However, being bilingual in specific language combinations may affect phonological awareness acquisition, causing a bilingual advantage, disadvantage, or differential developmental pattern without an overall (dis)advantage. Moreover, according to Bialystok & Bouchard (as cited in Goetry, Kolinsky & Mousty, 2002: 92), higher levels of analysed linguistic knowledge, and thus in extension phonological awareness, is mostly confined to bilinguals who have acquired both languages through instruction. Following that reasoning, the effect that bilingualism has on phonological awareness may be more extensive in children attending immersion programmes. Again, the evidence regarding this claim is inconclusive with, on the one hand, studies, such as Rubin & Turner (1989) and Bruck & Genesee (1995), providing evidence for a differential development in children attending immersion programmes, and on the other hand, studies such as Lecocq et al. (2006) and Tingley et al. (2004) refuting the claim.

The current study intends to contribute to the existing body of research relating bilingualism to metalinguistic development by conducting an experiment in which the language specific influence of bilingual school instruction on phonological awareness acquisition is assessed. More specifically, the study examines the metaphonological skills of children attending regular education and immersion programmes in Belgium. The phonological awareness of 25 bilingual French-Dutch first graders recruited from a Wallonian school offering Dutch immersion programmes is compared with both a monolingual French speaking as well as a monolingual Dutch speaking group recruited from regular education programmes in Wallonia and Flanders. By doing so, the study hopes to provide an insight in phonological awareness acquisition among monolinguals and bilinguals.

The present research paper is divided into five chapters. Chapter I provides a theoretical framework consisting of three parts. Firstly, the relevant research areas concerning phonological awareness are discussed. Secondly, the phonological characteristics of French and Dutch are compared. Lastly, bilingual education within the Belgian context is discussed. Chapter II is dedicated to the methodological framework. In this section, the research objectives are presented, the sample population is described in terms of composition and characteristics and the test together with the analyses procedures are explained. Chapter III reports the results of the experiment which are subsequently interpreted, discussed and incorporated into the existing theory on phonological awareness in Chapter IV. Chapter V concludes the research and provides future research directions.

1. THEORETICAL BACKGROUND

1.1 Phonological Awareness

In the present study, three important research areas within phonological awareness studies are discussed, namely research related to the conceptualisation of phonological awareness, research relating phonological awareness to literacy development and research relating phonological awareness to bilingualism. Given the reciprocal relationship that exists between phonological awareness and literacy development, it is necessary to review phonological awareness research with respect to literacy development, before the findings of phonological awareness research in relation to bilingualism can be presented. However, unravelling the construct of phonological awareness is crucial for understanding both literacy and bilingualism related research. Therefore, a detailed conceptualisation of phonological awareness is first provided.

1.1.1 The Conceptualisation of Phonological Awareness

The literature reviews of Smith et al. (1998) and Wagner & Torgesen (1987) provide strong support that phonological awareness is part of a compilation of skills that enables one to code and retrieve verbal information, also known as phonological processing. As research on the conceptualisation of phonological processing has progressed, attention has shifted to fine-grain examination of its dimensions. Nonetheless, phonological awareness has to be placed in its larger context in order to fully understand its nature, development and relation to reading achievement.

a. Phonological Processing

The key question that has engaged researchers is whether phonological processing has to be viewed as a general ability or a construct of independent, but correlated skills. To answer this question, Wagner & Torgesen (1987) analysed three independently developed bodies of research that investigated three kinds of phonological processing, namely phonological awareness, phonological recoding and phonetic recoding. Wagner & Torgesen (1987) concluded that although the significant interrelations between the three components, there is enough empirical evidence to divide phonological processing into two main dimensions, namely coding and awareness – each consisting of various components.

The coding dimension or phonological coding[1] can be further subdivided into phonological and phonetic recoding. Phonological recoding, on the one hand, refers to the process in which written words are linked to their conventional meaning by recoding[2] written symbols into sound-based symbols, or in other words, graphemes into phonemes (Wagner & Torgesen, 1987). This component skill can be measured by rapid naming tasks (Smith & al. 1998). Phonetic recoding, on the other hand, involves the process which recodes graphemes into phonemes and stores them in working memory for use during ongoing processes such as decoding[3] unfamiliar words during reading (Wagner & Torgesen, 1987). One's aptitude in phonetic recoding can be measured by list learning tasks (Smith at el, 1998). Although both components of phonological coding make use of recoding, retrieval[4] and memory, they are distinctive in the type of memory that is required. Phonological recoding relies upon long-term memory to assess one's lexicon and retrieve known words, whereas phonetic recoding takes place in short-term memory (Smith at al., 1998).

The awareness dimension of phonological processing, also known as phonological awareness refers to the ability to hear and manipulate sounds in spoken language as opposed to identifying sounds in written language which requires phonological coding (Smith et al, 1998). Phonological awareness relies on strong analysis and synthesis skills to segment words into even smaller segments and to blend these segments into new words (Wagner, 1988). As phonological awareness requires the knowledge that words can be broken down into syllables, onsets-rimes and phonemes, some researchers (e.g. Cisero & Royer, 1995) assume that it can further categorized into three types of awareness, namely syllable awareness, onset-rime awareness and phonemic awareness. Phonological awareness is less demanding on one's memory than phonological coding (Smith et al, 1998). In contrast, poor phonological coding skills are assumed to be at the basis of memory-related problems in the sense that poor coding results in less language related information in long- and short-term memory. Research suggest that the memory related difficulties of poor learners with weak coding skills are not due to low memory capacity in general, as these problems seem to be specific to the type of material presented (Smith et al., 1998). The performance of poor learners on rapid naming and list

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[1] Phonological coding refers to *"the representation of information about the sound structure of verbal stimuli in memory"* (Smith et al., 1998: p. 66)

[2] The term coding is used to denote processes in which stimuli are transferred from one form to another. This can be either from auditory to written or vice versa. Recoding, however, is only used when information is translated from written to auditory form (Smith et al., 1998: p. 66)

[3] Smith et al (1998: p 66) defines decoding as *"translating individual or groups of letters into sounds to access the pronunciation of a word"*

[4] By retrieval is meant accessing short-term or long-memory for coded information (Smith et al., 1998: p.66)

learning tasks indicates that they only experience difficulty with recalling verbal information since they perform equally well as their normal achieving peers when asked to recall nonverbal items such as objects, drawings, etc. (Smith et al., 1998). These findings suggest that poor learners have trouble coding verbal information and storing it in long-term and short-term memory making lexical access and ongoing processes involving verbal material more difficult.

b. The Nature and Development of Phonological Awareness

Definitions of phonological awareness

Over the decades, there have been a number of different conceptualisations of phonological awareness that can be ranged on a continuum from narrow to broad. The most strict definition (e.g. Yopp, 1988) only considers awareness on the level of phonemes as significant. It argues that phonological awareness involves manipulation of the abstract representation of spoken language. The premise behind this narrow definition is that only awareness of phonemes requires reflection on abstract representations because they are acoustically inseparable in speech (Anthony & Lonigan, 2004). Supraphonemic skills – i.e. awareness of syllables and onset-rimes – are either regarded as faintly correlated abilities necessary for the development of phonemic awareness or as distinct abilities. For example, Yopp’s (1988) factor analysis indicated that rhyme and auditory discrimination tasks – unlike other tasks such as segmentation etc.- did not tap into the phonemic dimension nor did they correlate with the other tasks. According to Yopp (1988), this may suggest that rhyme and auditory discrimination tasks measure different underlying abilities such as word, syllable and/or onset-rime awareness.

A second less narrow characterization maintains that phonological awareness consists of the ability to manipulate all subsyllabic units – i.e. onsets, rimes and phonemes – because, according to Treiman (1983, 1985), knowledge on the structure of syllables is needed to successfully performed phonemic analysis tasks. In addition, Treiman (1983,1985) argues that onsets and rimes are psychologically based unlike syllables which require solely speech perception[5] as opposed to manipulation of abstract representations. Tasks involving larger units such as syllables are therefore excluded.

A third conceptualisation (e.g. Morais as cited in Anthony & Lonigan, 2004) includes the ability to detect and manipulate syllables as well as subsyllabic units. However, it excludes the ability to make judgements about phonological dissimilarity or similarity. For example, auditory discrimination tasks, such as Wepman Auditory Discrimination Test, only ask children

[5] Speech perception or *“sensitivity to the acoustic quality of speech”* (Anthony & Lonigan, 2004: p 43).

to decide whether word pairs are exactly alike or different (Wepman, 1960). However, a child that can indicate that /kæt/ and /kæp/ are different words is not phonologically aware unless the child can reproduce the sounds in which these words differ. Such a conceptualisation of phonological awareness also goes by the term of segmental awareness as it focusses on one's skill to segment linguistic units smaller than words.

The last definition of phonological awareness[6] (e.g. Stanovich as cited in Anthony & Lonigan, 2004) claims that the conceptualisation of phonological awareness should move away from the idea of being consciously aware of linguistic units as consciousness is a term that cannot be properly determined. Phonological awareness should be viewed as a single construct that involves different degrees of sensitivity to the sound structure of language, ranged from shallow awareness of larger linguistic units to deep awareness of small linguistic units. According to this definition, phonological awareness manifests itself in different stages. For example, children develop syllable awareness before onset-rime awareness and phonemic awareness manifests itself in even later stage, mostly after contact with reading and writing. In addition, the ability to perform phonologically related operations also develops in stages with rhyme and sound discrimination skills as the earliest mastered dimensions of phonological awareness and segmentation as one of the last.

It can be noted that these definitions differ in two respects. Firstly, the definitions are distinguishable by linguistic complexity i.e. whether phonological awareness should be viewed on a phonemic level, on a subsyllablic level or on a sublexical level. Secondly, the definitions differ in level of consciousness, i.e. whether phonological awareness involves solely the recognition and identification, solely the manipulation of sound structures, or both the recognition, identification and manipulation of sound structures. This dichotomy in level of consciousness has given rise to the terms of implicit or epilinguistic awareness and explicit or metalinguistic awareness (Geuddens, 2003).

General ability or independent abilities hypothesis

Another key notion in which the conceptualisation of phonological awareness differs is whether or not it should be regarded as either a single ability with different types of phonological skills or a collection of independent abilities. A considerable amount of studies provide evidence for the general ability hypothesis. The high degree of correlations among tasks that measure phonological awareness offer support that these operations tap into one single ability. For

[6] Anthony et al (2003, 2004, 2005) who support this conceptualisation also call it phonological sensitivity

example, Yopp (1988) and Stahl & Murray (1994), who conducted similar studies, found that the operations – auditory discrimination, rhyme, segmentation, blending, counting, isolation, deletion and matching – performed by the children were significantly interrelated. However, Yopp's (1988) factor analysis only found a very weak connection between rhyme and auditory discrimination on the one hand and segmentation, blending, counting, isolation, deletion and matching on the other hand. In addition, further analysis also revealed two underlying factors which suggests that phonemic awareness consists of two independent skills. As the findings of Stahl & Murray (1994) suggest, these results are probably due to the fact that Yopp (1988) did not consider linguistic complexity and only asked the children to perform tasks that manipulated phonemes. Furthermore, rhyme and auditory discrimination tasks are not ideal to measure phonemic awareness. For example, a child that indicates that /sʌn/ and /rʌn/ rhyme is not necessarily aware of the phonemes. It can also be indication that the child is aware of the structure of syllables since /s/ and /r/ are the onsets and /ʌn/ is the shared rime. Stahl & Murray's (1994) factor analysis showed that the tasks tap into one underlying factor when taking into account linguistic complexity. In addition, their study also provided evidence for the developmental progression of phonological awareness in that syllable and onset-rime awareness seems to be prerequisite to phonemic awareness – a finding that was replicated by Cisero & Royer's (1995) study. Cisero & Royer (1995) also found that rhyme tasks were easier for young children than initial phoneme deletion and initial phoneme deletion was easier than final phoneme deletion. The latter finding can be explained by the fact that initial phoneme deletion taps into onset-rime awareness whereas final phoneme deletion taps into phonemic awareness. For example, accurate deletion of /k/ in /kæt/ only requires splitting the word into the onset /k/ and the rime /æt/, whereas accurate deletion of /t/ requires complete segmentation. However, as Cisero & Royer (1995) point out, it is ethically impossible to design the ultimate study to test the general ability hypothesis given that it would require taking two groups of young children without any speech or print experience and exposing them to conditions in which one group first receives training rhyme and discrimination skills through detection of syllables, onsets and rimes while the other group is immediately exposed to exercises to train segmenting skills through phoneme detection.

Despite strong support for the general ability hypothesis, there are a few inconsistencies. For example, studies such as Yopp (1988), Hoien et al. (1995), Van Bon & Van Leeuwe (2003) only encounter weak relations between rhyme and sound discrimination on the one hand and segmentation, blending and deletion on the other. Although both Yopp (1988) and Van Bon &

Van Leeuwe (2003) only focussed on phonemic awareness, Hoien et al.'s (1995) study did take into account all levels of linguistic complexity. In addition, investigations that examined the relation between segmenting and blending – by posing questions as "does learning how to blend first help with learning how to segment?" –, found no evidence to suggest causal relation between the analysis and synthesis dimension of phonological awareness (Smith et al., 1998). Although these findings seem to support the independent abilities hypothesis, Anthony et al. (2004), Smith et al. (1998) and Troia (1999) offer an alternative explanation. The lack of generalization in these studies could be due to design flaws. Anthony et al. (2004) argue that the type of factor analysis used in correlational studies may not be suitable as a measurement since it has generated contradictive results. In addition, Smith et al. (1998) and Troia (1999) indicated an inattention to the size of phonological unit and task battery and to the range of tasks and learner characteristics. Furthermore, rhyme tasks overall might not be adequate to measure phonological awareness as they may heavily rely on the size of one's internal vocabulary, the ability to search and retrieve this vocabulary and on the understanding of the concept of rhyme (Anthony, 2004). As the alternative explanations for the independent abilities findings seem to align with the general ability hypothesis, it can be assumed that research on the nature and development of phonological awareness as a general ability is rather conclusive.

Phonological awareness in relation to cognitive ability, memory and speech perception

There is evidence (e.g. McBride-Chang, 1995) that phonological awareness correlates with general cognitive ability, short-term memory and speech perception. This hypothesis is based on the fact that these three dimensions are important for successful performance on phonological awareness tests. Firstly, individuals must have the reasoning capacity to reflect on and manipulate the test item i.e. they must be cognitively ready. This correlation would explain the development progression of phonological awareness. For example, children successfully achieve syllable segmentation before they are able to segment phonemes because phoneme segmentation requires an analytic awareness instead of the holistic awareness necessary to segment syllables (Smith et al., 1998). Secondly, short-term memory is important because the participants must remember the stimulus for a period of time (McBride-Chang, 1995). However, paper and pencil tests reduce the reliance on memory significantly (Bus & Van Ijzendoorn, 1999). Thirdly, the test items must be perceived correctly in order to be successfully manipulated. This correlation would also justify the inclusion of syllable and onset-rime awareness in that syllables, onsets and rime in contrast to phonemes are acoustically marked. For example, syllables can be distinguished by changes in amplitude and onsets and rimes by steady rate articulatory cues (Anthony, 2004). McBride-Chang's (1995) study proved that cognitive ability, memory and speech perception were strong predictors of the performance on phonological awareness tasks. Previous studies (e.g. Wagner, 1987) had already indicated the importance of cognitive ability and memory in relation to phonological awareness. McBride-Chang's (1995) study, however, was the first to consider the role of speech perception and found that it was of greater importance than the other two dimensions. These findings have, as already indicated, important implications. For example, the significance of cognitive ability consequently entails that accurate assessment of phonological awareness in children requires phonological awareness tests to be not only phonologically appropriate, but also cognitively appropriate. In addition, the correlation with short-term memory indicates that poor performance on items consisting of several chunks might be an indication of poor short-term memory rather than poor phonological awareness. This problem can be resolved by representing the children with paper and pencil tasks or by controlling the experiment for said variable.

Phonological awareness across languages

Phonological awareness seems to be general across languages, at least to a certain degree. Anthony et al (2004) state that research has revealed a general sequence of phonological awareness development. More specifically, two overlapping patterns of development have been identified. First, children become gradually more aware of smaller and smaller linguistic units as they grow older. For example, children develop the ability to detect and manipulate syllables before they are able to detect and manipulate rimes and onsets. Second, children are able to indicate whether sounds are alike or different before they can manipulate sounds within words, and children learn how to blend before they can segment. In addition, it has to be noted that the development of phonological awareness does not occur in strict stages. As children learn new phonological skills, the skills that had been previously acquired are refined.

Experience with specific oral or written language types does not alternate this sequence, although it can accelerate or slow down the development pattern. For example, Children who hear and speak Greek, Turkish or Italian seem to develop syllable awareness more quickly than English or French speaking children. This can be explained by the fact that languages such as Greek, Turkish and Italian have simpler syllable structures with clearer boundaries than English and French do (Anthony, 2005). This has as a result that syllables in Greek, Turkish and Italian are easier to pick up on. In addition, children who learn to write in alphabetic orthographies develop phonemic awareness more quickly. For example, Mann (1986) compared the acquisition of phonological awareness in American and Japanese children. Despite lack of training in an alphabetic orthography, most Japanese children were able to develop phonemic awareness by fourth grade. However, the American children had become aware of phonemes sooner than their Japanese peers as they achieved phonemic awareness in first and second grade.

c. Summary

In sum, phonological awareness forms part of the larger construct called phonological processing which consists of two main dimensions, i.e. awareness and coding. There is conclusive evidence that phonological awareness should be viewed as a general ability that allows the recognition, identification and/or manipulation of syllables, onset-rimes and phonemes through phonological and cognitive (e.g. synthesis and analytic) skills such as sound discrimination, blending and segmenting. The development of phonological awareness occurs in a particular sequence that is general across languages and is correlated with cognitive ability and speech perception. In addition, cognitive ability, memory and speech perception also play a role in successful performance on phonological awareness tasks. Unpacking the construct of phonological awareness serves as a base for the following discussion on its relationship with literacy development and bilingualism.

1.1.2 Phonological Awareness and its Role in Literacy Development

The present study has already mentioned cause to assume a relation between phonological awareness and literacy development, especially the link with reading acquisition has been widely investigated. The key question that has occupied researchers is whether phonological awareness is either a prerequisite for learning to read and write, influenced by reading and spelling instruction or both a cause and consequence of reading and spelling acquisition. Establishing the exact nature of the relationship between phonological awareness and literacy development has important implications for the timing and content of phonological awareness instruction (Smith et al, 1998).

a. Phonological Awareness: Crucial for Literacy Development

Evidence from Longitudinal and Training Studies

Two approaches have been commonly used to determine the link between phonological awareness and the acquisition of reading and spelling, namely longitudinal correlational studies and experimental studies. Correlational studies involve measuring phonological awareness and literacy development at several points in time, and then testing for covariance among tasks (Wagner, 1987; Castles & Coltheart, 2004). However, there is the possibility that the uncovered covariance is caused by a third unknown variable. This third variable could be a cognitive skill which influences the development and functioning of both processes. For example, phonological awareness and reading both require a certain amount of analysed knowledge and cognitive control – which are, as mentioned in the introduction, cognitive dimensions. To reduce this third variable problem, several studies have measured children within the same IQ interval, although this is not the ideal solution. Bailystok (1985) indicates that children can develop deficits in cognitive skills such as the ability to process verbal information regardless of cognitive capacity. Experimental studies provide better protection against the third variable problem The experimental approach involves manipulating either phonological awareness or reading/spelling skills by designing an intervention plan for the targeted skill. However, this design also has several drawbacks. For starters, it assumes that skills can be trained, which is not always the case (Wagner & Torgesen, 1987). Secondly, training effects can be achieved without affecting the targeted skill. For example, the subjects could have gained better understanding of the task upset after various testings. Finally, the training could have indirectly affected the targeted skills through an unobserved variable, although the change is smaller than it is in a correlational study (Wagner & Torgesen, 1987). Even though both approaches have their flaws, evidence from longitudinal studies and experimental studies put together form strong support for a causal relationship in both directions (Wagner & Torgesen, 1987; Smith et al., 1998).

Phonological awareness as a prerequisite. Four longitudinal correlational studies (Hogan et al., 2005; Stahl & Murray, 1995; Van Bon & Van Leeuwe, 2003; Verhagen et al, 2010), and the correlational studies reviewed in several literature reviews (Castle & Colheart, 2004; Smith et al,1998; Wagner & Torgesen, 1987) provide the first source of evidence that phonological awareness measures predict reading and spelling ability. For example, Hogan et al. (2005) tested phonological awareness and reading skills of children in kindergarten, second and fourth grade. Their findings suggest that syllable and phoneme deletion tasks reliably predict second-grade reading skills. Another study by Stahl & Murray (1995) indicated that the ability to separate onset from rime within syllables and phoneme isolation were crucial for early reading. Nearly all the children who failed to successfully perform these tasks were unable to achieve preprimer reading levels[7]. In addition, the results of two other studies (Van bon & Van leeuwe, 2003; Verhagen et al., 2010) suggest that phoneme recognition and blending can predict

[7] Children in first grade need to achieve, at least, a preprimer reading level to be able to follow during reading instruction

reading ability and spelling accuracy in first and second grade. The insights of correlational studies on the power of phonological awareness as a prediction for reading skills are twofold. Firstly, it offers methods to identify children at risk for reading disabilities (Smith et al., 1998). Secondly, it provides information for educational and training programmes on what type of phonological skills should be promoted before reading and spelling acquisition.

The second line of support for the prerequisite status of phonological awareness were found in the meta-analysis of Bus & Van Ijzenhoorn (1999) and two literature reviews (Smith et al.,1998; Wagner & Torgesen, 1987). Wagner & Torgesen (1987) stated that the positive effects noted in training studies, were reasonable cause to assume a causal relationship between phonological awareness and reading. In all the intervention studies discussed in Smith et al. (1998) and Wagner & Torgesen (1987), the effect of phonological awareness instruction on phonological awareness development, reading acquisition and spelling acquisition was measured through pre- and post-tests which were then compared. From these studies, it can be assumed that phonological awareness training reliably enhances reading and spelling ability.

The evidence discussed above provide strong support for the prerequisite role of phonological awareness. However, Castle & Colheart (2004) caution strong conclusions because of the difficulty to find suitable subjects without any literacy development whatsoever. Even when considering their warning, there is still reasonable cause to assume that phonological awareness influences literacy development.

Phonological awareness as a consequence. Establishing that phonological awareness significantly affects literacy development, does not exclude the possibility of a causal relation in the other direction. The studies discussed above also contained evidence to suggest that phonological awareness may benefit from the development of reading and spelling skills. For example, Several studies (e.g. Van bon & Van leeuwe, 2010) indicate that the development of phoneme segmentation skills require minimum reading and spelling abilities. Phoneme recognition and blending skills also seem to significantly benefit from literacy development although they already start to develop before literary instruction. In addition, Hogan et al. (2005) indicated that second grade reading skills predicted fourth grade phonological awareness.

Two more lines of research offer support for the influence of literacy development: studies with readers in non-alphabetical languages and studies with illiterates in alphabetical languages. Antony et al. (2004) and Smith et al. (2005) reported on the latter line of research and disclosed the following findings. Firstly, phonological awareness tests revealed that the subjects had underdeveloped phonological awareness skills. Secondly, the groups of illiterate adults that had received reading instruction, showed increased phonological awareness skills. As for the studies with skilled readers in non-alphabetical languages, Mann (1986) investigated the influence of orthography by comparing the phonological awareness of Japanese children who use a written system based on characters with the phonological awareness of American children who write in an alphabetical orthography. The findings revealed that the Japanese subjects achieved phonemic awareness at a much later age. In addition, knowledge about word spellings can affect one's performance on phonological awareness tests positively as well as negatively. For example, orthographic knowledge can facilitate the segmentation of words with an equal number of letters and phonemes, but it can also complicate the segmentation of words that have an odd number of graphemes and phonemes.

Reciprocal relation. The present study has produced enough evidence to suggest a reciprocal relation between phonological awareness and the ability to read and write. A reciprocal relationship entails that the causal relation appears in both directions. In other words, phonological awareness affects and is affected by reading and spelling acquisition. The educational implications, therefore, are that instruction of phonological awareness before and during literacy development are recommendable.

b. Phonological Awareness: Crucial, but not Sufficient

The present review has focussed on sources that examined phonological awareness in relation to literacy development. However, several sources have investigated influence of phonological awareness in combination with other skills such as alphabetic knowledge, word recognition, coding skills, etc. Despite strong support of the importance of phonological awareness in literacy development, 10 to 30 per cent of children in intervention studies did not improve their literacy skills through phonological awareness instruction (Smith et al., 1998), which indicates that phonological awareness is not sufficient for successful acquisition of reading and spelling.

The alphabetic principle. Although the importance of phonological awareness has been established, its relation with alphabetic understanding needs further unpacking. The alphabetic principle is a combination of orthographic and phonological knowledge which enables the understanding that letters represent sounds (Smith et al, 1998). This alphabetical understanding requires not only phonological – , or more precisely phonemic – awareness, but also letter knowledge. Hogan et al. (2005) and Stahl & Murray (1995), among others, found that letter knowledge and identification facilitates reading and spelling acquisition independently from phonological awareness. Letter knowledge can be trained by, for example, teaching the alphabet song (Stahl & Murray, 1995). The alphabetic principle enables the pronunciation of words which is important for the ability to recognize and identify them. In turn, word recognition allows lexical access – i.e. access to one's internal dictionary. Bus & Van Ijzenhoorn (1999) showed that experimental studies that combine phonological awareness training with letter-sound correspondence instruction obtain more effective results than studies with only phonological awareness instruction do.

Phonological coding. The literature review of Wagner & Torgesen (1987) and the meta-analysis of Wagner (1988) expressed a need for expanding phonological awareness instruction to include coding tasks. Studies that have responded to this call have yielded positive results. For example, Verhagen et al. (2010) indicated that both phonological awareness skills and rapid naming skills predicted children's spelling abilities. As previously mentioned, raping naming tasks measure phonological recoding skills, or the ability to translate letters into phonemes for lexical access. Also, Smith et al. (1998) concluded that training of rapid naming and list learning skills would be helpful for successful reading achievement since studies showed that instruction in both tasks improved word recognition, reading speed and the quality of the coding process. In addition, Bus & Van Ijzendoorn (1999) suggest that the role of phonological awareness decreases as children become more skilled in coding skills.

Metalinguistic skills other than phonological awareness. As indicated in the introduction, metalinguistic skills in general are important for literacy development. While phonological awareness is crucial in beginning reading and writing, its importance reduces after a certain reading level is obtained. For example, Tunmer et al. (1988) suggest that syntactic and pragmatic awareness become increasingly important as children grow older.

Evidence from studies with disabled readers. Even though the phonological awareness skills of children with dyslexia often remain persistently underdeveloped, they are able to obtain average and above average reading and spelling skills (Smith et al, 1998). Research (e.g. Treiman & Bourassa, 2003) suggest that dyslexic individuals overcompensate their lagging phonological awareness skills by developing strong orthographic skills and by relying more on semantic information and memory. Nonetheless, phonological awareness instruction decreases reading deficits in children at risk and even prevents it from becoming a persistent disability.

c. Summary

The significance of phonological awareness in relation to literacy development appears to be widely recognized and well-founded. Evidence from longitudinal correlational studies and experimental studies suggest a reciprocal relation given that phonological awareness not only seems to influence, but also is influenced by reading and spelling acquisition. Instruction of phonological awareness before and during literacy development is therefore advisable. However, at which point phonological awareness instruction should be combined with or even make place for instruction in other skills such as letter-sound correspondence, word recognition, pragmatic awareness etc. is uncertain. The long-term effects of phonological awareness instruction is less clear as fewer studies have examined older children. Also, only a limited number of longitudinal studies has opted to include other important skills for literacy development in their design. In conclusion, an approach that focusses on one skill is no longer adequate to provide new insights, due to the complexity of the literacy development process and the various skills that play different roles in its successful acquisition.

1.1.3 Phonological Awareness and its Relation to Bilingualism

Researchers have become increasingly interested in understanding bilingual phonological awareness development as it has been hypothesized that bilinguals may acquire phonological awareness more easily. Establishing such a causal relation is especially interesting given the importance of phonological awareness in literacy development. If bilingualism enhances one's phonological skills, bilingual individuals may also have an advantage in learning how to read and write (Bialystok et al., 2003). The premise behind the bilingual advantage hypothesis is that access to more than one language code would lead to stronger phonological awareness due to increased exposure to oral language and cross-transfer between languages (Martin, 2011). Even if it turns out that bilinguals do not have an advantage, understanding bilingual development of phonological awareness will help to provide better assistance in literacy development in bilingual communities (Martin, 2011).

a. Terminological Clarification

A discussion of bilingual effects on phonological awareness calls for a brief conceptualisation of the term bilingualism, i.e. what criteria should be met in order to be regarded as a bilingual? The conceptualisation of bilingualism is characterised by a range of divergent and controversial definitions. The definition of bilingualism at its lowest extreme states that an individual can be regarded as bilingual when he or she alternates between two or more languages whereas the definition at the highest extreme postulates that only someone who has mastered two or more language, each at native level can be classified as a bilingual (Willemyns, 1998). Both definitions are unusable, because of their extreme nature. They can, conversely, be placed at the edges of a bilingual continuum. However, researchers more commonly make use of a typological reference frame to denote the nature of bilingualism type under investigation (Willemyns, 1998). Phonological awareness research in relation bilingualism exclusively deals with early bilingualism, i.e. two or more languages have been acquired during early childhood. Within early bilingualism, a distinction is made between simultaneous and consecutive bilingualism (Laurent & Martinot, 2010). This dichotomy reflects that children either learn to speak two languages present in their immediate environment at the same time or they acquire the second language after the first one, usually around or after the age of 3 within the context of bilingual educational programmes or a migration situation (Laurent & Martinot, 2010). When two or more languages are acquired simultaneously or consecutively within a schooling context, the bilingualism type is often considered to be of an additive nature i.e. beneficial for one's cognitive and linguistic development (Laurent & Martinot, 2010). Bilingualism can, however, also negatively affect one's developmental progress. This type of bilingualism, also known as subtractive bilingualism, is often observed in immigrant children and has been linked to the threshold hypothesis (Cummins, 1979). According to this hypothesis, a threshold level of linguistic skills in the L1 must be acquired in order to avoid cognitive deficits and experience the potentially beneficial aspects of learning a second language (Cummins, 1979).

b. Hypothesised Relations between Phonological Awareness and Bilingualism

A review of fourteen bilingualism related PA studies revealed a range of hypothesized relations between phonological awareness and bilingualism. First, it has been argued that phonological awareness skills emerge at a faster rate in bilingual individuals in contrast to their monolingual peers. The rationale is that contact between languages facilitates the acquisition of phonological awareness. Second, a number of results seem to suggest that knowledge of multiple languages causes a delay in the development of certain phonological awareness skills. This leads to the believe that being bilingual interferes with the acquisition of phonological awareness with as result poorer phonological skills in bilinguals as opposed to monolinguals. Third, the possibility exists that bilingualism nor monolingualism yield an overall advantage in phonological awareness per se, but both conditions may influence certain aspects of phonological awareness and the strategies used to solve phonological awareness tasks. Thus, bilinguals and monolinguals may demonstrate similar acquisition rate, but still differ in developmental process. Finally, there may not be a causal relationship between phonological awareness and bilingualism given that a select number of studies showed no difference in performance on phonological awareness task nor in strategies to solve these tasks when comparing groups of monolinguals and bilinguals.

Proposing that any of the causal links above exist involves the belief in two additional hypotheses. Either bilinguals similar to second language learners begin with a unified language system that slowly separates in two independent systems or bilinguals possess two autonomous language systems which interact (Goldstein & Fabiano-Smith, 2010). A third option is that bilinguals have separate language systems that do not interact (Goldstein & Fabiano-Smith, 2010) which refutes the idea of a causal connection. From the standpoint of the interdependence hypothesis and the unitary system hypothesis, two processes have been suggested to cause the causal relations between phonological awareness and bilingualism, namely cross-linguistic transfer and structural sensitivity.

Cross-linguistic transfer. The interdependence hypothesis proposes that individuals who are proficient in one language can apply knowledge from said language when learning another language and vice versa (Cummins as cited in Verhoeven, 2003). In other words, language-specific knowledge or language skills can be transferred from L1 to L2 and from L2 to L1. Cross-linguistic transfer is traditionally defined as the following: when two languages share a specific feature and that feature is more salient in Language 1 than in Language 2, then being proficient in L1 can facilitate its use in L2 (Odlin, 1989; Kuo & Anderson, 2010). However, such positive transfer is unlikely to occur from a language with a less salient structure to another or between languages that do not share features (Odlin, 1989; Kuo & Anderson, 2010). In the latter case, knowledge of a language with a simpler structure could interfere with the learning process of a language with more difficult structure, especially when one is dominant is the easy-structured language (Odlin, 1989; Kuo & Anderson, 2010). For example, Bialystok et al.'s (2003) findings suggest that English-Chinese children who spoke mandarin at home had more difficulty segmenting phonemes in English because the differential tonal and phonological structures of English and Mandarin. However, positive transfer between languages with differential structures is not impossible as Gottardo et al. (2001) indicated that Cantonese-English speaking children who had strong phonological skills in their first language Cantonese also showed good phonological and reading skills in their second language English despite L1's differential structure and symbolic orthography.

Structural sensitivity. Even though it cannot be denied that cross-linguistic transfer has an impact on bilingual development, a select number of studies indicate that it is not the only influential factor. Another framework used to explain the differential development process that may or may not lead to a bilingual advantage is called the structural sensitivity theory. It has been hypothesised that bilinguals constantly need to overcome interlingual inference, which directs the attention to the more abstract representation of language structure (Kuo & Anderson). The structural sensitivity theory deviates from transfer theory in that it assumes a shared language experience as opposed to carry-over of knowledge and skills from one language context to another. Individuals who speak and learn more than one language have the opportunity to encounter linguistic features in more contexts than monolinguals do. For example, they may get acquainted with a wider range of phonemes or with phonemes in a wider range of syllables which draws the attention of bilinguals to the similarities and dissimilarities between languages and might accelerate the acquisition of similar sounds (Goldstein, 2010). In addition, exposure to similar linguistic segments in various contexts might improve the ability to separate these segments from their context because of a gained understanding that linguistic segments are building blocks that are not necessarily context-bound. Thus, individuals with experience in more than one language may have an enhanced ability to represent language structures abstractly in their minds (Kuo & Anderson, 2010).

c. Evidence from Experimental Studies

The reviewed studies had one general purpose, that is, gaining insight into the possible differential development of bilingual phonological awareness. All but one study compared bilingual and monolingual PA skills. The remaining study by Verhoeven (2007) correlated L1 to L2 PA skills of Turkish children. The studies revealed mixed results with evidence for each suggested causal relation.

The bilingual advantage hypothesis

Rubin & Turner (1989) was the first study to report superior phonological awareness in English-French bilinguals. The first grade students who attended a French immersion school were better at analysing phonological structures than the English monolingual children. In addition, the bilinguals also showed an advantage in reading words and non-words with spellings that reflected the phonological structure. Bruck & Genesee (1995) obtained similar results by revealing bilingual English-French advantages for onset-rime awareness in kindergarten and for syllable awareness in first grade.

Several studies with different language combinations have also established a positive influence of bilingualism on phonological awareness. Bialystok et al (2003) compared children who received English schooling of which one group was monolingual English and the other was bilingual English-Spanish. The children who came in contact with Spanish at home achieved better scores on the phoneme segmentation task. The result was contributed to the more salient letter-phoneme correspondence of Spanish. Kuo & Anderson (2010) also presented evidence in favour of bilingualism through a comparison of children ranged from preschool to second grade who were proficient in Mandarin or in Mandarin as well as Southern Min. The bilingual children outperformed the monolinguals on tasks measuring onset-rime awareness and tone awareness. In addition, Yelland et al. (1993) investigated the effect of limited contact with a foreign language on word and phonological awareness. The English speaking children who had received one hour of Italian instruction every week over the course of six months outperformed the control group on judgement tasks that required the children to indicate whether a word was long (polysyllabic) or short (monosyllabic).

Most of the results are interpretable in terms of cross-linguistic transfer which undoubtedly was an influence, given that several studies have directly provided support for cross-linguistic phonological awareness. Cisero & Royer (1995), for example, found that the phonological awareness skills in L1 predicted L2 performance, but encountering such a relationship depended on the moment of testing. In order to assess whether cross-linguistic transfer has taken place one needs to look at the right skill at the right time in a student's developmental history. Verhoeven (2007) provided support for this claim as the study revealed that the bilingual Turkish-Dutch children who showed high levels of phonological awareness – including rime awareness – in L1 also produced higher scores on the PA tasks in L2. However, it has to be noted that the majority of task designs were not suitable to indicate whether the results could have been caused by the structural sensitivity theory. In addition, the advantage for onset-rime awareness in the preschool children of Bruck & Genesee (1998) who were attending the preschool French immersion programme cannot be explained through language transfer as onsets and rimes are more salient in English than in French given that English is a stressed-timed language whereas French is syllable-timed. Only two studies (Goldstein, 2010; Kuo & Anderson, 2010) designed their measures to include shared and unshared sound structures in existing as well as non-existing words which made the assessment of the structural sensitivity theory possible. Both studies provide reasonable cause to assume that the structural sensitivity theory is an influential factor in the differential development of bilingual phonological awareness.

The bilingual disadvantage hypothesis and the differential development hypothesis

Support for differential development in bilinguals and monolinguals was found in a number of studies. However, it rarely led to a bilingual disadvantage unless the phonological awareness measurements were administered in the less dominant language.

Bialystok et al. (2003) conducted three experiments to compare bilingual and monolingual phonological awareness. In the first experiment, English monolinguals and English-French bilinguals were tested in preschool, first grade and second grade. In kindergarten, both monolingual and bilingual children performed equally well on the English phoneme substitution task. However, the bilinguals seemed to rely on different strategies to solve the required operations. In first and second grade, the monolinguals had an advantage on the English phoneme substitution task. Bialystok et al. (2003) argued that the latter finding could have been caused by the mismatch in language of literacy instruction and language of testing. During first and second grade, the bilingual children only received literacy instruction in French. In addition, they also spoke French at home with at least one parent. Therefore, French was probably their more dominant language. To test this hypothesis, they repeated the experiment with monolingual and bilingual children whose dominant language was both English instead of French and no difference in overall performance was uncovered. In the third experiment, the performance of English monolinguals, English-Spanish bilinguals and English-Chinese children were compared on a phoneme substitution task and on a phoneme segmentation task. The three groups performed equally well on the phoneme substitution task. In contrast, the three groups did differ in their ability to segment words into phonemes with the Spanish-English bilinguals being the most accurate. The English monolinguals, in turn, had an advantage over the English-Chinese bilinguals. It has to be noted that the Chinese-English children were never under the normal acquisition range of monolingual phonological awareness and that the differences between groups became smaller while the children grew older. Furthermore, Bruck & Genesee (1993) obtained similar results in that the French immersion first graders showed lower phonemic awareness than their English peers. However, it is unclear whether this finding truly indicates a disadvantage because the phonological awareness measurements were conducted in English and only contain English structured stimuli. As the French subjects only received literacy instruction in French and lived in an environment in which French was frequently spoken, French had most likely become their dominant language. Therefore, the disadvantage might have been caused by the mismatch in language of testing. In addition, Bruck & Genesee remarked that the bilingual phonemic advantage in Rubin &

Turner's (1989) study may be distorted because the test battery was not entirely suitable to measure awareness on the level of phonemes.

The studies of Goldstein & Fabiano-Smith (2010), and Tingley et al. (2001) did not reveal an accelerated acquisition of bilingual phonological awareness, although the former did notice differential patterns of phonological awareness development. Goldstein & Fabiano-Smith (2010) compared the phonological awareness skills of bilingual English-Spanish and monolingual English children to assess the influence of language transfer and structural sensitivity. The bilingual children obtained slightly lower scores overall than their monolingual peers, but still within the normal monolingual acquisition range. In addition, the bilinguals scored consistently better on shared phonological features and consistently less on unshared features. This indicates that the bilingual children shared a performance pattern based on exposure to similar and dissimilar sounds. In contrast, the large standard deviations of the monolingual scores on the shared and unshared features indicated a lack of such a performance pattern. In addition, only 25 % of the bilingual children exhibited signs of language transfer which emphasises the importance of taking structural sensitivity into account as an influential factor. Finally, another study by San Francisco et al. (2006) tested the influence of purely spoken exposure to another language in contrast with exposure to written and spoken form of another language. San Francisco et al. (2006) compared English monolinguals with Spanish-English bilinguals who received literacy instruction in either English or Spanish. It was hypothesised that the Spanish speaking children would be more likely to segment English diphthongs such as /aɪ/ and /eɪ/ into separate phonemes which was indeed the case. The language of literacy instruction proved influential given that Spanish-English bilinguals who received Spanish literacy instruction were most likely to segment diphthongs, followed by the Spanish-English bilinguals who received English Literacy instruction. The English monolinguals were less likely to segment the diphthongs. The overall performances of the three groups were similar with a slight disadvantage for the bilinguals due to the negative transfer errors.

No causal link between phonological awareness and bilingualism

The reviewed sources only deliver suggestive evidence for the proposed hypotheses due to design flaws and selected design type. The studies chose a quasi-experimental design which is the best available option as the research purpose does not allow random assignment to age group, cognitive ability, language status, etc. (Martin, 2010; Wester et al. 2006). However, in order to obtain valid results, quasi-experimental designs need valid and repeatable measures as well as extraneous variable and statistical control (Wester et al. 2006). The internal validity of several investigations was lacking in that the measurements were not always suitable to measure certain aspects of phonological awareness or the phonological awareness of a specific language group. Several studies also failed to properly control for influential variables such as memory capacity, general language or cognitive ability, social background, parents' education, etc. Finally, several studies did not perform statistical tests such as Turkey, Games-Howell or Bonferroni post-hoc test to correct for unequal sample sizes and multiple comparisons (Field, 2005; Martin, 2010). In conclusion, there is not enough evidence to reject the null hypothesis although the emerging evidence suggests that the null hypothesis should be adapted. In other words, bilingualism does not affect phonological awareness, but being bilingual in a specific language combination might.

d. Testing Population

The bilingual participants recruited in the studies discussed above, can be divided into two categories: (a) children who become bilingual due to the linguistic family situation and (b) children who become through bilingual educational programmes. Generally, participants of the latter category are preferred in order to better control the language exposure as it is difficult to verify the amount and type of language exposure children of bilingual or immigrant families receive within the extra-curricular context. Moreover, according to Bialystok & Bouchard (as cited in Goetry, Kolinsky & Mousty, 2002: 92), higher levels of analysed linguistic knowledge, and thus in extension phonological awareness, is mostly confined to bilinguals who have acquired both languages through explicit instruction. Following that reasoning and taking into account the threshold hypothesis mentioned earlier, not only being bilingual in a specific language combination, but also the language learning context which results in bilingualism could negatively or positively affect metaphonological development. Evidence regarding this claim, however, is inconclusive. For example, studies, such as Rubin & Turner (1989) and Bruck & Genesee (1995), have reported an enhanced phonological awareness in children attending immersion programmes, whereas studies such as Tingley et al. (2004) did not uncover a differential metaphonological development in bilinguals. Studies (e.g. Verhoeven, 2010) concerning the phonological skills of children from immigrant families, conversely, reveal a differential metaphonological development in terms of a bilingual disadvantage due to underdeveloped linguistics skills in the L1.

e. Summary

Bilingualism in itself may not have beneficial effects nor cause differential development patterns. However, contact with specific language combinations may yield enhanced phonological skills on condition that (a) the languages share a similar structure, (b) the children are schooled in both languages and (c) the phonological awareness task are analytically high in cognitive demand. In order to accurately determine the effects of exposure to more than one language, the individuals need to be tested in their dominant language with stimuli that contain shared and unshared features of the bilingual language combination. Furthermore, evidence is implicated for both cross-linguistic transfer and an increased structural sensitivity as plausible causes of differential phonological awareness acquisition in bilinguals. In conclusion, knowledge of more than one language can be beneficial for one's phonological awareness. Even when knowledge of two language systems may cause interference, bilinguals' presumed heightened structural sensitivity seems to compensate for possible disadvantages given that the majority of bilinguals either performed better or within the normal monolingual acquisition rate. However, children from immigrant families may form an exception to the rule due to undeveloped L1 skills.

1.1.4 Phonological Awareness: Other Factors of Influence

It may already have become apparent that other factors aside from literacy development and bilingualism can significantly affect the development of phonological awareness. Early child development is influenced by various genetic and environmental factors. Indeed, phonological awareness forms no exception in that respect. Research has identified a number of influential factors not explicitly mentioned thus far that influence the acquisition of phonological awareness. The most important factors, such as age, language difficulties, socio-economic status and immigration background are briefly discussed below.

Age. As already indicated, metaphonological abilities are suggested to gradually develop from awareness to increasingly smaller linguistic units over the course of a short age span, mainly from the ages 4 to 10. Therefore, even small differences in age can significantly influence the development of phonological awareness. Rothe et al. (2004), for example, noted that slightly older pre-schoolers (on average 5.9) displayed significantly higher levels of phonological awareness compared to the younger pre-schoolers (on average 5.1). Several other studies (e.g. Frohlich et al., 2013) have also found a correlation between age and metaphonological abilities.

Language Difficulties. Impairments in written and oral languages abilities are frequently associated with deficits in phonological awareness (Treiman & Bourassa, 2003; Zoccolotti & Friedmann, 2010). Research indicates that children at risk for developing dyslexia show significantly lower levels of phonological awareness (Treiman & Bourassa, 2003; Frohlich et al., 2013). Other studies (e.g. Frohlich et al., 2013) have also found negative associations between metaphonological abilities, on the one hand, and articulation problems and deficits in grammar or lexicon, on the other. Frohlich et al (2013) even indicate that the child related factors cognitive ability, age and language difficulties are the strongest predictors with respect to the levels of phonological awareness.

Socio-economic status and migration background. Socio-economic status has also been found to influence phonological awareness. One's socio-economic status is determined on the basis of income, education level and occupation. It has been indicated that children from financially secure backgrounds tend to exhibit better language skills, including phonological awareness. Terrisse et al. (1998) attributes this observation to the fact that parents from a more advantaged milieu tend to stimulate their children more in terms of language input. The children receive more conversational input and the parents read stories to them on a regular basis. In contrast, children from less advantaged homes tend to lag behind their peers from financially secure families, mainly because they are less conversationally and educationally stimulated. This tendency is also observed when comparing children with and without a migration background (Frohlich et al., 2013).

1.2 A Description of the French and Dutch Phonological Systems

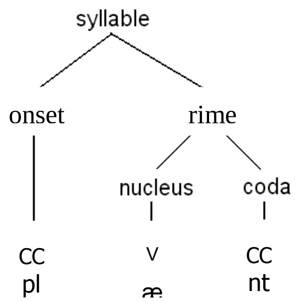
Given that the development of phonological awareness is influenced by language specific aspects, and material to test metaphonological ability should be designed to reflect the characteristics of the language combination spoken by the bilinguals, a description of the French and Dutch phonological systems is provided. However, first some theoretical notions concerning the sublexical units are discussed.

1.2.1 Theoretical Notions concerning the Syllable and Phonotactic Constraints

Generative theorists such as Chomsky & Halle (1968) regarded the phonological system of a language as a linguistic subsystem containing underlying phonemic sequences that are arranged according to certain rules. However, in Chomsky and Halle's (1968) *The Sound Pattern of English* (SPE) the phonological representations did not contain syllables or phonemes, but more abstract bundles of unordered distinctive features, such as high or low to indicate the tongue position when producing a vocal sound (Geudens, 2003: 5). The SPE approach was heavily criticized as phonologists were of the opinion that certain aspects of the phonological structure cannot be described without referencing to syllables and other supra-segmental units (Geuddens, 2003). It is argued that reference to the syllable is needed in order to properly define the phonological rules and describe the permissible sequence of segments, also referred to as phonotactic constraints.

Traditionally, the syllable is regarded to consist of the onset – i.e. the initial consonant or consonant cluster – and the rime, – i.e. the vowel together with following consonants. The rime can be further subdivided into the obligatory vocalic nucleus and the consonantal coda. This syllabic division, illustrated in figure 1, is also known as the ternary branching syllable structure, which perceives the syllable as a hierarchical unit with an internally structured tree that forms the building block of the prosodic hierarchy (Geudens, 2003). Syllables are themselves grouped into larger units called metrical feet, which, in turn, form constituents of phonological words. However, it has to be noted that only the metrical feet present in stress-timed languages consist of various syllables. In syllable-timed language, the metrical foot equals to one single syllable. Other approaches to syllabification have been suggested, such as the Mora Theory which states that syllables consist of constituents that are in essence weight units, i.e. morae or the Optimality Theory which rejects the generative interpretation mentioned above and subsequently does not consider subsyllabic units (Geudens, 2003). However, these theoretical notions fall outside the scope of the present study.

Figure 1. *Ternary branching syllable structure for the English word plant /plænt/*



The underlying phonemic sequence that forms the syllabic structure is governed by phonotactic constraints. As Lecocq (2008: 97) emphasizes: "*syllabification and phonotactic constraints cannot be regarded as independent from each other. The phonotactic illegality of a phonemic sequence is directly determined by the arrangement of the phonemes that form part of the syllabic structure. Therefore, the syllabic structure should be partially regarded as a sequence of phonotactic regularities.*"

The principle of sonority is generally conceived to define the legality of phonemic sequences in a particular language (Geudens, 2003; Lecocq, 2008). It was observed that the syllable is characterized by a rise and fall in intensity of a column of air being released through the vocal mechanisms (Geudens, 2003: 8). This observation has led to the postulation of the Sonority Sequencing Generalisation (SSG) which states that the sonority of the linguistic units decreases towards the extremities of the syllable (Geudens, 2003; Lecocq, 2008). In other words, the syllable centre has the greatest intensity, whilst the syllable margins have the least. Geudens (2003: 8) defines sonority constraints within a phonological system in terms of a scale of decreasing intensity from vowels (e.g. a, e, o, i, u), glides (e.g. j, w), liquids (e.g. r, l), nasals (e.g. m, n, ŋ), fricatives/affricatives (e.g. v, z, f, s, ʃ) to plosives (e.g. b, d, p, t, k). In other words, vowels have the highest sonorous quality. Voiced consonants are more sonorous than voiceless consonants and sonorants (i.e. glides, liquids and nasals) are more sonorous than obstruents (i.e. fricatives, affricates and plosives). However, there exist phonemic sequences that are deviant in terms of sonority and yet they frequently occur in words of a particular language. For example, in Dutch, the frequently used phonemic sequence /sp/ in onset position does not conform to the SSG since it consist of a fricative followed by stop. Consequently, Lecocq (2008: 97) postulates that phonological legality and illegality should not be viewed as a strict dichotomy, but as a continuum based on the frequency with which a sequence occurs in a particular language.

1.2.2 The French Phonological System

a. The French Vowels and Consonants

TABLE 1: The French Vocalic System (Lecocq, 2008: 101)

	Front		Back	
	Unrounded	Rounded	Unrounded	Rounded
Oral vowels				
Closed	i	y		u
Half-closed	e	ø		o
Half-open	ɛ	œ		ɔ
Open	a		ɑ	
Nasal vowels	ɛ̃	œ̃	ɑ̃	ɔ̃

Table 1 provides an overview of the various vowels that occur in the French language. In French, vowels are classified according to lip position (i.e. rounded vs. unrounded), nasality (i.e. oral vs. nasal) and tongue position. The latter criterion is further subdivided into tongue height which determines the degree of openness of the oral cavity (closed, half-closed, half-open, open) and part of the tongue that is raised or lowered (back vs. front). Contrary to Dutch, the French vowels maintain a constant quality and do subsequently not undergo the phenomenon of vowel reduction (Lecocq, 2008). Also, the process of diphthongisation has not occurred in French (Lecocq, 2008; Walter, 1977). The schwa /ə/ has not been listed in Table 1. This oral central vowel does occur in French, although not frequently.

The French consonants, presented in Table 2, are classified according to the following criteria: voicing, place of articulation and manner of articulation.

TABLE 2: The French Consonant System (Lecocq, 2008: 102)

	Labial	Dental	Alveolar	Palatal	Velar	Glotal
plosive	p, b	t, d		k, g		
fricative	f, v	s, z		ʃ, ʒ		
Nasal	m	n		ɲ	ŋ	
Liquid						
lateral			l			
vibrant						ʁ
Glides				j, ɥ	w	

b. The Syllable in French

French, being a syllable-timed language, has clear and unambiguous syllable boundaries (Cutler et al., 1986). The French syllable always has one single vowel as nucleus. In the onset position, generally one or two consonants occur, although the maximum number of consonants that legally occur amounts to four. In contrast, the coda can maximally contain three consonants (Lecocq, 2003). However, the onset and coda are not essential elements of the French syllable given that a syllable can solely consist of a nucleus as is the case with the French word *eau* (Lecocq, 2003). According to Duncan et al (2006) there are 8 syllable types that frequently occur in French. The French syllables tend to be open (CV-structures: ± 60 %; CCV-structures: ± 14 %: CVC-structures: ± 17 % (Léon 1992:96)) and linguistic phenomena such as liaison serve to enhance this open syllabic structures (Duncan et al., 2006). In French, the stress falls on the final syllable of a word spoken in isolated speech and the stress pattern of word can vary in connected speech without affecting its meaning (Duncan et al., 2006).

c. Phonological Sequences Permissible in French

In her doctoral thesis, Lecocq (2008: 102-104) offers a detailed overview of the various phonological sequences that are legal in French in onset, nucleus and coda position.

Onset position. Combinations between plosives and liquids occur most frequently in the initial position (e.g. /pʁ/, /tʁ/, /kʁ/, /bʁ/, /gʁ/, /dʁ/, /pl/, /kl/, /gl/, /bl/). Combinations between plosives and nasals, however, are infrequent and the only permissible sequences are /pn/ and /gn/ which appear in some borrowed words. Also, combinations between fricatives and liquids occur of which /fʁ/, /fl/ and /vʁ/ are the most frequently observed. Sequences such as /vl/, /sl/ and /ʃl/ only appear in a few rare words. Phonological sequences consisting of fricatives and nasals are uncommon and the only ones are encountered are the combinations /sn/, /sm/ and /ʃn/. Plosives can be combined with fricatives (e.g. /ps/, /dʒ/, /ts/, /ks/, /pf/, although these combinations are rarely observed. Finally, there are certain combinations in French that violate the SSG. This is the case for combinations between fricatives and plosives (e.g. /st/, /sp/, /sk/), between two nasals (e.g. /mn/) and between two fricatives (e.g. /sf/). However, their occurrence is rare. When there are three or four consonants present in the onset position, the phonological sequence always contains /st-/ followed by either /ʁ/ or a glide.

Rime position. In the open syllable, the vowels /e/ and /ɛ/ are most frequently observed followed by /o/ and /ø/. The vowel /e/, however, does not occur in closed syllables and the vowels /o/ and / ø/ only appear on the condition that they are followed by the consonant /z/. Similarly, the vowels /œ/ and / ɔ/ only appear before the consonant /ʁ/.

Coda position. In the final position, liquids can be combined with a nasal (e.g. /-lm/, /-ʁm/, /-ʁn/, /-ʁɳ/), with a fricative (e.g. /-lv/, /-lf/, /-ls/, /-lʒ/, /-ʁv/, /-ʁf/, /-ʁs/, /-ʁʃ/) or with a plosive (e.g. /-lb/, /-lp/, /-ld/, /-lt/, /-lg/, /-lk/, /-ʁb/, /-ʁp/, /-ʁd/, /-ʁt/, /-ʁg/, /-ʁk/). Combinations between fricatives and plosives, such /st/ and /sk/ appear on occasion and the sequence /-ft/ is observed in a limited number of borrowed words. Also in the codas, there are combinations possible that violate the principle of sonority. This is, for example, the case with combinations between obstruents and liquids (e.g. /-fʁ/, /-vʁ/, /-bʁ/, /-pʁ/, /-tʁ/, /-kʁ/, /-gʁ/, /-fl/, /-bl/, /-pl/, /-gl/, /-kl/), which occur frequent in French. The SSG predicts that clusters containing obstruents and nasals, two liquids or two plosives cannot appear. However, French allows for the sequences /-ps/, /-st/, /-ts/, /-ks/, /-dʒ/, /-tʃ/, /-ʁl/, /-pt/ and /-kt/ to occur. In the case that three consonants are present in the coda, the following sequences are generally observed: (a) plosive-fricative-plosive (e.g. /-kst/), (b) fricative, plosive, liquid (e.g. /-stʁ/, /-skl/), (c) plosive-plosive-liquid (e.g. /-ptʁ/, /-ktʁ/), (d) liquid-fricative-plosive (e.g. /-ʁst/) and (e) liquid-plosive-fricative (e.g. /-ʁts/, /-ʁks/) in certain loan words.

1.2.3 The Dutch Phonological System

a. The Dutch Vowels and Consonants

The Dutch vocalic system consists of 16 vowels which are displayed in Table 1.3. These vowels are usually distinguished on the basis of place of articulation (i.e. front, central, back), lip position and length. According to Booij (1995), length should not be viewed as a purely phonetic property, because the main reason for distinguishing seven long vowels has a phonological premise. Long vowels namely behave as two units whilst short vowels behave as a single unit. Apart from the vowels listed in Table 3, Dutch has certain marginal vowels that solely appear in a selected number of loan words such as certain nasal vowels which appear in French loan words.

TABLE 3: The Dutch Vocalic System (Booij, 1995: 4)

Short vowels	ɪ, ɛ, ɔ, ʏ, ɑ
Long vowels	i, y, u, e, ø, o, a
Schwa	ə
Diphthongs	ɛi, œy, ɔu

As in French, the Dutch consonants, presented in Table 4,0 are classified according to nasality, manner of articulation and place of articulation. The consonants /g/ has been put in parentheses because it only occurs in loan words such as *goal* and as the contextual allophone of /k/ before a voiced plosive as in *zakdoek* /zɑgduk/ (Booij, 1995)

TABLE 4: The Dutch Consonant System (Booij, 1995: 7)

	Bilabial	Labiodental	Alveolar	Palatal	Velar	Glottal
Plosives	p, b		t, d		k, (g)	
Fricatives		f, v	s, z		x, ɣ	h
Nasals	m		n		ŋ	
Liquids			l, r			
Glides		ʋ		j		

b. The Syllable in Dutch

The syllable boundaries in Dutch are less straightforward than in French due to the occurrence of ambisyllabic syllable boundaries. According to Zwitserlood et al. (1993), 45 per cent of the syllables in Dutch have clear bisyllabic syllable boundaries between the consonants of the medial cluster, 34 per cent have open first syllables ending in long vowels and 21 per cent are ambisyllabic. As in French, only consonants appear in onset position and vowels are exclusive to the nucleus. The onset can maximally contain three consonants, whereas the rime can contain minimally two and maximally three elements (Booij, 1995). The most important syllable structure rule is that Dutch allows for syllables to end in a long vowel, a consonant or a consonant cluster.(Zwitserlood et al., 1993). However, syllables ending in short vowels do not occur. Syllables consisting of a single short vowel must be closed by a consonant (Booij, 1995; Zwitserlood et al., 1993). When this consonant is succeeded by another vowel, the principle of maximal onsets is implemented, which entails that the consonant is assigned to the onset of the next syllable (Zwitserlood et al., 1993). In other words, the consonant that closes the first syllable simultaneously belongs to the rime of the first syllable and the onset of the second syllable resulting in ambisyllabic syllable boundaries. Thus, assigning the consonant as part of two syllables depends on the quantity of the preceding vowel (Zwitserlood et al., 1993). Aside from ambisyllabicity, Dutch is also known for having words that end in extremely long consonant sequences (Lecocq, 2008). This phenomenon can be explained by the fact that it is allowed to add an appendix consisting of maximally three obstruents to the rime of the last syllable (e.g. koord /kor-d/, koorts /kor-ts/, hersft /hɛrf-st/, bedaardst /bədar-dst/, promptst /prɔmp-tst/)

The type of syllable structure is crucial for the assignment of stress in Dutch (Zwitserlood et al., 1993). In stress-timed languages such as Dutch, syllables can be characterized as heavy or light (Goetry, Kolinsky, Mousty, 2002; Geudens, 2003). The stress typically falls on heavy syllables whereas light syllables are stressed depending on their position within a word (Geudens, 2003). It is not the entire syllable build-up which determines whether a syllable is heavy and, thus, stress-attracting. Syllable weight is defined solely on the basis of the rime structure since onsets are regarded as weightless (Geudens, 2003). The general rule in Dutch is that closed syllables and syllables with a diphthong are conceived as heavy (Geudens, 2003). Unlike in French, the varying stress pattern of Dutch words can affect their meaning. For example, *vóórkomen* /‘vor.komən/ means *to occur* or *to appear* in Dutch, whereas *voorkómen* /vor.‘komən/ means *to prevent*.

b. Phonological Sequences Permissible in Dutch.

In the works of Booij (1995: 33-42) and Lecocq (2008: 100-101), a detailed overview of the various phonological sequences that are legal in Dutch in onset, nucleus and coda position is provided, which is briefly summarised below.

Onset position. The general rule is that all Dutch consonants with the exception of the nasal velar consonant /ŋ/ can appear in the initial position. The fricative glottal consonant /h/ cannot be combined with other consonants, nor is it allowed to combine two sonorants (i.e.

glides, liquids and nasals). The obstruents can appear in combination with glides (e.g. /pj-/, /tw-/, /tw-/, /zw-/), with the exception of the sequences /dj-/ and /zj-/. Similarly, obstruents can be combined with liquid consonants (e.g. /pl-/, /br-/, /tr-/, /fl-/, /vl-/, /sl-/, /ɣl-/) with the exception of the sequences /tl-/, /dl-/, /zl-/, /zr-/ and /sr-/. In general, obstruants and nasals do not occur together with the exception of the three sequences which appear in numerous Dutch words: /sm-/, /sn-/, /kn-/. The combination of plosives and fricatives is not allowed according to the SSG since they are characterised by the same degree of sonority. However, this combination can be encountered in a limited number of loan words, such as the sequence /ts-/ in the word *tsaar*. Similarly, the /s/ in three consonant combinations is frequently combined with plosives and fricatives or with plosives and liquids (e.g. /spr/, /str-/, /skr-/, /spl-/, /skl-/, /sxr-/), which constitutes a violation in terms of the SSG.

Rime position. The diphthongs cannot be followed by a glide or the fricative velar /r/. The short vowels cannot be succeeded by /v/ or /z/, although these sequences do occur in a limited numbers of loan words. Lastly, the nasal velar consonant /n/ cannot be preceded by a long vowel or a diphthong.

Coda position. Only the consonant that never occurs in the coda position is the /h/. This is due to the fact that the /h/ needs to be succeeded by a vowel in order to enable its placement features. Glides can only appear by themselves in codas. Otherwise, the rime would contain more than three positions, since glides have to be combined with a long vowel. However, glides can be followed by the appendix consonants. As for combinations between liquids and nasals, only the following three are permissible in Dutch: /-lm/, /-rm/, /-rn/. The occurrence of clusters containing liquids and obstruents is almost unrestricted (e.g. (/-lp/, /-lk/, /-rf/, /-rɣ/, /-ld/, /-rt/, /-ls/, etc.). However, liquids and the obstruent /b/ (e.g. /-lb/, /-rb/) do not occur together. Nasals consonants can be combined with plosives (except of /b/), but not with fricatives. Even though the SSG predicts that clusters of fricatives and stops do not go together, except in the appendix, Dutch does allow for the sequences /-sp/, /-st/ and /-sk/.

1.2.4 Summary

The syllable is traditionally conceived to consist of an onset and a rime. The latter can be further subdivided into a nucleus and a coda. The underlying phonological sequences that form this syllabic structure are directed by certain rules or phonotactics. Generally, it is thought that the principle of sonority or the SSG dictates the legality of phonological sequences. Even though French and Dutch largely abide to the SSG, some violations can be noted in the sequences mentioned above. Therefore, it has been postulated that phonological legality and illegality should be regarded as a continuum based on the frequency with which sequences occur in a particular language. The main differences between French and Dutch are related to the syllable type, syllable length and stress pattern. The majority of the syllables of French are open-ended whereas closed syllables are more frequent in Dutch. Also, the phonological sequences that appear at the end of syllables in Dutch can be significantly longer than in French as a result of the fact that Dutch allows for an appendix to be added to the final rime. As for the stress pattern, some major differences exist because of the fact that French is syllable-timed whereas Dutch is stress-timed. Finally, the extensive enumeration of the phonological sequences in French and Dutch has enabled the identification of structures that typically belong to French and Dutch. Open syllables consisting of one or two consonants in combination with a nasal vowel, /œ/ or /ø/ are typically French whereas diphthongs and other sequences, listed in table 5 are typically Dutch.

TABLE 5: Phonological sequences typical for Dutch with number of occurrence in Dutch – CELEX (381288 entrees) – and French – Lexique (134407 entrees) (Lecocq, 2008: 105)

sequences	Dutch Ex.	CELEX	Lexique	French Ex.
In onset position:				
	snel	1618	47	snob, snack
	smaak	1226	18	smog, smala
	knie	1839	1	vlan
	vlug	1739	3	knout
In rime position:				
	deur	657	0	–
	rook	131	3	glauque
	beul	30	3	meule
	doen	377	7	doudoune
	leuk	123	1	pentateuque
	voor	2028	31	centaure
	bloem	138	42	vroum, lokoum
	knoop	523	4	taupe, gaupe
	neus	219	0	–
	doof	321	16	sauf, chauffe
In coda position:				
	wesp	52	5	crispe
	plots	1222	16	kiboutz
	vogels	2727	16	pulse, valse
	punt	2873	11	sprint
	heeft	1411	19	aphtes, lift
	zelf	213	16	elfe, golf

1.3 Bilingual Education

As the present study has chosen to investigate the effect of bilingual language instruction within the Wallonian immersion context, a short explanation on bilingual education and, more specifically, the bilingual educational system encountered within Belgium is required. Broadly defined, bilingual education refers to the use of two languages as media of instruction (Brisk, 2005). This simple definition has translated itself into a wide variety of programmes, influenced by particular circumstances, student needs and resources. Even though all these programmes use two or more languages for instruction, their use may vary proportionately and serve different purposes throughout the educational course (Brisk, 2005). In Belgium, bilingual education in the form of immersion programmes or Content and Language Integrated Learning (CLIL) is encountered. The terms “immersion” and “CLIL” are often used interchangeably, although there is a nuance to be noted. In immersion programmes, minimally 50 % of the curriculum is instructed in the target language, whereas the minimum amount of exposure to the second language within a CLIL context is not fixed (Genesee, 2004).

1.3.1 Bilingual Education in Belgium

Belgium is an official trilingual country with three linguistic communities (i.e. Flemish, French and German) and three regions (i.e. Flanders, Wallonia and Brussels). It consists of three monolingual areas, namely Flanders, Wallonia and a small German speaking community located in the Wallonian region. The capital, Brussels, is officially a bilingual area with French and Dutch as official languages. Education and, thus in extension language education, falls under the jurisdiction of the communities. Although the presence of more than one language in the society is often encouraging for bilingual education, this is not always the case. Indeed, bilingual education in Belgium mainly remains restricted to foreign language teaching, largely due to Flanders’ historical struggle to consolidate the position of Dutch against the Francophone domination in the governmental and educational structures within Belgium (Bollen & Baten, 2010). The Flemish struggle for emancipation led to reform waves of language legislation that separated the French and Dutch speaking communities and resulted in educational separatism. The language legislation carried on July 30th 1963 and its corollary decrees fully consolidated the territorial unilingualism. With regard to education, the legislation stipulated that the language of instruction must correspond to the official language of the community, i.e. Dutch in Flemish schools, and French in Wallonian schools. For Brussels, this meant that Dutch-speaking schools existed alongside, but strictly separate from French speaking schools. In addition, the law only allowed for foreign language teaching, i.e. formal instruction in a second language as part of the regular curriculum, starting from the age of 11 in Flanders and Wallonia and from the age of 8 in Brussels (Bollen & Baten, 2010; Van de Craen, 2002). Thus, as a result of the 1963 legislation, bilingual education fell outside the national legal framework and so, to date, bilingual initiatives require ministerial approval (Bollen & Baten, 2010; Van de Craen, 2002). Despite the strict language legislation, Wallonia enabled schools to organize immersion-type bilingual education programmes through the adoption of the Onckelinckx decree in 1998 (Bollen & Baten, 2010; Van de Craen, 2002). Also the Brussels community has found ways to offer bilingual education in forms of CLIL initiatives that do not technically violate the 1963 legislation. The most significant CLIL initiative is the pilot project STIMOB (*Stimulerend Meertalig Onderwijs in Brussel* “Stimulating Mulilingual Education in Brussels”). The project was launched in 2001 in two Dutch-language primary schools with a third school joining in 2003. Participation entailed that a part of the curriculum taught in Dutch was subsequently repeated in French during revisional hours. As the national language legislation does not specify the language of instruction for revisions in primary schools in Brussels, the project steered clear of breaking the law (Bollen & Baten, 2010). The project’s positive results inspired the participating schools to ask the Ministry of Education to expand the project to the entire Flemish community. However, the Flemish community remained reluctant to adjust the 1963 language legislation in order to allow forms of bilingual education. Enacted modifications remained few in number and vaguely formulated. For example, Former minister of education Frank Vandenbroucke issued a decree (2004) which allowed language awareness projects as well as language initiations in kindergarten and primary schools. Such initiatives aim to stimulate the development of a positive attitude towards language and cultural diversity (Candelier, 2005). However, the decree does not elaborate on the specifics of such initiatives in terms of execution. Only recently, the Flemish community has issued a decree (Onderwijsdecreet 23, 2013[8]) which enables Flemish schools to officially offer CLIL programmes starting September 2014. This adjustment was approved as a result of the positive outcomes of a research project conducted by Sercu & Strobbe (2011). However, the stipulated conditions to which the CLIL programmes in Flanders must abide are stricter in comparison with Wallonia. As Dutch must remain priority, maximally 20 per cent of the curriculum can be instructed in a second language.

[8] http://docs.vlaamsparlement.be/docs/stukken/2012-2013/g2066-1.pdf

1.3.2 Immersion Education in Wallonia

a. Immersion Education: Definition, Purpose and Core Features

The term “immersion” was coined by Lambert & Tucker (1972), who described a bilingual education experiment in a Canadian school in a suburban of Montréal (Lambert & Tucker in De Groot, 2005: 3). The initiative was created as a result of the concern expressed by English speaking families who feared that their children would fail to acquire an adequate level of proficiency through traditional language education which would severely limit their job opportunities (De Groot, 2005). The generic definition was adopted by Genesee (1987) who describes immersion education as a type of bilingual education aimed at students proficient in the majority societal language, in which the curriculum is partly instructed in the native language and partly in a second language (Genesee, in De Groot, 2005: 3).

The main purpose of immersion education is twofold. Firstly, immersion programmes must result in additive bilingualism. More specifically, the children must, at least, have attained an educational baggage and a level of linguistic competence in the L1 equal to educational and linguistic knowledge acquired by their monolingual peers who follow the regular education programme. In addition, the immersion students must have reached a level of L2 proficiency comparable to that of peers who speak the L2 as a native language (Briquet, 2006). Secondly, immersion programmes should be accessible to all children, regardless of financial or cultural background. As Briquet (2006: 52) puts it: “L’immersion est démocratique”. Whether this statement is translated into practice can be questioned as interest for bilingual education mainly comes from educated middle class families (Bollen & Baten, 2010). Swain & Johnson (1997) provide a detailed overview of the core features and purposes that distinguish immersion education from other bilingual education types: (a) the L2 is used as the medium of instruction alongside the L1, (b) the immersion curriculum parallels the local first language curriculum, (c) overt support exists for the L1, (d) the program aims for additive bilingualism, (e) exposure to the L2 is largely confined to the classroom, (f) students enter with similar (and limited) levels of L2 proficiency, (g) the teachers are bilingual, and (h) the classroom culture is that of the local L1 community (Swain & Johnson, in Tedick 1998: 585). However, in spite of these common core of characteristics, 10 points of differences can be identified that tend to distinguish immersion programmes among each other: a) level within the educational system at which immersion is introduced i.e. kindergarten, primary school (early immersion) or secondary school (late immersion), (b) the extent of immersion, referring to the time in the school day spent in the L2, (c) the ratio of L1 to L2 at different stages within the program, (d) the continuity across levels within the educational system, (e) the support provided to help students at initial stages of immersion to move from L1 to L2 medium instruction, (f) resources, i.e. bilingual education calls for specialised pedagogical resources which are often non-existent (g) commitment on the part of all those involved, from students to teachers to policymakers, (h) attitudes toward the culture of the L2, and (i) status of the L2 in the immersion context referring to the fact that although the L1 and L2 should be treated equally in theory, in practice there often exists a preference for one or the other (Swain & Johnson, in Tedick, 1998: 585). These core and difference points serve as a reference framework for the immersion models described in the following section.

b. Immersion models encountered in Wallonia

The former prime minister of the regional Wallonian govemement, Laurette Onkelinx, made headlines in 1996 with her statement "*Tous bilingues en 2001*" which came as a reaction to the negative outcomes of the traditional foreign education system in the French community. Words were translated into action, when she issued a decree in July 1998 which allowed Wallonian schools to offer the curriculum in two languages (Décret Onkelickx, 1998[9]) on the following conditions:

- Wallonian schools are allowed to offer immersion programmes in either Dutch, English or German. French speaking schools in the Brussels region, however, are only authorised to offer immersion programmes in Dutch.
- In 3rd year of kindergarten and the first cycle (i.e. first to third grade) of primary school maximally 50 to 75 per cent of the total of 28 curricular hours can be instructed in the second language. In the second cycle of primary education (i.e. fourth to sixth grade), the amount of instruction in the target language is allowed to vary between 25 per cent and 75 per cent.
- Any non-language course can be offered in the L2 with exception of religion or ethics.

The primary objective of immersion schools equals to that of regular education schools, namely the pupils must obtain their primary education degree (CEB or Certificat d'Etudes de Base), which grants access to the secondary education system. Although the implementation of immersion education can vary across schools, general conduct always conforms to the conditions stipulated in the decree of 1998. Generally, the encountered programmes can be divided into two categories, namely "immersion partielle" or partial immersion and "immersion

[9] http://archive.pcf.be/99203RBEI154376?action=browse

massive" or massive immersion (Briquet, 2006). Table 6 illustrates the curriculum arrangement in terms of the ratio between L1 and L2 instruction at different stages encountered within partial and massive immersion programmes.

TABLE 6: The extent of L1 to L2 instruction at different stages in immersion programmes

	Partial Immersion		Massive Immersion	
	L1	L2	L1	L2
Cycle 1 (3^{rd} K, 1^{st} G, 2^{nd} G)	50 %	50 %	25 %	75 %
Cycle 2 (3^{rd} G, 4^{th} G)	50 %	50 %	50 %	50 %
Cycle 3 (5^{th} G, 6^{th} G)	50 %	50 %	75 %	25 %

In massive immersion programmes, the majority of the curriculum is instructed in the L2. However, towards the end of the programme's educational course programme, the ratio of L1 to L2 instruction is reversed to ensure that the children reach similar levels of L1 proficiency in comparison with their non-immersed peers. Schools of this type generally start with reading instruction in the L2, before reading instruction in French is offered in second grade. In partial immersion programmes, 50 per cent of the curriculum is instructed in the L2 throughout the programme course. These schools often choose to start reading instruction in French, although many Dutch immersion schools also opt to commence instruction in the L2 due to the higher degree of orthographic transparency in Dutch in comparison with French.

1.3.3 Summary

Bilingual education in Belgium has made many positive strides forward over the past two decades, although there remains a long road to travel. As of recently, bilingual education in the form of immersion or CLIL programmes has been fully authorised by the Belgian legislation. Such programmes, aimed at majority language students, focus on language learning through content as the L2 is used as a medium of instruction. In the Flanders, schools have been recently granted permission to organise CLIL programmes in which up to 20 per cent of the curriculum can be offered in a second language starting from September 2014. In the French community, however, immersion education in the form of partial and massive immersion programmes have been officially part of the educational landscape since 1998 and their number is exponentially growing year after year due to its positive outcomes.

2. METHODOLOGY

2.1 Objectives and Research Questions

The various studies discussed in the theoretical framework revealed a discord concerning the effects of bilingualism on the development of metaphonological skills. With regards to the effect of early exposure to a second language, studies have reported that the bilingual children at times showed enhanced levels of phonological awareness (e.g. Bialystok et al., 2003; Bruck & Genesee, 1995; Kuo & Anderson, 2010; Rubin & Turner, 1989). However, several studies have also found that bilinguals can have difficulties with identifying, discriminating and producing phonological structures, possible due to an interference between the two language to which they are exposed. (e.g. Bialystok et al. 2003). Lastly, several studies have also indicated that the metaphonological development of bilinguals does not significantly differ in comparison with monolingual metaphonological development (e.g. Tingley et al., 2004). It has been suggested that bilingualism in se does not affect the development of phonological awareness, but rather being bilingual in specific language combinations together with the context in which the language learning takes place.

The objective of the present study is to determine the language specific effects of bilingual school instruction on phonological awareness. In order to do so, an experiment was designed in which the metaphonological awareness of bilingual French-Dutch first graders recruited from a Wallonian primary school offering Dutch immersion programmes was compared with both a monolingual French speaking as well as a monolingual Dutch speaking group recruited from regular education programmes in Wallonia and Flanders. Both the monolingual groups form a benchmark to accurately assess the bilingual deviation of the monolingual norm. In addition, such a group upset will not only reveal language specific influences, but also universal metaphonological development trends. The general research question has been defined as the following:

> *Does learning Dutch within the Wallonian immersion context lead to a differential acquisition of phonological awareness? If so, can the differential development best be explained in terms of cross-linguistic transfer or the structural sensitivity theory?*

Considering the studies discussed in the theoretical framework, the present study aims to examine the hypothesis that the development of phonological awareness is not influenced by bilingualism in se, but by the language specific qualities of the spoken language combination. Therefore, it is expected that the immersion children have acquired an enhanced awareness to onset-rimes and phonemes, given Dutch' stress-timed quality. In addition, the immersion children should have developed a level of syllable awareness similar or superior to the Francophone children enrolled into the regular education programmes, as immersion contexts usually lead to additive bilingualism. In order to assess whether cross-linguistic transfer or structural sensitivity lays at the basis of a possible bilingual effect, a phonological awareness test battery was designed that contained three series of novel words, namely a series of novel words containing shared phonological features of French and Dutch as well as two series of novel words containing phonological features exclusively to either French or Dutch. Novel words were preferred over real words, not only to test the structural sensitivity theory's postulation that bilinguals have a heightened ability to abstractly represent language, but also to enable assessment across language barriers. The three test stimuli were divided into three series in order to verify the claim by the structural sensitivity theory that exposure to two language systems accelerates the acquisition of similar sound structures, as a result of a gained understanding of the similarities and dissimilarities that exist between languages. Also, a comparison of the performance on the test stimuli containing features exclusive to French and Dutch will allow to assess whether language transfer from L1 to L2 or vice versa has occurred.

Various control measures have been undertaken to ensure that the experiment should validly measure the investigated effect. Firstly, the parents of the participating children were asked to fill in a survey in order to gain insight into the familial socio-economic status, languages spoken within the family and the educational stimulation which the children receive at home. In addition, the schools indicated which children had languages difficulties or came from underprivileged families. Lastly, the children were tested with a digit span task and a reading task in order to measure short term memory capacity and technical reading skills. This information was subsequently used to exclude outlier values from the data set. Only children who were exposed at home to a language non-dominant within the larger language community, i.e. Wallonia or Flanders, were immediately excluded from the experiment.

2.2. Participants

2.2.1 Composition of the data sample

The data sample contains three groups of first grade pupils, recruited from four different schools:

a) An experimental group (ImD) consisting of 25 francophone first grade students who are enrolled in a Dutch partial immersion (*immersion partielle*) programme. The

Wallonian primary school that provided the participants is located in Visé, belongs to the community educational network and offers both an immersion programme as well as a regular educational programme. The immersion programme commences in the last year of kindergarten. In addition, reading instruction is firstly offered in Dutch. Reading instruction in French, however, does not start until the students have reached second grade.

b) A control group (RegF) consisting of 32 francophone first grade pupils who are enrolled in a regular educational programme. The students were recruited from three different Wallonian primary schools belonging to the community educational network. Thirteen pupils came from a primary school located in Verviers, 16 pupils came from a primary school located in Esneux and 4 pupils came from the primary school that also provided the immersion participants.

c) A control group (RegD) consisting of 28 Dutch speaking first grade pupils who are enrolled in a regular educational programme. The pupils were recruited from a Flemish primary school that belongs to the catholic educational network and is located in Lanaken.

In order to form the data sample 94 children were tested. However, the observations of six participants belonging to the control groups were excluded due to proficiency in languages other than the schooling language. In addition, two participants belonging to the experimental group were excluded, because Dutch was the dominant language spoken at home. Lastly, one participant of the experimental group was excluded due to technical difficulties during testing.

2.2.2 Participant characteristics

a. Age, gender and language difficulties

Table 7 presents the age distribution, gender distribution and number of children with language difficulties per group. It can be noted that the group compositions are similar in terms of age. With respect to gender, the monolingual control groups are proportionally distributed. In contrast, a slight majority of the female sex can be observed among the immersion subjects. However, previous research (e.g. Frohlich et al., 2013) indicates that gender does not seem to affect the acquisition of phonological awareness. In regards with language difficulties, nine children in total were indicated by the schools as developmentally lagging behind in terms of language acquisition in comparison with their peers. Within the French monolingual group, four participants were classified as at risk for dyslexia and send to a speech pathologist. The remaining student was in treatment with a speech pathologist for persistent articulation problems. Within the immersion school, two children were identified by the teacher as severely lagging behind in overall performance including reading skills. Among the Dutch monolingual children one participant was identified as at risk for dyslexia and referred to a speech pathologist.

TABLE 7
Age, gender and language difficulties

	RegFR (n=32)	ImD (n=25)	RegD (n=28)
Age			
Mean	6;10	6;10	6;10
Minimum	6;06	6;03	6;03
Maximum	7;08	7;08	7;08
Gender			
Male	18	9	15
Female	15	16	13
Language difficulties			
Yes	5	3	1
No	28	22	27

b. Extra-curricular context

As mentioned earlier, non-cognitive factors can also influence the development of phonological awareness. In order to have an oversight of such factors, a survey[10] was composed as a control measurement. The surveys (see Appendix I) contain demographic questions as well as multiple-choice questions with the possibility to specify. The surveys were distributed in class by the instructors and filled in by the parents of the subjects. The return rate amounts to 81 per cent for the French monolingual group, 96 per cent for the Dutch immersion group and 93 per cent for the Dutch monolingual group. For the purpose of analysis, the information collected through the surveys was divided into three categories, namely the familial socio-economic status, the familial linguistic context and language attitudes/stimulation.

Familial socio-economic status

Table 8 provides an overview of the family origin, parents' profession and home situation. Information concerning the financial home situation was obtained through the school. It can be noted that each group contains non-existent to low rates of single parent and underprivileged families. The number of single parent families per group range from zero to two. The number

[10] The survey was modelled after the survey used in Lecocq et al. (2006).

of underprivileged families per group range from zero to five. In both cases, the maximum value is observed in the monolingual French group. With respect to the place of birth, the majority of children as well as parents were born in Belgium. However, the slight difference between the monolingual Dutch group, and the other two groups can be discerned. This observation is due

TABLE 8

Home situation, place of birth and profession

	RegFr	ImD	RegD
Single parent families	7 %	0 %	4 %
Underprivileged families	15 %	4 %	0 %
Birthplace of Child			
Belgium	100 %	100 %	81 %
The Netherlands	0 %	0 %	19 %
Other	0 %	0 %	0 %
Birthplace of Father			
Belgium	81 %	92 %	72 %
The Netherlands	0 %	0 %	24 %
Other	19 %	8 %	4 %
Birthplace of Mother			
Belgium	96 %	100 %	61 %
The Netherlands	0 %	0 %	31 %
Other	4 %	0 %	8 %
Profession of Father			
Housekeeper	4 %	0 %	0 %
Civil servant	4 %	36 %	4 %
Employee	40 %	45 %	84 %
Independent	40 %	14%	12 %
Executive	4 %	0 %	0 %
Between jobs	4 %	5 %	0 %
Retired	4 %	0 %	0 %
Profession of Mother			
Housekeeper	16 %	13 %	0 %
Civil servant	24 %	22 %	46 %
Employee	36 %	55 %	50 %
Independent	16 %	0 %	0 %
Executive	0 %	10 %	0 %
Between jobs	16 %	0 %	4 %
Retired	0 %	0 %	0 %

to the fact that the Flemish primary school which provided the monolingual Dutch speaking participants is located near the Belgian-Dutch border. In addition, the largest proportion (Birthplace father: 18 %) of parents who immigrated from countries other than the Netherlands can be found in the monolingual French group. However, it has to be remarked that the children of foreign origin who were included in the data sample never or seldom come in contact with the native language of their parents. Furthermore, a great diversity in cultural backgrounds can be discerned among these participants, with parents that have immigrated from the DR Congo, Nigeria, Angola, Lebanon, India, Colombia, Spain, Portugal, Italy, France and Germany.

Regarding the parents' professions, the responses were classified according the following nomenclature: housekeeper, civil servant, employee, independent, executive, between jobs, retired. The most common practised professions of the fathers are employee and independent whilst civil servants and employees are in the majority among the professional careers of the mothers. Families with a single employed parent are infrequent. Only small differences between groups with respect to the parents' professions can be observed.

Familial linguistic context

TABLE 9
Familial linguistic context

		RegFR	ImD	RegD
Language(s) spoken at home:				
	French	100 %	100 %	0 %
	Dutch	0 %	4 %	100 %
	Other	4 %	7 %	8 %
Language(s) spoken with father:				
	French	100 %	100 %	0 %
	Dutch	0 %	4 %	100 %
	Other	0 %	4 %	0 %
Language(s) spoken with mother:				
	French	100 %	100 %	0 %
	Dutch	0 %	0 %	100 %
	Other	0 %	0 %	8 %
Language(s) spoken with grandparents:				
	French	100 %	100 %	0 %
	Dutch	0 %	11 %	100 %
	Other	0 %	7 %	4 %
Language(s) spoken among parents:				
	French	100 %	100 %	0 %
	Dutch	0 %	0 %	96 %
	Other	0%	4 %	8 %
Language(s) spoken with brother(s)/sister(s):				
	French	100 %	100 %	0 %
	Dutch	0 %	0 %	100 %
	Other	0 %	0%	0 %
Language(s) spoken by brother/sister at school:				
	French	96 %	100 %	0 %
	Dutch	0 %	38 %	100 %
	Other	4 %	0 %	0 %
Other languages mastered by father:				
	French	N/A	N/A	81 %
	Dutch	13 %	44 %	N/A
	Other	30 %	37 %	55 %
Other languages mastered by mother:				
	French	N/A	N/A	77 %
	Dutch	29 %	52 %	N/A
	Other	46 %	48 %	62 %

Table 9 offers information on the languages spoken within the family. For this section, the survey allowed for multiple responses. All the families indicate that the language spoken within the family corresponds with the dominant language of the language community, i.e. French for the families living in Wallonia and Dutch for the families living in Flanders. However, a small minority stated that children are on occasion exposed to other languages or dialects. For the French monolingual group, only one family indicated that their child occasionally hears the father communicate in Hindi with his family members. For the immersion group, a small number of families indicated that the parents and/or grandparents sporadically spoke Dutch, Arabic or Spanish with the children or among each other. Concerning the Dutch monolingual group, a small number of parents specified that they spoke either Lingala or a Dutch dialect among each other. In addition, two families indicated that the grandparents on occasion speak a Dutch dialect with their grandchild. Lastly, two children of blended families are exposed to English through the stepmother. Communication with siblings, however, exclusively occurs in the dominant language of the language community. Regarding the language spoken by the siblings at school, the monolingual Dutch families indicate that siblings exclusively speak Dutch within the curricular context. The same tendency is observed among the French monolingual group, with exception of one family who indicated that the older siblings attend English immersion programmes in secondary school. In contrast, a fairly large proportion (38 %) of the siblings related to Dutch immersion participants also attend Dutch immersion programmes and therefore speak French as well as Dutch at school. However, it has to be mentioned that the majority of the parents with children below the school-age indicated that they were also planning on enrolling their children into an immersion programme, or that their child had to drop out of the immersion programme due to developmental problems (e.g. subnormal intelligence, autism, dyslexia).

Language attitudes and language stimulation

Table 10 summaries the responses with respect to the L2 knowledge of the parents, the habits regarding reading bedtime stories and watching television in the non-dominant language (French or Dutch) as well as other extra-curricular activities in the non-dominant language (French or Dutch) not explicitly mentioned in the survey. The questions related to the L2 knowledge of the parents and the extra-curricular activities in the non-dominant language not explicitly mentioned in survey allowed for multiple responses.

What concerns the language knowledge of the parents, the three groups seem to differ greatly. The majority of parents related to the monolingual Dutch participants indicate that they have mastered at least two second languages relatively well to very well. These language are mostly French, English and German, although a small number of parents also mentions an average.

TABLE 10

Language attitudes and language stimulation

		RegFR	ImD	RegD
Languages mastered by father:				
	French	N/A	N/A	81 %
	Dutch	13 %	44 %	N/A
	Other	30 %	37 %	55 %
Languages master by mother:				
	French	N/A	N/A	77 %
	Dutch	29 %	52 %	N/A
	Other	46 %	48 %	62 %
Child watches TV in French:				
	Not at all	N/A	N/A	96 %
	Monthly	N/A	N/A	4 %
	Weekly	N/A	N/A	0 %
	Daily	N/A	N/A	0 %
Child watches television in Dutch:				
	Not at all	85 %	67 %	N/A
	Monthly	11 %	25 %	N/A
	Weekly	0 %	8 %	N/A
	Daily	4 %	0 %	N/A
Parents read stories in French:				
	Not at all	0 %	0 %	100 %
	Monthly	51 %	21 %	0 %
	Weekly	30 %	30 %	0 %
	Daily	19 %	49 %	0 %
Parents read stories in Dutch:				
	Not at all	100 %	79 %	4 %
	Monthly	0 %	17 %	23 %
	Weekly	0 %	0 %	35 %
	Daily	0 %	4 %	38 %
Child engaged in other extra-curricular activities in French:	Not at all	N/A	N/A	88 %
	Yearly	N/A	N/A	8 %
	Monthly	N/A	N/A	4 %
	Weekly	N/A	N/A	4 %
	Daily	N/A	N/A	0 %
Child engaged in other extra-curricular activities in Dutch:	Not at all	96 %	75 %	N/A
	Yearly	4 %	4 %	N/A
	Monthly	0 %	17 %	N/A
	Weekly	0 %	4 %	N/A
	Daily	0 %	0 %	N/A

proficiency in Spanish or Portuguese. In contrast, on average half of the parents related to the immersion subject indicate to speak Dutch and/or English averagely to very well. A small number of parents also indicate to have an average to good understanding of Spanish or Italian. Lastly, only a minority of the parents (F: 13 %; M: 29 %) related to monolingual French speaking participants mention a basic to good proficiency in Dutch. This trend continues among the responses of the fathers for the knowledge of languages other than Dutch. However, nearly half of the mothers (46 %) state to have an average to good knowledge of a language other than Dutch. The language specified mostly constitutes English, although a small number of parents also mention Spanish or Italian. With regards to the habits of watching television in the non-dominant language, only one participant from the monolingual Dutch group watches television in French, whereas several monolingual French and immersion children watch television in Dutch on a monthly, weekly or daily basis. Nonetheless, the monolingual French and immersion children that have the habit of watching TV in Dutch remain a minority. The survey also reveals that all the parents, regardless of group, take the effort to read bed time stories in the dominant language within family, with the exception of one family within the monolingual Dutch group. However, the timely basis of reading bedtime stories differs somewhat between groups. As for reading bedtime stories in the non-dominant language, this trend is only observed within the immersion group as a minority of the immersion parents indicate that they read stories in Dutch to their children. Lastly, the survey inquired whether the children partook in other extra-curricular activities in the non-dominant language not mentioned in the survey, which was the case for several participants belonging to the immersion and the monolingual Dutch group. The extracurricular activities not mentioned by the survey in which the monolingual Dutch participates participated, were French language camps, extra-curricular French lessons and sitting in with the French study sessions of elder siblings. The extracurricular activities not mentioned by the survey in which the immersion children engaged, were Dutch language camps, extra-curricular Dutch lessons, playdates with Dutch-speaking friends and visits to Dutch family members. As for the monolingual French group, one participant indicated to have participated in a Dutch language camp.

2.3 Apparatus and materials

2.3.1 Phonological awareness tests

In order to measure the phonological awareness on the level of the syllable as well as subsyllabic units, the children are presented with an initial syllable deletion and an initial phoneme deletion task. The latter task contains a single consonant and a consonant cluster condition to assess the ability to split words between onset-rime and phoneme boundaries. For the successful completion of these tasks, the participant needs to segment and delete the initial syllable or phoneme from the rest of the word, and subsequently repeat the remaining sound structure after deletion. In addition, the test stimuli selected for both tasks vary in phonological structure. Three series of test stimuli based on phonological composition can be distinguished: (1) series A, which contains 8 bisyllabic novel words with phonological features typical for French, (2) series B, which contains 8 bisyllabic novel words with phonological features shared by French and Dutch, and (3) series C, which contains 8 bisyllabic novel words with a phonological features typical for Dutch.

a. Creation and selection of the pseudo-words

Several methods have been suggested in order to create pseudo-words. The most common procedure is to take existing words and change one or two letters in these words in order to form novel words (Brysbaert, 2010). However, the outcome is inclined to depend on the creator’s language experience, which may lead to a disadvantages for researchers who are not fully proficient in the language – e.g. a non-native French speaker doing research in French (Brysbaert, 2010). In addition, this method is prone to biases as one may have an idiosyncratic preference to change certain letters or letter combinations (Brysbaert, 2010). An alternative is not to change one or two letters, but to start with a list of existing words and subsequently switch around entire syllables to create pseudo-words (P. Mousty, personal communication, 4 march, 2014). Lastly, it is also possible to use pseudo-word generators such as WordGen (Duyck, Desmet, Verbeke & Brysbaert, 2004) or Wuggy (Brysbaert, 2010), which apply certain algorithms to help the users select pseudo-words based on a number of criteria (Brysbaert, 2010). Initially, the pseudo-word generator Wuggy (Brysbaert, 2010) was applied for the creation of the French pseudo-words by entering a stimuli list consisting of real French words from a previous experiment by Duncan et al. (2006) into the generator in order to create the French novel words. However, this approach did not yield satisfactory results. For example, the word *jongleur* generated non-words such as *joxideur, jolfseur, jexoleur, jorpseur*. These generated pseudo-words were created on the basis of the letter strings instead of the phonological structure and contain letter combinations that are not widely present in French. Therefore, this approach was abandoned. Instead, the French pseudo-words were created by manually switching around the syllables of test stimuli used by Duncan et al. (2006). As for the French-Dutch novel words, they were taken from a previous investigation conducted by Lecocq et al. (2005). The Dutch novel words were either self-created starting from an existing Dutch word or selected from a pseudo-word reading test that forms part of a diagnostic tool for reading and spelling deficits (CLB, 2004). The Dutch stimuli were slightly adapted in order to contain phonological features typical for Dutch. In addition, certain phonemes in several French, French-Dutch and Dutch novel words were added or deleted in order to create stimuli that were more or less equal in length across the item series.

Table A (See Appendix II) provides an overview of the items presented during testing. The test stimuli are all morphologically conceived as singular nouns without derivational suffixes, except for three items of series C on the initial syllable deletion test, which are based on the morphological structure of the Dutch diminutive. The item length varies from six to eight phonemes for the syllable deletion task and from six to seven phonemes for the phoneme deletion task. It can be noted that only series A contains open syllables with nasal vowels (Vn) whereas closed syllables are more frequently observed in series B and C. Semi vowels (Vs) are observed in both series A and C. All test stimuli but one have unambiguous syllable, onset-rime and phoneme boundaries. The syllable boundaries of French-Dutch non-word *draplof*, conversely, can be regarded as open-ended (CV-CCVC), closed (CVC-CVC), or ambisyllabic (CV(C)CVC) if one takes into account the phonological characteristics of both French and Dutch. Therefore, the responses *plof* and *lof* were both deemed accurate. It is also highly likely that several of the other test stimuli were interpreted as ambisyllabic. However, the initial syllable deletion task does not reveal this train of thought because the required response only contains the last syllable of the presented novel word. The items obtained either a score of 1 or 0. Total scores were calculated per phonological feature condition and amount to 8. The test stimuli were recorded by a late bilingual Dutch-French speaker who resided in Nantes, France for two years. The presentation of the test items occurred in a randomized order via laptop and loudspeaker.

2.3.2 Control tests

a. Digit span

The digit span subtest from the Wechsler Intelligence Scale for Children (WISC III) was administered to evaluate the working memory and the ability to concentrate. This task contains two testing conditions and examines the ability to memorize and manipulate digit strings. The children are presented with 15 exercises which require the child to repeat increasingly long strings of random numbers in the same order (8 exercises) and in reversed order (7 exercises). Each exercise contains two digit strings of equal length and is scored with either 2, 1 or 0. The total score amounts to 30. Assessment per testing condition is ceased when the child has made two consecutive errors at the same string length.

b. Reading test

The children were presented with 12 pseudo-words (Appendix II) that contain shared features of Dutch and French, taken from Lecocq et al. (2006). The children were required to read these non-words out loud, while being recorded, to ascertain letter knowledge and technical reading skills at word level. The test was modelled after the pseudo-word subtest in the diagnostic tool for reading and spelling deficits (CLB, 2004) and measured reading accuracy as well as reading speed. The pseudo-words were considered correct when the child was able to produce phoneme-grapheme correspondences legal in French and Dutch. Reading the words as separate letters was also considered accurate if the sound mapping was deemed to be legal in Dutch or French. Inaccuracies during the reading session were assessed on the basis of the sound recording. Words containing mapping mistakes received a score of 0. The aim of this control test is solely to provide a basis to exclude outliers encountered for the PA tests during the statistical analysis.

2.4 Procedure

2.4.1 Experiment introduction

The management, teachers and parents were informed of the research objective and experiment set up through an information letter and a parental consent letter (see Appendix III). The instructors had informed the children in advance that someone was coming by to play games with them. On the first day of testing, the researcher would introduce the experiment in class in companionship of two cuddly toys. The researcher explained to the class that her two furry friends were making a lot of pronunciation mistakes and that they needed the children's help to learn how to speak correctly. This general introduction was given in order to avoid feelings of anxiety during testing. After this introduction, the researcher told the children that they would be accompanying her individually in alphabetical order. After the children were taken to a separate classroom for testing, the researcher repeated that they were meant to help the two cuddle toys, but that they would first play some word and number games. The tests were presented to the children in the following order: (1) digit span, (2) reading test, (3) syllable deletion task and (4) phoneme deletion task. The testing sessions were recorded and lasted on average 30 minutes.

2.4.2 Control test procedure

For the digit span assessment, the children were told in plain language that they had to repeat the numbers said by the researcher. The digit span forward does not contain any practice exercises. Feedback was not offered unless the child has misinterpreted the assignment. For example, some children responded with the sum of the digit string instead of a repetition. In that case, the exercise explanation was repeated. After the child had made two consecutive errors at same string length, the digit span forward was ceased by saying *" Well done!"*. Then, the researcher continued by stating that she was going to say some more numbers, but now the child had to repeat the numbers in reverse. Before the start of the digit span backward, the child was offered two practice attempts with corrective feedback, if necessary. Again, the test was ceased after two consecutive mistakes by saying *"Good job. We're finished!"*.

To introduce the reading test, the researcher told the children that the instructor had mentioned that they were such excellent readers. She subsequently asked them to read a list of strange words as if they were French or Dutch, depending on the group to which the subject belonged. The words were presented to the children on a reading card (see Appendix II). The researcher sat next to the child during the reading session and used her finger to guide the children while they were reading in order to prevent that the children skipped words. No training items were offered in advance. If the child directly asked for or the body language (e.g. looking up after reading a pseudo-word) indicated a need for feedback, the researcher always offered positive reassurance, regardless of the performance.

2.4.3 PA test procedure

For the presentation of the PA tests, the procedure as explained in Lecocq et al. (2006) was employed. In order to explain the tasks, the children were presented to Arno for the syllable deletion task and to Florian for the phoneme deletion task. The children were told that Arno and Florian made particular pronunciation mistakes and that the children would have to correct these mistakes, if they wanted to help them. The task procedure was explained by means of three training examples. The offered training items were visualised by two differently coloured Lego blocks. During the first example, the researcher pronounced the training item while pointing with her finger to the blocks in order to clarify the boundaries of the linguistic units. She subsequently removed the first block and repeated the last syllable or remaining letter string. During the consecutive examples, the children were asked to repeat the offered training items, remove the first block and repeat the last syllable or remaining letter string. Corrective feedback was given, if necessary. After the training sessions, the children were told that the researcher had recorded all the words which either Arno or Florian pronounced incorrectly on her laptop and that they were now supposed to correct each word by themselves following the procedure explained in the training session. The children were offered no feedback except when they were repeated the first syllable instead of the last. In that case, the researcher asked whether that really was the last piece of the word. Also, when the researcher noticed that the child had misunderstood a test stimulus, the item in question was replayed. For example, when a child mistook the novel word *drantesse* for *dantesse*, it was played again because the misinterpretation would yield an inaccurate response, while the subject might have been able to split the word at phoneme level instead of onset-rime level.

It has to be mentioned that the procedure of Lecocq (2006) was slightly adapted. Firstly, the French presentation text was adjusted in order to match the proficiency level of the researcher. Secondly, the phoneme deletion procedure was adapted after the first testing session, because a discrepancy between the reading test and phoneme deletion task was observed. The child was able to read all the pseudo-words without mistakes at a steady pace. However, he obtained a bottom score of 0 on each condition of the phoneme deletion task. Given that the boy exhibited beginning literacy, another explanation was sought for the observed bottom scores. During the training session of the phoneme deletion test, the child seemed to have difficulty with switching from deletion of initial syllable to the deletion of initial phoneme as he persistently kept deleting the initial syllable instead of the initial phoneme inspite of corrective feedback. During the investigation of Lecocq et al. (2006) the PA tests were administered on separate occasions while the phoneme deletion task during the current study was administered right after the syllable deletion task. To decrease the influence of the task presentation order, the two monosyllabic pseudo-words were added at the beginning of the training session. After this adjustment, no more bottom scores were obtained by children who were able to perform flawlessly on the reading test. Lastly, for the initial phoneme procedure in the present study, the children were asked to repeat the non-word, identify the first phoneme and then delete it. The identification of the first phoneme during the initial phoneme deletion task was not part of the procedure followed by Lecocq et al. (2006) However, it was added because it would deliver valuable insights for interpreting inaccurate answers.

2.4.4 Reward

At the beginning of the testing session, the children were told that they would be allowed to pick out to two pieces of candy from the candy box in order to motivate the children to do their best. Children with diabetes received stickers instead of candy. Also the children who were disqualified from participation due to proficiency in languages other than the schooling language were retrieved from class in order to avoid a feeling of exclusion. These children came in groups of two, remained with the researcher for 5 minutes during which they were presented with some of the PA test stimuli and were rewarded with two pieces of candy.

2.5 Error Analysis

The scoring of PA tests classifies errors as either correct or incorrect. However, such a classification does not capture some important distinctions among errors. For example, when asked to delete the initial phoneme, the incorrect responses can vary from failing to provide an answer or deleting the first syllable to deleting the initial consonant cluster. Not all these incorrect responses convey the same level of incorrectness. A child who deletes the onset instead of the initial phoneme in a word starting with a consonant cluster has a heighted sense of phonological awareness in comparison with a child who deletes the initial syllable. Similarly, errors on the initial syllable deletion task can vary between failing to provide an answer, misplacing the syllable boundaries, deleting the final syllable or responding with the final rime instead of the syllable. In addition, such errors can reveal evidence for negative cross-linguistic transfer. For example, the francophone children could have the tendency to perceive syllables of the Dutch test stimuli which contain short vowels as open instead of closed. Therefore, an additional error analysis was conducted to reveal tendencies observed among the incorrect responses on the phonological awareness tasks.

2.6 Statistical analysis

To verify whether the obtained results reveal significant differences among the compared groups and stimuli conditions, a statistical analysis was conducted by means of the statistical software programme SPSS. Firstly, descriptive statistics by means of histograms, means, standard deviations, etc. are employed to provide an overview of performance differences. Secondly, the significance of the differences in performance is analysed by means of either parametric or non-parametric tests, depending on the characteristics of the data set. Ideally, the syllable deletion results should be analysed with a Two Way Mixed ANOVA with group as the between subject factor and phonological composition of test items as the within subject factor in order to establish possible interactions between these two independent variables. Similarly, the phoneme deletion results should be analysed with a Three Way Mixed ANOVA with group as the between subject factor and phonological structure of test items as well as the number of initial consonants as the within subject factors. However, in order to find the most suitable analysis method for the results obtained by the PA tests as well as the control tests, the parametric assumptions of normality and homogeneity of variance had to be verified.

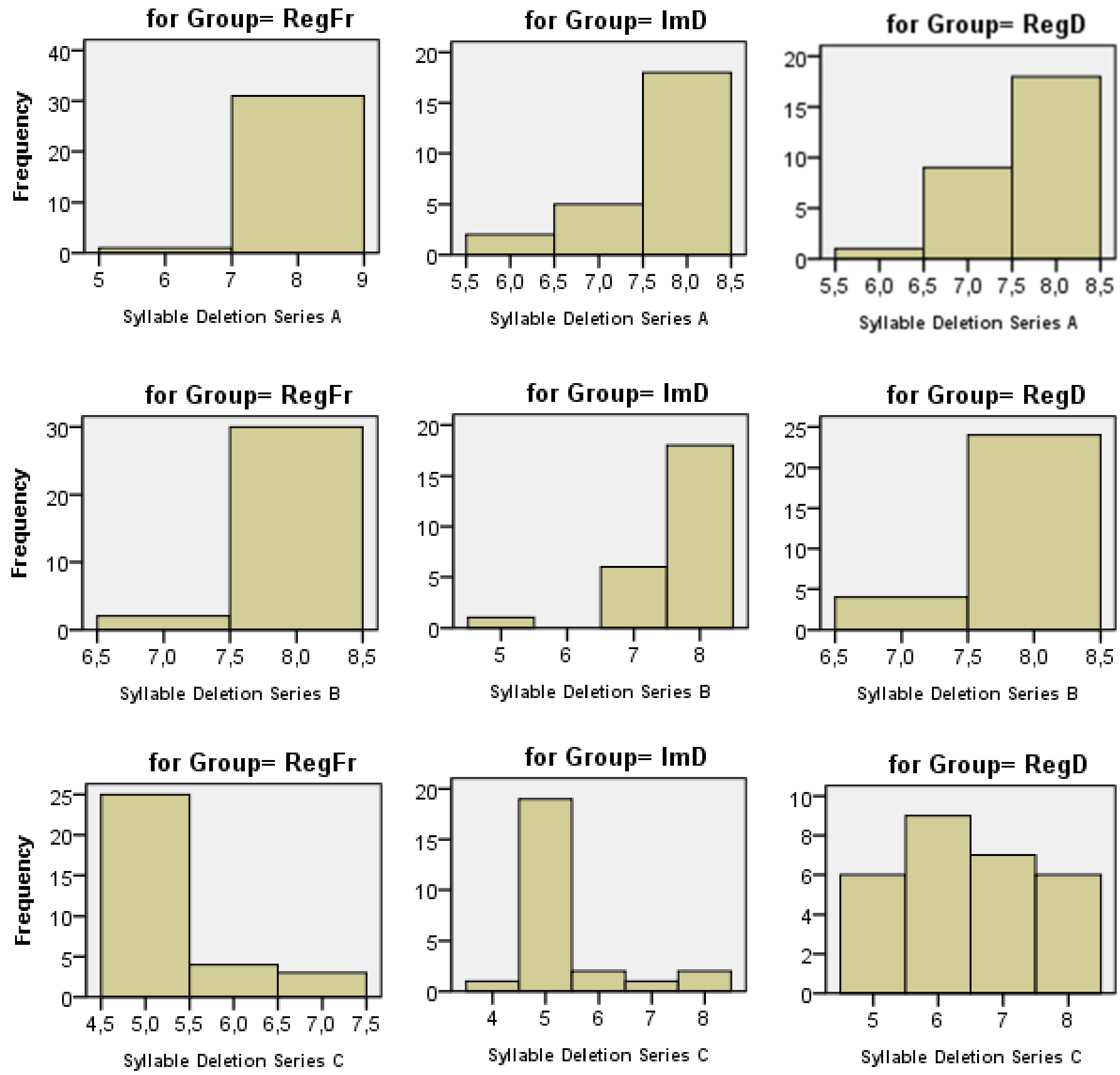
2.6.1 Assumption verification and test selection

To assess whether the data is normally distributed, the descriptives, histograms and outcomes of the Shapiro-Wilk test were consulted. The S-W test was preferred over the Kolmogorov-Smirnov test as Field (2005) and Ahad et al. (2011), among others, indicate that it is the most powerful option with smaller sample sizes (< 50 elements). However, the outcomes on the S-W test were still verified by means of Q-Q plots. To verify whether homogeneity of variance is met, the Levene's test was employed.

a. Syllable deletion task

The descriptives and histograms presented in figure 2 reveal highly negatively skewed syllable deletion data for series A – RegF: zskew = -13.66 $p < .001$.; ImD: zskew = -3.50, $p < .001$; RegD: zskew = -2.49, $p < .01$ – and series B – RegF: zskew = -9.167 $p < .001$.; ImD: zskew = -5.44, $p < .001$; RegD: zskew = -4.80, $p < .001$. In addition, the histograms clearly show the presence of a ceiling effect among the series A and series B scores. This tendency is, conversely, not observed among the scores obtained on the Dutch test item series. The syllable deletion scores of condition C are significantly positively skewed – RegF: zskew = 4.30 $p < .001$.; ImD: zskew = 4.30, $p < .001$, with exception of the scores obtained by the Dutch monolingual participants – zskew = 0.23, ns. The outcomes of the S-W test, as shown in Table B (Appendix IV), confirm the significance of the non-normally distributed data – $p <.001$ or $p < .01$. It has to be noted that the box plots were checked in order to eliminate outliers. However, no reasonable cause was found to remove any of the indicated outliers from the data set. In order to correct the deviation from normality, a square root and log transformation were applied to the original scores. However, these transformations failed to correct the deviation from normality to such an extent that the use of parametric tests would become feasible. The use of a rank transformation procedure, which entails converting the original scores to ranks before running the parametric tests was excluded due to the high number of identical scores. Besides the violation of normality, the data – original as well as transformed – also failed to meet the homogeneity of variance criterion as the Levene's test yielded significant results (see Table C, Appendix IV).

Figure 2. *Syllable Deletion Histograms*



Taking into account the violations discussed above, the significance of the performance differences would best be analysed with a combination of non-parametric tests given the lack of a direct non-parametric alternative for a mixed ANOVA design. As such, the significance of the differences between groups on each condition were assessed by means of a Kruskal Wallis test whereas the significance of performance differences on the three test item series within each group was analysed by means of a Friedman's ANOVA.

b. Initial phoneme deletion task

When examining the descriptives, histograms presented below and S-W test (see Table D, Appendix IV), the data distribution appears highly deviant from normality. After the employment of log and square root transformations, the deviation has not decreased to such an extent that would enable the use of parametric tests. As for homogeneity of variance, the Levene's test (see Table E, Appendix) indicates that the assumption has been met for some, but not all of the test conditions. This trend is also observed when the Levene's test is performed on the transformed data. Given that parametric tests are preferred for their ability to establish the significance of interactions between independent variables, the author decided to check whether a parametric analysis at a higher level would be feasible. The rationale behind this decision is that the increase of observation numbers per condition (phonological sequence condition: from 4 to 8; consonant condition: from 4 to 12) might yield more homogeneous and normally distributed data. Therefore, in order to establish whether the phonological composition of the test items influence the performance on the initial phoneme test, the consonant condition was dropped and vice versa. Subsequently, the assumption verification was repeated in order to established whether Two Way mixed ANOVA's for the independent variables, group and phonological sequence on the one hand and the independent variables, group and consonant condition on the other would be feasible.

The assumption verification revealed that the data for group and phonological sequence met the assumption of homogeneity(see Table G, Appendix IV). However, the S-W test revealed that the deviation from normality was non-significant for some, but not all of the phonological sequence conditions (see Table F, Appendix IV). The execution of a square root transformation reduced the deviation of normality further, but still several significant values on the S-W test can be observed (see Table H, Appendix IV). Nonetheless, the observed values on the normal Q-Q plots mostly fall along the straight diagonal line of expected values (see figure A, Appendix IV). Taking into account the outcomes of Levene's test, the Q-Q plots and the fact that an ANOVA is a robust analysis method in which the Type I error α and Type II error β remain constant under the violation of normality (Schmider et al., 2010), the use of parametric ANOVA was deemed feasible. Therefore, the author decided upon the Two Way Mixed ANOVA in order to analyse the significance of the performance differences and the interactions between the between subject factor, group, and the within subject factor, phonological composition of the test items. Pairwise comparisons were analysed by means of the robust Scheffé post-hoc test. With regard to the data for group and consonant condition, the assumption verification also revealed that the variances were homogeneous throughout the data set However, the S-W test indicated that the deviation from normality was highly significant for.

all conditions to an extent that could not be corrected by data transformations as all conditions remained significantly deviant from normality. In addition, the observed values on the Q-Q plots did not fall along the straight line of observed values. Therefore, it was decided to analyse the differences in performance on the consonant conditions with a combination of Kruskall-Wallis tests and the Wilcoxon signed rang tests. The effect for the factor consonant condition remained of interest, giving that the histograms reveal a tendency to score better on the single consonant condition, as on the consonant cluster condition. Therefore, it would be preferable to establish whether these observed differences are significant. The use of a Wilcoxon signed test to verify the significance of performance differences on the consonant condition within each group in combination with a Kruskal-Wallis to verify the significance of performance differences between groups within each condition was considered the best non-parametric alternative for a Two Way Mixed ANOVA

Figure 3. *Phoneme deletion histograms at onset-rime level (single consonant condition*)

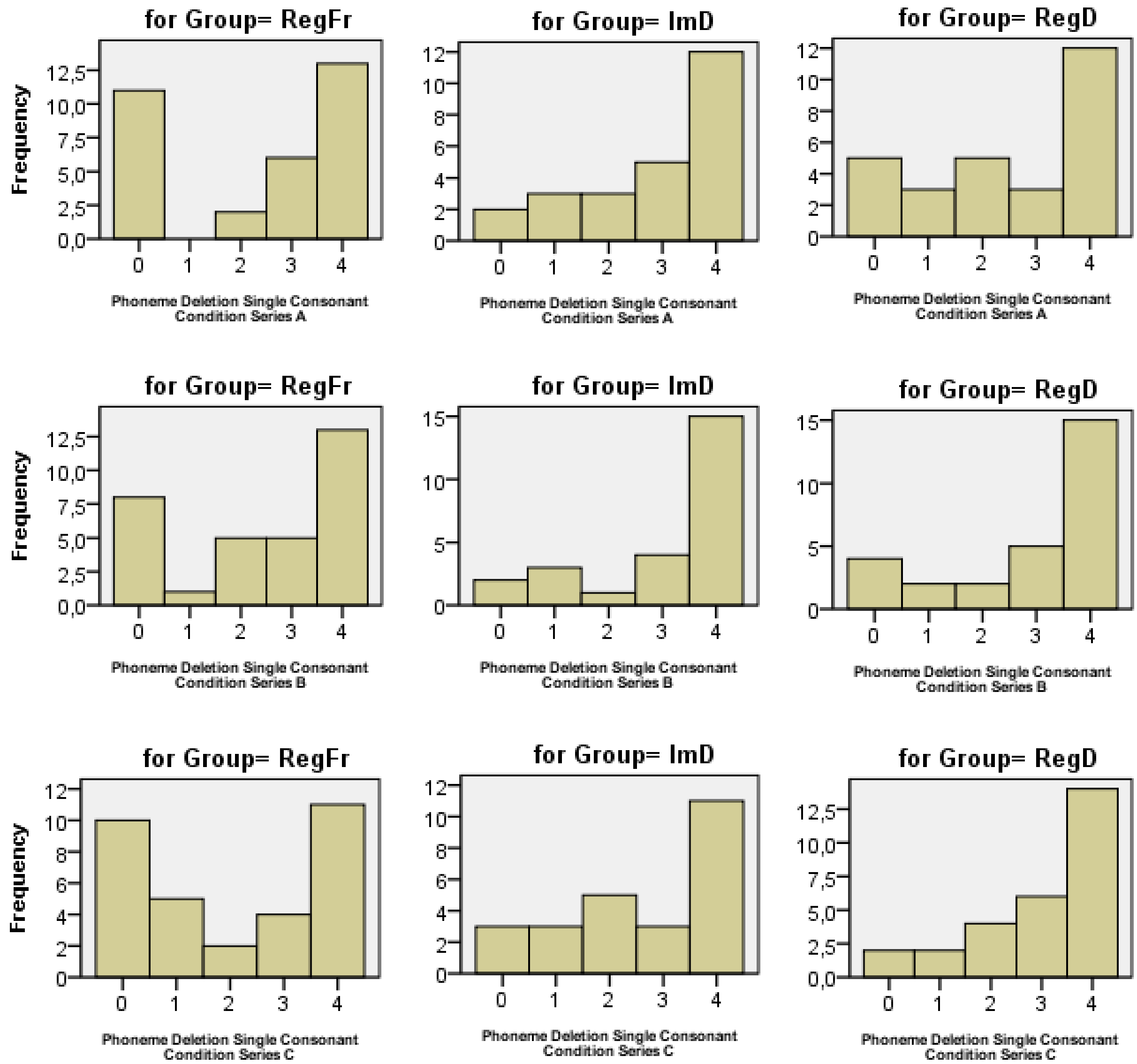
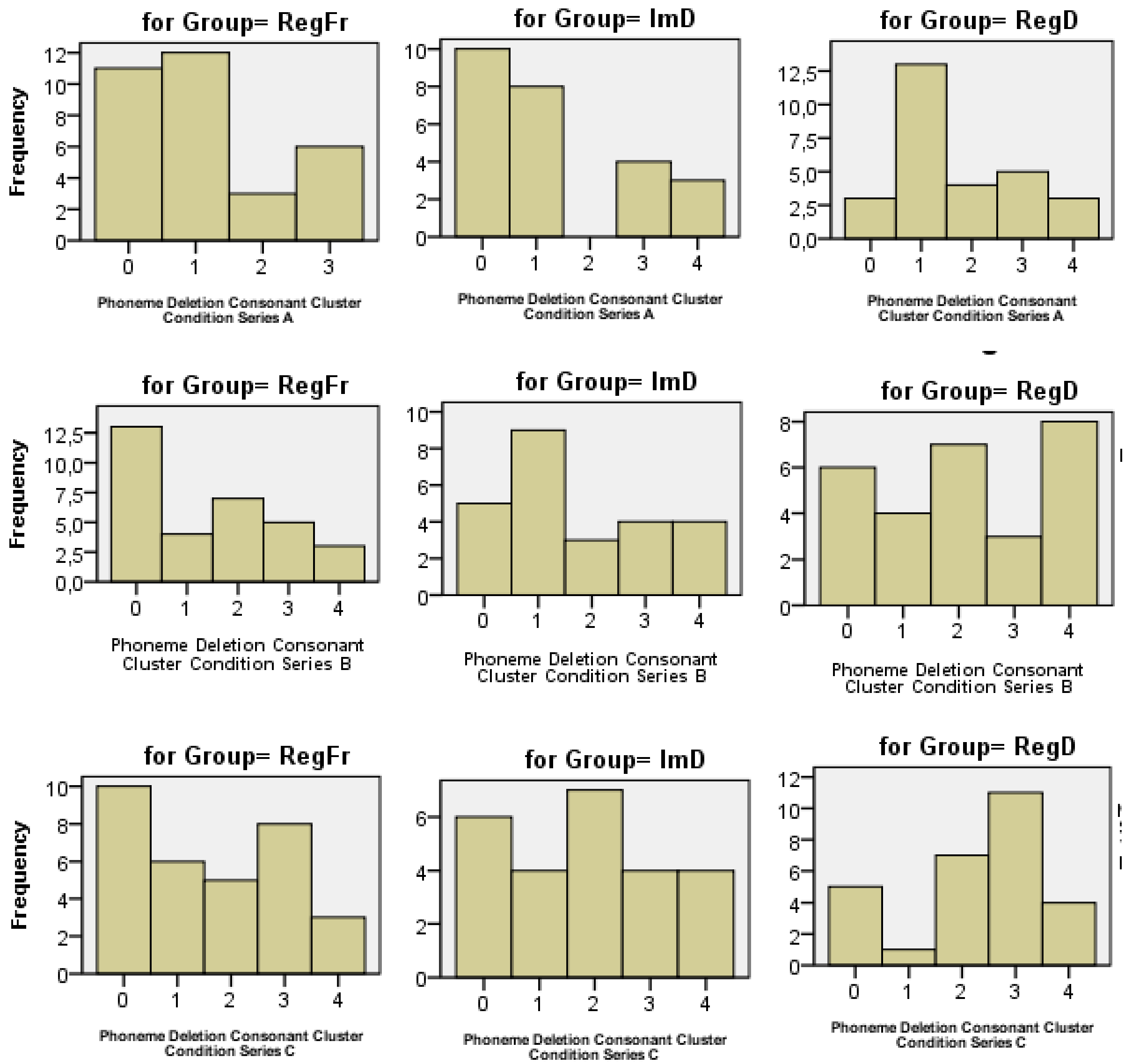


Figure 4. *Phoneme deletion histograms at phoneme level (cluster consonant condition)*



c. digit span task

The data of the digit span task met the parametric assumptions (see Appendix IV:Table I, J, K). However, a square root transformation was first implemented in order to meet the assumption of normality, because, according to the S-W test, the data collected from the monolingual French speaking group deviated significantly from normality – W (32) = 0.173, $p < .05$. After the square root transformation, the deviation from normality observed in the data collected from the monolingual French speaking group was reduced to a non-significant level. The Q-Q plots were consulted in order to verify the results of the S-W test (see figure C, Appendix IV). As the observed values fell alongside or close to the straight line of expected values, it was assumed that the data had met the assumption of normality. Therefore, an One Way ANOVA in combination with Howell-Games post-hoc test were employed in order to establish the significance of the performance differences on the digit span task. In addition, spearman correlations were performed to verify whether there truly exists a significant relation between the digit span scores and the PA tests.

d. Reading test

The reading test offers an insight into two variables, namely reading accuracy and reading speed. The data collected with respect to reading accuracy and reading speed met the assumption of homogeneity of variance. However, the data for reading accuracy is highly negatively skewed – RegF: $z_{skew} = -3.32 < .001$; ImD: $z_{skew} = -3.44$, $p < .001$; RegD: $z_{skew} = -3.70$, $p < .001$ – to such an extent that data transformations did not correct the deviation from normality to satisfactory levels. Conversely, the data for reading speed presents itself as significantly positively skewed – RegF: $z_{skew} = 2.70$, $p < .01$; ImD: $z_{skew} = 1.40$, $p = ns$; RegD: $z_{skew} = 3.70$, $p < .001$. The S-W test confirms that the data is significantly deviant from normality at .001 for reading accuracy and .05 for reading speed. A log transformation nor a square root transformation corrects the deviation from normality to satisfactory levels. The data for reading accuracy remained significantly deviant from normality at .001.whilst the data for reading speed remained significantly non-normally distributed at .001 for one out of three groups. Even though the variances are homogeneous throughout the data and an ANOVA can handle deviation from normality to some extent, an Kruskal-Wallis test was employed to verify the significance of the performance differences. The variables reading accuracy and reading speed are treated as independent from each other, as a bad performance on either of them can be an indication of reading difficulties. As such, it is not necessary to establish possible interactions between these two independent variables. Therefore, given the extent of the deviant from normality, the non-parametric equivalent of the One-Way ANOVA was preferred. In addition, spearman correlations were performed to verify whether there truly exists a significant relation between the reading test variables and the initial phoneme deletion scores. Unlike with the digit span task, only the significance of the relation with the phoneme deletion task was of interest as beginning literacy influences the development of subsyllabic metalinguistic awareness.

d. Effect Sizes

Not only the significance of the investigated effect is of interest – i.e. is the observed difference between groups more than an accidental sampling? –, but also the extent of the effect is important – i.e. how large is the observed differences between groups caused by the experimental manipulation? Calculating effect sizes are a means to quantify the size of the difference between groups and unlike significance values, their outcome does not depend on the sampling sizes. Therefore, researchers are encouraged by the American Psychological Association to report effect sizes in addition to *p*-values (Coe, 2002; Field, 2005). Most commonly, standardized mean differences (SMD) are used to calculate effect sizes in experimental groups such as Hedges' *g* and Cohen's *d*, although the product-moment correlation coefficient, *r* can also be used in groups designs when one variable is dichotomous and the other is not (Durlak, 2009). McGrath and Meyer (2006) and Ruscio (2008) offer a valuable discussion of the relative merits of SMDs and *r* as measures of effect size. Based on the arguments provided in the aforementioned studies and in Field (2005), *r* was calculated, computed on the basis of the test statistics for parametric test and the z-scores for non-parametric tests.

3. RESULTS

3.1 Control Tests

One important factor that can affect the performance of the phonological awareness tasks is the participants' working memory capacity. Also, differences in the level of beginning literacy may influence the outcomes of the phoneme deletion task as phoneme awareness only begins to develop after a beginning level of literacy has been acquired. Therefore, aside from the PA tests, the children were also presented with a digit span task and a reading test in order to gain an insight into these extraneous variables.

3.1.1 Digit Span Task

The mean scores together with the standard deviations, minimum and maximum values obtained on the digit span task are presented in Table 11 whereas the histograms are provided in Figure 2.

TABLE 11
Digit Span Task[1]: Descriptive Statistics

	M (SD)	Min.	Max.
RegF (n = 32)	9.44 (2.20)	6	15
ImD (n = 25)	9.88 (1.79)	6	13
RegD (n = 28)	10.11 (2.10)	6	16

[1]maximum obtainable score is 30

Figure 5. *Digit Span Histograms*

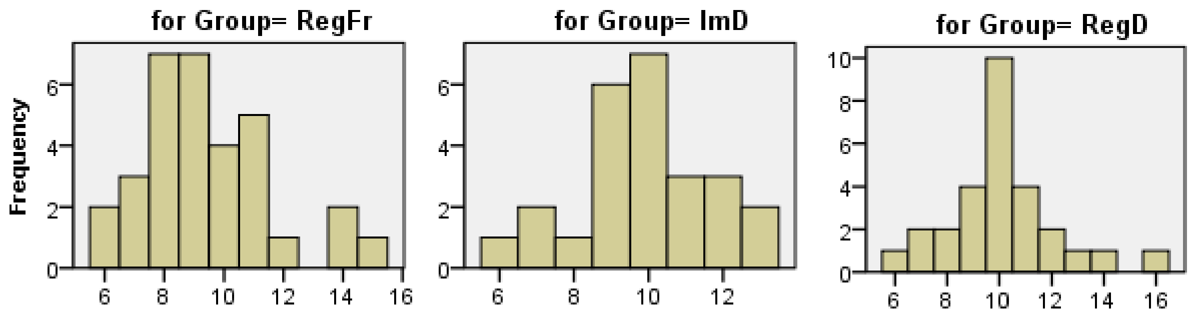


Table 11 reveals that the monolingual Dutch group obtained the highest mean score on the digit span task. However, when looking at the histograms, this result is probably due to an outlier score of 16 obtained by one of the monolingual Dutch participants. The most frequent score observed within the Dutch monolingual group is 10 which was obtained by 10 participants. Within the immersion group less individual variance can be noted in comparison with the monolingual groups and the most frequently observed scores range from 9 to 10 with six participants obtaining a score of 10 and seven participants obtaining a score of 9. The French monolingual group obtained the lowest mean score. The most frequently observed values within this group range from 8 – obtained by seven participants – to 9 – also obtained by seven participants. Ideally, the observed differences should be insignificant to avoid a third variable problem. In order to confirm this, a one way analysis of variance together with a Games-Howell test was performed, which revealed that the groups did not significantly differ from each other – $F(2, 82) = .913$, $p = .405$, $r = .14$. Subsequent pairwise comparison by means of a Games-Howell test were unnecessary given that no main effect was encountered.

3.1.2 Reading Test

a. Reading Accuracy

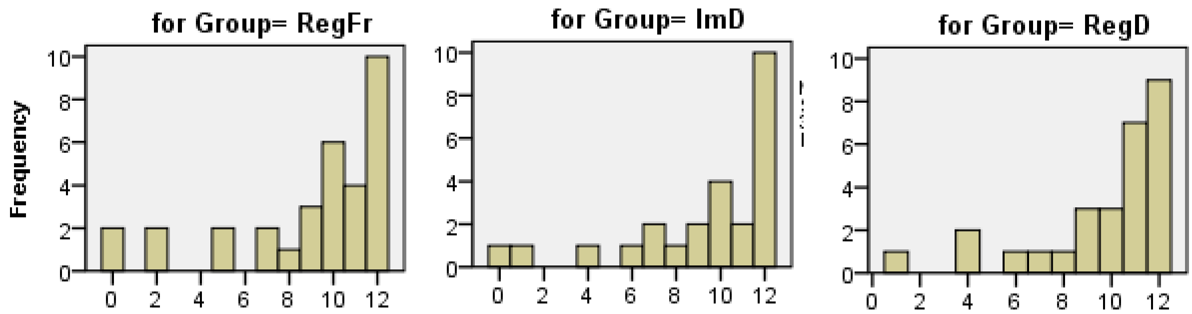
Table 12 provides the mean scores together with the standard deviations, minimum and maximum values obtained for reading accuracy whereas the accompanying histograms are presented in figure 2.

TABLE 12
Reading Accuracy[1]: Descriptive Statistics

	M (SD)	Min.	Max.
RegF (n = 32)	8.97 (3.65)	0	12
ImD (n = 25)	9.32 (3.46)	0	12
RegD (n = 28)	9.71 (2.89)	1	12

[1]Maximum obtainable score is 12

Figure 6. *Reading Accuracy: Histograms*



The monolingual Dutch group obtained the highest mean score for reading accuracy. However, the histograms reveal similar trends across groups. The majority of the pupils (RegF: 62 %; ImD: 68 %; RegD: 76 %) obtained a score between the range of 10 and 12. Therefore, the majority of the children were able to map out legal phoneme-grapheme correspondences for most to all non-words. The most frequently misread letters were *k*, *f* and *i*. All students who obtained bottom scores of 0, 1 and 2 were identified by the schools as at risk for dyslexia or as lagging behind in general. However, the students with language difficulties were not excluded from the present experiment as several participants aside from the students identified with language difficulties obtained bottom scores on the initial phoneme deletion task. The Kruskal Wallis test confirmed what the histograms already indicated, namely that the groups did not significantly differ in terms of reading accuracy – H (2) = .439, p = .803.

b. Reading Speed

TABLE 13
Reading Speed (in Seconds): Descriptive Statistics

	M (SD)	Min.	Max.
RegF (n = 32)	98.23 (44.01)	47	222
ImD (n = 25)	111.67 (51.34)	52	234
RegD (n = 28)	71.18 (52.68)	24	268

Table 13 illustrates the mean scores together with the standard deviations, minimum and maximum values obtained for reading speed, denoted in seconds. Unlike for working memory and reading accuracy, the groups differ significantly in terms of reading speed – H (2) = 14.31, p < .001. Pairwise comparisons revealed that the Dutch monolingual participants were able to read significantly faster as the French monolingual participants – U = 18.42, p <.01., r = -0.40 and as the immersion participants – U = 23.63, p < .001, r = -0.46. However, the French monolingual group did not read significantly faster in comparison with the immersion group – U = -5.21, *ns*, r = -0.12.

3.1.3 Summary

The statistical analyses of the control tests revealed that the groups did not significantly differ in terms of working memory capacity. In addition, the Francophone, immersion and Dutch speaking children were similar in terms of reading accuracy, as the majority were able to correctly sound out most to all novel words. The groups did, however, differ in terms of reading speed as the Dutch monolingual children read significantly faster in comparison with the French monolingual and immersion children. Nonetheless, the reading test findings indicate that most participants had reached the stage of beginning literacy. The participants who obtained bottom scores on the reading test belonged exclusively to the group of children with language difficulties. However, these participants were not excluded from the experiment as several other participants aside from the children with language impairments obtained low scores on the initial phoneme deletion task.

3.2 Phonological Awareness Tasks

3.2.1 Initial Syllable Deletion Task

Table 14 presents the mean, minimum and maximum scores for each condition of the initial syllable deletion task obtained per group.

TABLE 14

Initial Syllable Deletion[1]: Descriptive Statistics

	RegF (n = 32)			ImD (n = 25)			RegD (n = 28)		
	M (SD)	Min	Max	M (SD)	Min	Max	M (SD)	Min	Max
Phon. Sequence									
Typically French	7.94 (0.35)	6	8	7.64 (0.64)	6	8	7.61 (0.56)	6	8
Shared Fr-D	7.94 (0.25)	7	8	7.64 (0.70)	5	8	7.86 (0.36)	7	8
Typically Dutch	5.31(0.64)	5	8	5.36 (0.95)	4	8	6.46 (1.07)	5	8

[1]The maximum obtainable score is 8

Within the French monolingual group and the immersion group, a similar observation can be made in terms of the performance on the different test item conditions i.e. both groups score equally well on the test stimuli with a typically French and shared structure, but worse on the items with typically Dutch structures. The participants of the Dutch monolingual group, conversely, perform best on the shared phonological sequences, followed by the typically French sequences . On the typically Dutch sequences, they obtain the lowest scores. However, it has to be noted the mean score of the shared features obtained by immersion group may not be an accurate representation of the observed performance considering that the histograms reveal that a greater number of immersion participants obtained a score of 8 or 7 in comparison with the other two groups. Albeit, this is not reflected in the mean scores due to an outlier score of 5 observed within the immersion group. Said score was obtained by a student who had language difficulties and came from an underprivileged family. The pupil in question performed below average during the entire testing session. However, her performance was not excluded as the syllable deletion test contained several outliers due to observed ceiling effect.

A Friedman ANOVA and subsequent pairwise Wilcoxon signed rank comparisons with Bonferroni correction were performed in order to establish whether the performance differences observed per condition within each group were significant. The statistical analysis confirms that the effect is situated in the comparison between the typically French and typically Dutch series – RegF: $T = 0$, $p < .001$, $r = - 0.92$; ImD: T = 1, $p < .001$, $r = .- 0.85$; RegD: $T = 3$, $p <.001$, $r = -0.66$ – as well as the comparison between the shared series and typically Dutch series – RegF: $T = 0$, $p < .001$, $r = - 0.91$.; ImD: $T = 0$, $p < .001$, $r = - 0.83$.; RegD: T = 1, $p <.001$, $r = -$

0.75. In addition, Dutch monolinguals score significantly better on the shared phonological sequences in comparison with the typically French phonological sequences – $T = 0$, $p < .05$, $r = -0.37$.

As for the performance differences between groups on each test condition, the Kruskall Wallis test and subsequent pairwise Man Whitney U comparisons with Bonferroni correction reveal that the monolingual French group scores significantly better than the immersion group – $U = 10.51$, $p < .05$, $r = -0.34$ and the monolingual Dutch group – $U = 13.24$, $p < .05$, $r = -0.40$ – on the typically French phonological structures. The immersion group and Dutch monolingual group, however, do not significantly differ among each other – $U = 2.73$, *ns*, $r = -0.06$. However, this significant effect disappears in the shared features condition as the French monolinguals do not longer significantly outperform the immersion group – $U = 33.00$, *ns*, $r = -0.24$. or the Dutch monolingual group – $U= 41.00$, *ns*, $r = .028$. When looking at the means, there is slight advantage to be noted for the Dutch monolingual group over the immersion group. However, the pairwise comparisons reveal that this difference in performance is insignificant – $U = 32.50$, *ns*, $r = -0.17$. In addition, a main effect in performance is noted on the typically Dutch series – $H(2) = 25.46$, $p < .001$. The pairwise comparisons indicate that the Dutch monolingual group significantly outperformed both the monolingual French group – $U = -25.27$, $p < .001$, $r = -0.57$ and the immersion group – $U = -25.80$, $p < .001$, $r = -0.53$.

The outcomes described above as well as the histograms presented in figure 2 (section 2.6) indicate that there is a ceiling effect for the typically French as well as the shared features. For the Dutch test stimuli this effect is not observed, probably due to an inconsistency that exists between the typically French and common items on the hand and the typically Dutch on the other. The typically Dutch series namely contains non-words with the structure of the diminutive. These test items were subsequently left out and the analyses were recalculating, which revealed a similar ceiling effect for the typically Dutch stimuli as was observed for the other conditions. As a result, the advantage of the monolingual Dutch group over the other groups on the Dutch test stimuli has disappeared – $H(2) = 0.805$, *ns*. Therefore, the statistical analysis has not revealed significant differences in performance on test item conditions within each group with the exception of the Dutch monolinguals, who score better on the shared items as opposed to the typically French items. As for differences in group performance, the only significant difference that remains is that of the monolingual French participants who score better on the typically French series in comparison with the immersion group and Dutch monolingual group.

3.2.2 Initial Phoneme Deletion Task

a. phonological awareness on a subsyllabic level

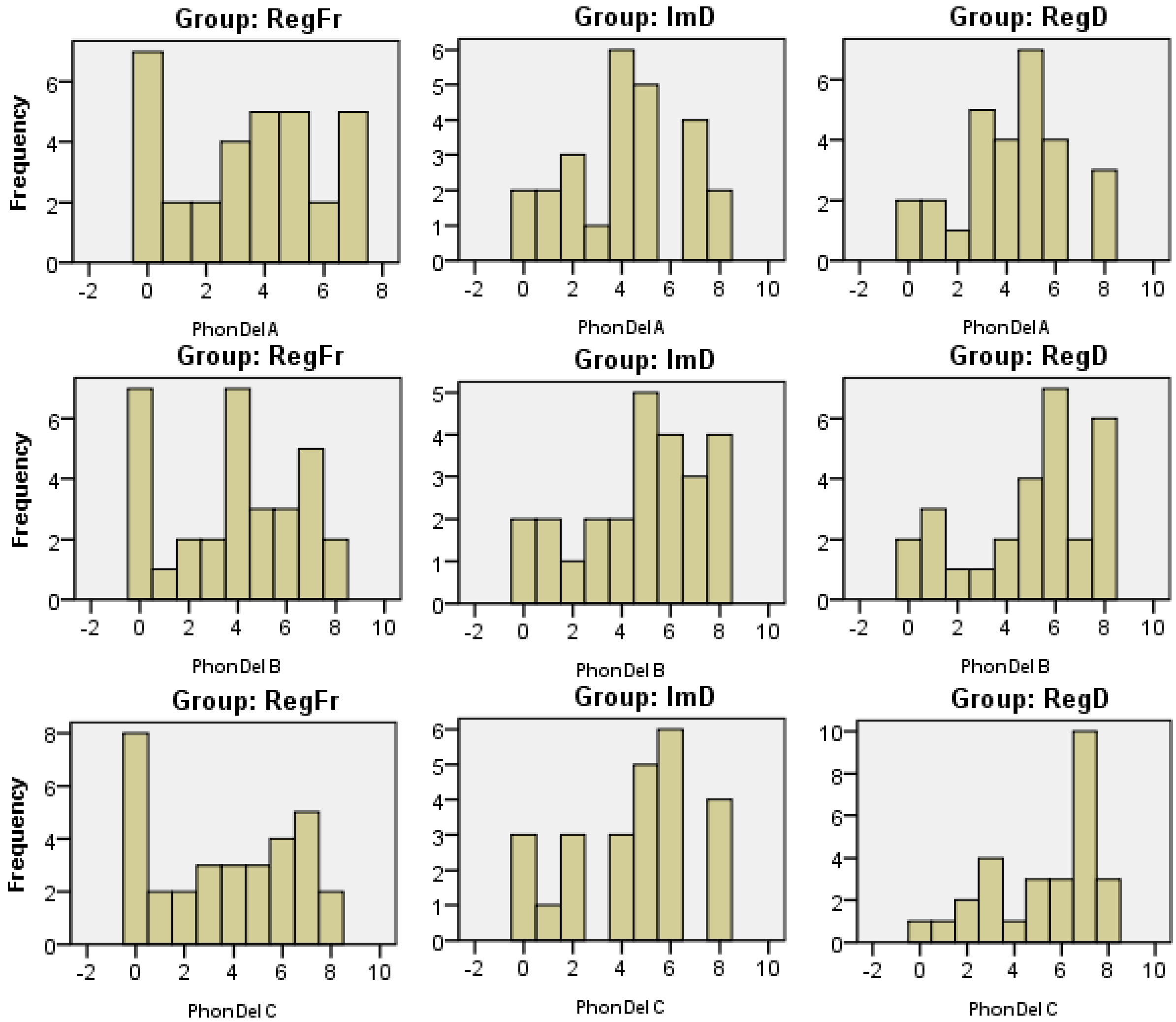
TABLE 15

Initial Phoneme Deletion[1]: Descriptive Statistics

	RegF (n = 32)			ImD (n = 25)			RegD (n = 28)		
	M (SD)	Min	Max	M (SD)	Min	Max	M (SD)	Min	Max
Phon. Sequence									
Typically French	3.44(2.48)	0	7	4.16(2.37)	0	8	4.21(2.18)	0	8
Shared Fr-D	3.84(2.68)	0	8	4.80(2.52)	0	8	5.00(2.60)	0	8
Typically Dutch	3.66(2.84)	0	8	4.48(2.55)	0	8	5.29(2.31)	0	8

[1]Maximum obtainable score is 8.

Figure 7. *Histograms: Initial Phoneme Deletion Task (Subsyllabic level)*



The mean, minimum and maximum scores obtained on the three test item series of the initial phoneme deletion task are presented in Table 15 whereas the histograms are provided in figure 7. The mean scores indicate that the Dutch monolingual group outperformed the monolingual French group and, in a lesser degree, the immersion group across phonological sequence conditions. The immersion group, in turn, outperformed the monolingual French group across phonological sequence conditions. As for the performance differences obtained on the test item conditionq within each group, it can be noted that the Dutch monolingual group obtained the highest scores on the stimuli with typically Dutch sequences and the lowest on the typically French items. Within the French monolingual and immersion group, a similar trend is observed as both groups performed best on the common items and worst on the typically Dutch items. However, the standard deviations and histograms indicate the presence of a great non-normally distributed variety of scores, making the mean not an accurate representation for the data. Therefore, as mentioned earlier, a square root transformation was performed to decrease the effect of the deviation for normality to an acceptable degree.

A two way mixed analysis of variance was performed in order to establish whether the observed differences in performance can be considered significant. The analyses revealed a main effect for phonological sequence – F (2,82) = 8.89 p <.001 and the simple contrasts carried out with the typically French stimuli as the reference group indicated that the children scored significantly better on the Dutch test stimuli in comparison with the typically French test stimuli – F (2, 82) = 14.30 p <.001, r = 0.14 and on the shared in comparison with the typically French items, - F(2, 28) = 13.96, p<.001, r = 0.15. Pairwise comparisons with Bonferroni correction performed for phonological sequence confirmed the significant differences encountered by the simple contrasts and further indicated that the difference in performance on the shared and typically Dutch features did not significantly differ. However, the analyses also revealed that the groups did not significantly differ in performance, when not taking into account the different test item conditions – F (2, 82) = 8.89, *ns*, nor was an effect found for the interaction between group and phonological sequence – F (2,82) = 1.25, *ns*.

In order to measure group differences at the level of the onset-rime and phoneme, the phonological sequence conditions were omitted. Given that the two way analysis of variance did not reveal an interaction between group and phonological sequence, the omission of the test stimuli series as a factor should not significantly affect the outcomes of the statistical analysis at onset-rime and phoneme level.

b. phonological awareness on a onset-rime level and phoneme level

Table 16 illustrates the mean, minimum and maximum scores for each consonant condition of the initial phoneme deletion task obtained per group. The mean scores reveal that all groups performed better on the test stimuli starting with a single consonant in comparison with the test items beginning with a consonant cluster. As for group differences, the immersion group outperformed the other two groups on the single consonant items. The Dutch monolingual group, in turn, outperformed the monolingual French group. On the consonant cluster items, however, a different trend is observed as the Dutch monolinguals outperform the French monolinguals as well as the immersion group. The immersion group, in turn, outperforms the French monolingual group.

TABLE 16

Initial Phoneme Deletion[1]: Descriptive Statistics

	RegF (n = 32)			ImD (n = 25)			RegD (n = 28)		
	M (SD)	Min	Max	M (SD)	Min	Max	M (SD)	Min	Max
Consonant Condition									
Single Consonant	6.78(4.86)	0	12	8.60(3.94)	0	12	8.39(4.05)	0	12
Consonant Cluster	4.16(3.32)	0	11	4.84(3.88)	0	12	6.11(3.33)	0	12

[1]the maximum obtainable score is 12

In order to establish whether the scores obtained by each group across conditions were significant, Wilcoxon signed-rank tests were performed. The statistical analysis revealed that all groups performed significantly better on the single consonant condition than on the consonant cluster condition – RegFr: $T = 4$, $p < .001$, $r = -0.6$; ImD: $T = 1$, $p <.001$ $r = -0.8$; RegD: T = 6, p < .01 r = -0.53. In order to verify whether the scores obtained across groups within each consonant condition was significant, Kruskal Wallis tests were performed which revealed that the groups did not significantly differ in performanceon the single consonant items – H (2) = 2.91, *ns*. Therefore, the observed differences in mean scores between the immersion group and Dutch monolinguals – $U = 361$, *ns*, $r = -0.06$ –, the immersion group and French monolinguals – $U = 306$, *ns* , $r = -0.20$ –, or the Dutch and French monolinguals – $U = 361$, *ns*, $r = -0.17$ – cannot be considered more than a chance finding. On the consonant cluster condition, however, the Dutch monolingual group significantly outperformed the French monolingual – $U = 300$, $p <.05$, $r = 0.30$, but not the immersion group – $U = 365$, *ns*, $r = - 0.07$. Also, the performance of the immersion group did not differ significantly in comparison with the French monolingual group – $U = 267$, *ns*, $r = 0.20$.

3.2.3 Error Analysis

a. Initial Syllable Deletion Task

For the error analysis of the initial syllable deletion task, errors were counted regardless of the test item conditions. In addition, the typically Dutch test items with the morphological structure of the diminutive were excluded from the error count. Given the ceiling effects obtained on the initial syllable deletion task, a limited number of errors are observed. However, four error types were identified among the inaccurate responses. i.e. instead of the last syllable the child either responded with the first syllable, the last rime, the last phoneme or misplaced the syllable boundary within the consonant cluster.

Table 17 provides information on the type of errors per group observed on the initial syllable deletion task. Within the French monolingual group, only six errors occurred of which three were responses containing the first syllable and three were responses containing the last rime. However, the three inaccurate last rime responses were observed in one participant only. Among the immersion group participants, 16 errors in total occurred and a great variety with respect to error type was encountered in comparison with the French monolingual group. The most frequently observed error is the repetition of the last rime in words like gampost, fortif, kirlot, roeidim, smeurpal, chartist, etc. In addition, instances of a repetition of the last phoneme are observed in words such as chartist, cinblot and gampost and on occasion, misplaced syllable boundaries were observed in the words, such as jonbril, cinblot, targlif and barkleut. Lastly, two instances of a response containing the first syllable was observed in the same participant. For the monolingual Dutch group, similar trends are observed.

TABLE 17
Syllable Deletion: Error Analysis

	RegFr (n = 32)	ImD (n = 25)	RegD (n = 28)
	n	n	n
Total number of errors	6	16	15
Repeated first syllable	3	2	1
Repeated last rime	3	7	9
Repeated last phoneme	0	4	3
Misplaced syllables boundaries	0	3	3

The encountered errors within the three groups can be a result of a failure to comprehend the non-words correctly. However, children were asked to repeat the word before deleting the first syllable. In case of a misunderstanding, the word was replayed and the child was asked to repeat the word again. Therefore, it can be said with certainty that only the syllable boundary errors were at times caused by misunderstandings. The incorrect responses could also have been caused by difficulties to retain the non-words in the working memory during the deletion procedure. However, the last rime responses occur in a lesser extent in the French monolinguals and the last phoneme responses as well as syllable boundaries do not occur. Therefore, some errors could also be attributed to the exposure to Dutch. For example, the non-words that evoked last phoneme responses all shared an intrinsic quality. i.e. they were all modelled after French words with the female gender and were slightly pronounced with a *e muet* or schwa. Some of immersion and Dutch monolingual children could have interpreted this as an extra syllable due to the exposure to Dutch. Also the last rime responses can be attributed to exposure to Dutch. For example, seven Dutch monolingual participants responded with /je/ for the non-word *clanvier* This error is likely caused by the knowledge of the diminutive form in Dutch. However, this response was not observed among the immersion participants. Nonetheless, the immersion group participants could have perceived the last rime as the final part of the word instead of the syllable as a result of the exposure to Dutch given the language's stress-timed quality, which makes onset-rimes more salient. Lastly, some syllable boundary mistakes can be a language specific effect as some incorrect responses mirror the Dutch syllable structure e.g. CVnC-CVC instead of CVn-CCVC.

b. Phoneme Deletion Task

For the error analysis for the phoneme deletion, the phonological sequence condition was dropped, but the consonant condition was retained, since items starting with a single consonant could yield different error types in comparison with items starting with a consonant cluster.

Single consonant items

TABLE 18

Error Analysis: Initial Phoneme Deletion Single Consonant Items

	RegFr (n = 32)		ImD (n = 25)		RegD (n = 28)	
	n	%	n	%	n	%
Total number of errors	178	100%	92	100%	82	100%
No response	30	17 %	9	10 %	2	3 %
Repeated last syllable:	126	71 %	71	77 %	72	88 %
Correct syll. boundaries	115	90%	63	89%	69	96%
Incorrect syll. boundaries	11	10%	8	11%	3	4%
Repeated rime of:						
First part of bisyllabic word	9	5 %	4	4 %	4	5 %
Last part of bisyllabic word	13	7 %	8	9 %	4	5 %

Table 18 provides information on the type of errors per group observed on the initial phoneme deletion task. Four error types were identified among the inaccurate responses on the single consonant items of initial phoneme deletion task. Firstly, there were participants who failed to deliver an interpretable answer. Secondly, the incorrect response could contain the last syllable instead of the initial phoneme. Within this category, the distinction can be made between responses that reflected correctly placed syllables boundaries e.g. *(nom-)plitte* instead of *(n-)omplitte* and incorrectly placed syllable boundaries e.g. *(doo-)smup* instead of *(d-)oosmup*. Lastly, some children answered only with the rime of the first or second part of the non-word. It has to be noted that the children who responded with only the rime of the second syllable of the non-word, identified the beginning letter as the first letter of the second syllable of non-word, although the non-word was repeated correctly. Overall, the occurrence of errors types are similarly distributed across groups as the vast majority of the children respond with the last syllable when they fail to accurately delete the first single consonant of the non-word. However, there is a small observable difference between groups with respect to failures to provide a response. This discrepancy is due to the fact that there is a slight unequal distribution of children with language difficulties across groups, given that only the children with articulation problems or at risk for dyslexia failed to generate responses. In addition, these children often failed to correctly identify the first phoneme of the non-word given that the majority persistently were unable to provide an interpretable response or persistently identified the entire first syllable as the first sound of the non-word. Unlike with the initial syllable deletion task, very few errors could be interpreted as a result of language specific effects. Only the some last syllable answers with incorrectly interpreted boundaries can be regarded as signs of negative transfer as a tendency for creating open syllabic boundaries within Dutch test stimuli containing a short vowel was observed within the immersion and monolingual French group – e.g. *(smu-)droei*.

Consonant cluster items

TABLE 19

Error Analysis: Initial Phoneme Deletion Consonant Cluster Items

	RegFr (n = 32)		ImD (n = 25)		RegD (n = 28)	
	n	%	n	%	n	%
Total number of errors	234	100%	169	100%	148	100%
No response	37	16 %	4	2 %	14	9 %
Repeated last syllable:	103	44 %	88	52 %	61	42 %
Correct syll. boundaries	98	95 %	81	92%	61	100%
Incorrect syll. boundaries	5	5 %	7	8 %	0	0 %
Repeated rime of:						
First part of bisyllabic word	3	2 %	2	1 %	1	1 %
Last part of bisyllabic word	7	3 %	3	2 %	2	1 %
Deleted onset	84	35 %	72	42 %	70	47 %

Table 19 illustrates the type of errors observed for the consonant cluster items on the initial phoneme deletion task. The identified error types are equal to the four error categories observed for the single consonant items with the addition of a fifth type, namely responses in which the first onset of the non-word was deleted. For all groups, the most frequently occurring responses contain the final syllable or involve the deletion of the onset instead of the first phoneme. The Dutch monolinguals produced slightly more responses in which the onset was deleted in comparison to responses that contain the last syllable. For the immersion group and French monolingual group, a reverse trend is observed. The most striking difference between the performance on the single consonant and consonant cluster items is that for the single consonant stimuli the majority of participants were able to identify the first sound of the non-word. However, for the consonant cluster items, the initial onset is often perceived as the first sound resulting in an inaccurate deletion of the first onset instead of the initial phoneme.

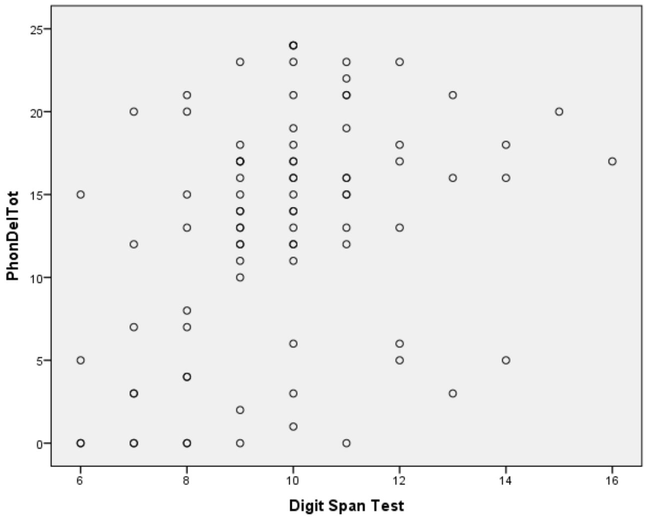
3.2.4 Summary

The statistical analyses of the phonological awareness tasks uncovered a complex pattern. For the initial syllable deletion task, the test item conditions did not significantly affect the participants' performance with the exception of the Dutch monolinguals, who score better on the shared items as opposed to the typically French items. The Kruskal Wallis tests indicated that the French monolingual children were significantly better in deleting the first syllable of typically French stimuli in comparison with the immersion children and the Dutch monolingual children. This advantage was, however, not observed for the test items containing shared features. The error analysis of the initial syllable deletion task revealed that the error rate pattern observed in the immersion group bore more resemblance to that of the Dutch monolinguals than the French monolinguals, suggesting a language specific effect of Dutch. As for the phoneme deletion task, an general effect for phonological sequence condition and consonant condition was observed, indicating that all participants performed better on the typically Dutch stimuli in comparison with typically French stimuli and on the single consonant items in comparison with the consonant cluster items. However, the effect of phonological sequence disappeared when entering the factor, group, into the equation which means that the groups did not significantly differ in performance on any of the test item condition. The groups did also not differ in overall performance on the initial phoneme deletion task which measured phonological awareness on a subsyllabic level. However, when looking more specifically at the onset-rime and phoneme level, the Dutch monolinguals significantly outperformed the French monolinguals, but not the immersion children on the consonant cluster items. The error analysis of the initial phoneme deletion task revealed similar patterns across groups, although slight differences between the French monolinguals and immersion group on the one hand, and the Dutch monolinguals on the other were observed regarding the error rate of consonant cluster items.

3.3 Correlations

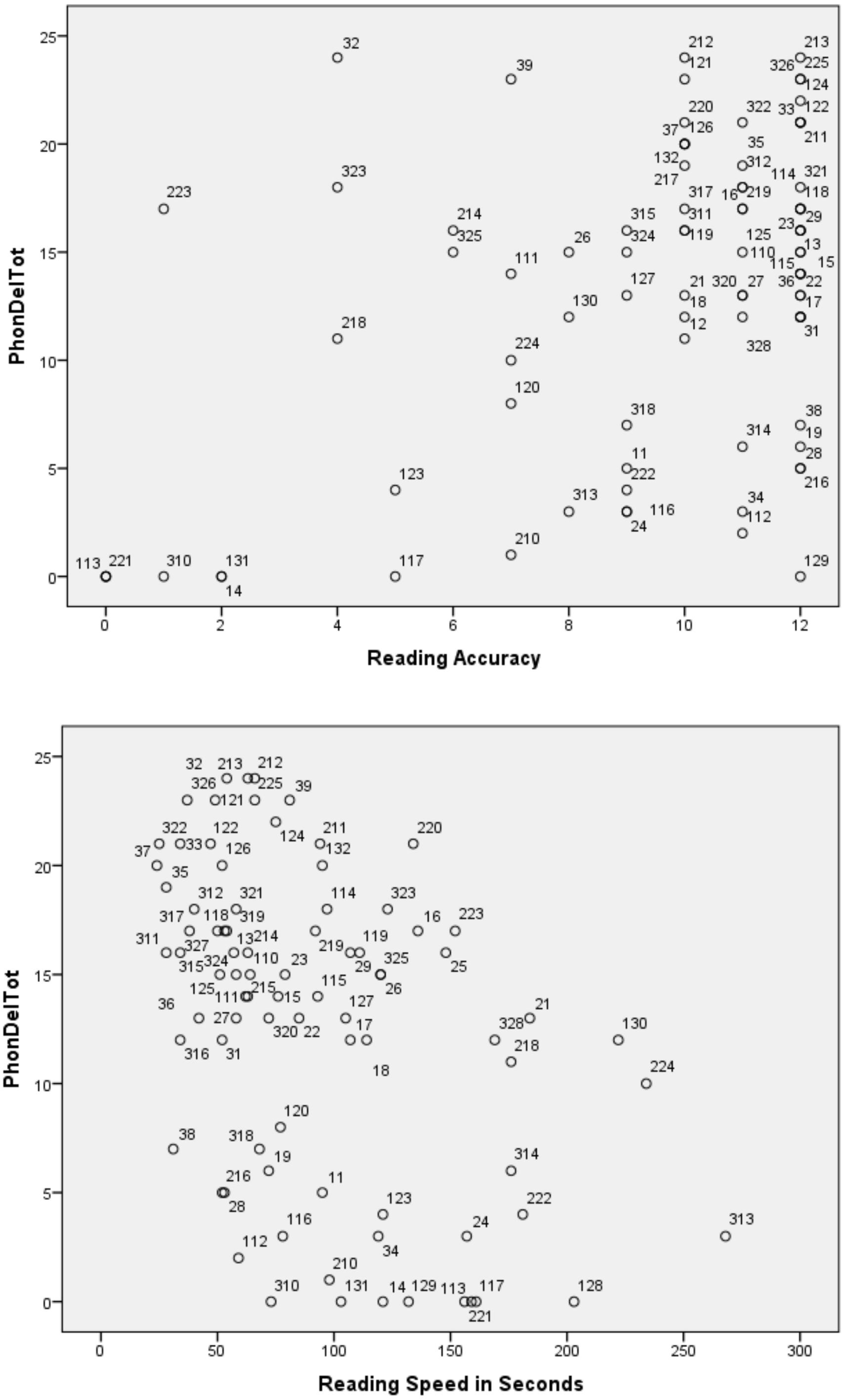
To establish whether the control tests selected based on the literature review were valuable additions to the test design, spearman correlations were performed in order to gain insight into the relation between the control tests and the PA tasks. With regard to the digit span task, no significant relation was encountered between the digit span scores and the initial syllable deletion scores – $r_{sp} = .086$, *ns* –, probably due to the observe ceiling effect. For the phoneme deletion task, however, a significant positive correlation was found – $r_{sp} = .39$, *p (one-tailed)* <.001, which accounts for 16 per cent of the variation. The scatterplot in Figure 8 reveals that a high score on the digit span task does not necessarily co-occurs with a high score on the phoneme deletion task, although the majority of people with a digit span score higher than 9, also obtain an initial phoneme deletion score higher than 10.

Figure 8. *Scatterplot: Digit Span Task – Initial Phoneme Deletion Task*



With respect to the reading test, correlations were only performed between the reading accuracy and reading speed scores on the one hand and the initial phoneme deletion task on the other, as the literature indicated that only subsyllabic metalinguistic awareness is influenced by beginning literacy. For reading accuracy, a significant positive correlation was found with respect to the initial phoneme deletion scores – $r = .321$, $p < .001$ – whereas for reading speed, a negative correlation was encountered – $r = -.461$, $p < .001$. Reading accuracy and reading speeding, respectively, explain 11 and 21 per cent for the variation. The scatter plots of the executed correlations are presented in Figure 9 together with code markers – the first number of the code marker denotes the group to which the participant belongs (1 = RegF; 2 = ImD; 3 = RegD). The scatter plots reveal that the majority of the scores for reading accuracy and initial phoneme deletion are centred in the upper right corner, which indicates that the majority of the participants who obtained a high score for reading accuracy also obtained a higher score on the initial phoneme deletion task. However, some of outliers can be detected. Some participants seem to have obtained high scores on the phonological awareness tasks, but not for accuracy and vice versa. Regarding reading speed, a similar trend is observed. i.e. the scatterplots in figure 9 indicate that majority of the participants who are able to read the list of non-words in under two minutes obtain an initial phoneme deletion score between 10 and 25, although there are several participants for which this observation does not hold

Figure 9. *Scatterplots: Reading test*



4. DISCUSSION

The primary aim of the present study was to corroborate previous findings that bilingualism has selective language specific rather than universal effects on the metaphonological development. Therefore, it was hypothesised that the French-Dutch bilinguals would show similar levels of syllable awareness and superior levels of onset-rime and phoneme awareness in comparison with the French monolinguals. Of secondary interest was to specify whether an observed effect was best explained in terms of cross-linguistic transfer or in terms of the structural sensitivity theory. To this end, a phonological awareness test battery was created that contained three series of test stimuli, namely items with a typically French or a typically Dutch phonological structure and items with a structure common in both French and Dutch. However, the results only deliver limited evidence that the development of metaphonological phonological awareness in bilinguals is affected by the language specific factors.

4.1 Phonological Awareness and Bilingualism: A Language Specific Effect?

At the level of the syllable, the French monolinguals outperformed both the immersion children and the Dutch monolinguals on the typically French stimuli. However, this advantage disappeared on the shared feature items. Also on the typically Dutch stimuli, no significant differences were found. This finding is in line with Fabiano-Smith & Goldstein (2010) who compared the phonological awareness of bilingual Spanish-English children enrolled in a bilingual educational programme to that of Spanish and English monolinguals. The study found that the Spanish monolinguals had heightened levels of phonemic awareness for typically Spanish features in comparison with the Spanish-English bilinguals, but the groups performed similarly for the shared features. Similar to the present study, the comparison between the English monolinguals and Spanish-English bilinguals did not yield an advantage in either direction. Fabiano-Smith & Goldstein (2010) identified a variation of the structural sensitivity theory in combination with cross-linguistic transfer as simultaneous causes for the differential bilingual development. According to Fabiano-Smith & Goldstein, exposure to two different language systems can cause interference in acquisition, causing a delay in dissimilar features. However, one language might also simultaneously aid the acquisition of similar features in the other language, which allows for a bilingual acquisition rate that falls within the monolingual range. Similarly, the bilingual disadvantage on the typically French items can be caused by interfering knowledge of the Dutch syllabic rules as the error analysis revealed that the bilingual error pattern bears close resemblance to that of the Dutch monolingual children. The subsequent disappearance of an bilingual disadvantage on the shared feature items can be an indication that the knowledge of Dutch and French is aiding in the acquisition of similar sounds, causing the acquisition rate to fall within the monolingual norm. As such, the present study presents evidence for a combination of cross-linguistic language transfer and the structural sensitivity as causes for a differential development of metaphonological abilities in bilinguals. This supports the postulations of more hybrid hypotheses as proposed by Durgunoglu & Roediger (1987) & Fabiano-Smith & Goldstein (2010) that consider both phenomena as simultaneous causes for a differential bilingual development.

The outcomes mentioned above, however, do not corroborate Lecocq et al. (2006) and Lecocq (2008), who compared the metaphonological skills of monolingual French children, monolingual Dutch children and bilingual French Dutch children enrolled in Dutch immersion programmes on a test battery that contained test stimuli with shared and typically Dutch features. The studies in question revealed that the immersion children showed heightened levels of syllable awareness on the shared feature items in comparison with French monolinguals. However, as mentioned earlier, the absence of such an advantage in the present study is likely caused by an outlier score on the shared feature items that could not be excluded due to lacking probable cause. In addition, Lecocq et al (2006) and Lecocq (2008) found that the monolingual Dutch children outperformed the monolingual French as well as the immersion children on the typically Dutch test items. The immersion children; in turn, outperformed the French monolinguals. The absence of such an effect in the present study could be interpreted in terms of French's syllable timed nature which leads to an enhanced development of syllable awareness in the L1. This highly developed syllable awareness, in turn, facilitates the identification and manipulation in the L2. However, such a positive transfer argumentation seems flawed given the differential syllabication rules in French and Dutch and the fact that the immersion children did not significantly outperform the Dutch monolingual children on the shared feature or the typically French items. Considering the encountered ceiling effects, it is more likely that the test apparatus was not sufficiently adequate to measure such differences either due to an incompatibility between the children's level of metaphonological development and the difficulty level of the test material or due to a too extensive feedback procedure.

Unlike for the initial syllable deletion task, the initial phoneme deletion task revealed a highly significant, but small main effect for the factor phonological sequence. The specific comparisons between test series revealed that the participants had a tendency to score better on the typically Dutch test items in comparison with the typically French test items regardless of the group to which they belong. However, the groups did not significantly differ from each other on the task composition and the two independent factors also did not interact. This indicated that the three groups have acquired comparable levels of subsyllabic awareness and are similarly affected by the phonological composition of the test stimuli. The latter finding suggests that Dutch's stress-timed quality can facilitate the identification and manipulation of onsets and rimes, even without having attained proficiency in said language. However, the previous study of Lecocq et al. (2006) does not corroborate this finding as they found that the participants regardless of group performed better on the shared features items in comparison with the typically Dutch items. These contradictory findings could be explained by the overall length of the test stimuli. In the present study, the test stimuli consistently contained six phonemes across item series with the exception of the one shared and one typically Dutch non-word which consisted of seven phonemes. In Lecocq et al (2006), the shared test items consisted of six or seven phonemes whereas the typically Dutch test stimuli contained seven up to nine phonemes. The statistical analysis revealed bottom effects for the typically Dutch stimuli across groups, indicating that the highly analytical nature of the task in combination with the test stimuli that reflected the Dutch language's characteristic of lengthy syllabic structures was cognitively too demanding for the developmental stage under investigation. Such bottom effects were not replicated by the present study, probably because of shorter syllabic structures which only reflected the contrast between open and closed syllables that exists between French and Dutch. Also the feedback technique was slightly more elaborative. The current study namely replayed the target item when the children indicated that they did not remember it.

The absence of a group effect encountered in this experiment stands in contrast with Lecocq et al. (2006)'s findings as their study revealed that the Dutch monolinguals outperformed the French monolingual and immersion children on an initial phoneme deletion task containing shared feature items. These contradictory outcomes might be caused by the fact that the initial phoneme deletion task measured at subsyllabic level in order to establish the effect of the two independent variables and their interaction whereas the task administered by Lecocq et al. (2006) only measured at the level of the onset-rime. However, the subsequent analyses performed at onset-rime and phoneme level do not support this claim. The analyses revealed that the groups did not significantly differ in terms of onset-rime awareness. At phoneme level, on the other hand, the monolingual Dutch children showed heightened levels of phonemic awareness in comparison with the francophone groups, which reflects the fact that Dutch has a more transparent orthography as opposed to French. Such an advantage was, conversely, not observed among the immersion children in spite of the fact that they also received reading instruction in Dutch. This can be explained by the fact that proficiency in the L2 is an influential factor in reading development. For example, Verhoeven (2000) found that reading skills of Dutch learners were less developed in comparison with their native speaking peers due to a more limited vocabulary knowledge. It is, however, possible that the immersion children will exhibit an enhanced phonemic awareness at a later developmental stage as research (e.g. Geva & Siegel, 2000) also indicates that children who learn to read in a second language with a more transparent orthography show an enhanced ability to read words and pseudo-words in comparison with their monolingual peers who read in a less transparent alphabet.

The claim that the bilingual children might show heightened levels of subsyllabic awareness at a later developmental stage is supported by Lecocq (2008) who found that second grade children enrolled in a Dutch immersion programme showed enhanced levels of onset-rime awareness in their performance on shared feature items in comparison with monolingual French children. In addition, Laurent & Martinot (2009) examined the metaphonological development in French monolinguals and French-Occitan bilingual children from second to fifth grade. The study revealed differential patterns of change in the development of the bilingual and monolingual participants which eventually resulted in a bilingual advantage in terms of phonemic awareness when the children reached fourth grade. The authors explained the fact that the bilingual advantage was not encountered until late in the developmental course in terms of Cummins' (1979)' threshold hypothesis. Cummins' (1979) states that a sufficiently high level of proficiency in the two languages must be attained before a beneficial effect can be noted. Therefore, the degree of bilingualism must become a factor to take into account when determining the effects of bilingualism in relation to phonological awareness. Such an interpretation seems plausible to clarify the great variety of outcomes that range from bilingual advantages, bilingual disadvantages to an absence of an bilingual effect.

Cummins'(1979) threshold hypothesis would also explain why Goetry, Kolinsky & Mousty (2002)'s claim that bilingual children attending school in their two languages would display general enhanced levels of metaphonological awareness is not supported by several studies including the present. On the basis of their investigation in which the phonological awareness of Wallonian and Flemish children enrolled in a regular French preschool programme was compared with that of Wallonian and Flemish children enrolled in a regular Dutch preschool programme, they concluded that children in French-Dutch bilingual educational programmes should exhibit both enhanced levels of syllable awareness as well as onset-rime awareness. This hypothesis was founded on their finding that the Dutch-French bilinguals enrolled in regular

French educational programmes outperformed the Dutch monolinguals on syllable deletion tasks whereas French-Dutch bilinguals enrolled in regular Dutch educational programmes outperformed the French monolinguals in rime deletion tasks. As a result, they argued that children in bilingual programmes should display the beneficiary language specific effects of both languages analytically acquired. However, the participants in Goetry, Kolinsky & Mousty (2002) were fully submersed in their second language for three years at the moment of assessment, whereas the participants of most studies (e.g. Tingley et al.) including the present have been partly immersed in their second language for one or two years. Even though the present study did not encounter a bilingual advantage at a onset-rime or phoneme level, the mean scores did indicate that the French-Dutch bilinguals performed better than their monolingual French peers. The individual variance at the developmental stage under investigation was, however, too large to speak of a significant effect.

Cummins' threshold hypothesis, however, does not explain Genessee & Bruck (1995)'s disappearance of an initial bilingual advantage in epilinguistic and metalinguistic onset-rime awareness. The study initially revealed that bilingual English-French kindergarteners showed enhanced levels of onset-rime awareness in comparison with their monolingual English peers. However, by first grade the monolingual English children had caught up, most likely by virtue of effects of maturation and the introduction to literacy instruction. Therefore, based on findings to be addressed, the present study postulates that not only language specific factors and degree of bilingualism are influential in determining bilingual effects on phonological awareness, but also universalities in metaphonological development should be taken into account.

4.2 Universalities in Metaphonological Development

The findings of the present study were consistent with the existing body of research concerning the metaphonological development patterns in young children across languages. The majority of research on the conceptualisation of phonological awareness has shown that metaphonological abilities develop hierarchically from an awareness of large to small units in line with the child's development of cognitive capacity. The findings of the current experiment support such a metaphonological conceptualisation as the children consistently showed enhanced levels of awareness of onset-rime boundaries as opposed to phonemic awareness. In addition, ceiling effects were not observed on the initial phoneme deletion task even though the test stimuli were similar in composition which suggests that the syllable awareness was the most highly developed skill among the metaphonological skills under examination. Also the error analysis is in line with a hierarchically development pattern as the majority of the inaccurate single consonant responses contained the last syllable. Similarly, the incorrect responses for the consonant cluster items mostly consists of the last syllable or entailed the deletion of the initial onset as opposed to the initial phoneme. Therefore, the findings of the present study clearly indicate universalities in metaphonological development across language barriers. However, one metaphonological component skill does not have to be completely mastered prior to learning a subsequent phonological skill, as the performances on the single consonant and consonant cluster items illustrate. As such, encountering positive language specific influences in bilingual metaphonological development depends on looking at the right component skill at the right moment in the developmental stage, while taking into account the levels of L2 proficiency.

4.3 Limitations of the Study

The control measurements undertaken in the current investigation ensured that the control and experimental groups were similarly composed in terms of child factors, socio-economic status and language exposure. The correlations confirmed the significant relations between the working memory capacity and technical reading skills on the one hand and the phonological awareness tasks on the other. However, the relation between the digit span task and the initial phoneme deletion task revealed by scatter plot calls for a reconsideration of the implementation of a numeric based memory task in order to measure short term memory within language acquisition related research. Although the use of digit span tasks is not uncommon, especially for cross-linguistic examination, it measures only one’s general working memory capacity. However, research on phonological processing indicated that difficulties to retain information in working memory can be specific to the nature of the material presented (Smith et al., 1998). Therefore, the administration of the pseudo-word repetition, as employed in Lecocq et al. (2006) and Lecocq (2008), may be more highly related to the outcomes of phonological awareness tasks and consequently a better control measure in comparison with a digit span task. Nonetheless, the current study sufficiently managed to control for extraneous variables in order to create a controlled environment. However, the present study did struggle with methodological difficulties regarding the designed test apparatus.

Firstly, as indicated earlier, there is reasonable cause to suspect that the test design for the initial syllable deletion task failed to detect certain trends. Firstly, 85 per cent of the participants obtained a maximum score resulting in a ceiling effect. Even though research (e.g. Anthony et al. (2003) indicates that syllable awareness is the first component of the phonological awareness construct to fully develop, syllable tasks are frequently used at the developmental progression stage examined in the present study. For example, Bruck & Genessee (1992) used syllable counting and same-different tasks to measure the phonological awareness of preschool and first grade monolingual and bilingual children. The administered tasks yielded mean percentages of correct responses between 78 and 93 percent for the first grade participants. Goetry; Kolinsky &Mousty (2002) administered initial and final syllable deletion tasks containing non-words with phonological structures legal in French and Dutch to preliterate monolingual and bilingual preschool children and obtained mean accuracy percentages between 70 and 86 per cent. Similarly, Lecocq (2008) who presented monolingual and bilingual first grades with items containing phonological structures either common in French and Dutch or exclusive to Dutch obtained mean accuracy percentage between 68 and 84 per cent for the shared items and between 56 and 84 for the typically Dutch items. The present study, conversely, obtained mean percentages of accurate responses between 93 and 98 per cent.

It is however unlikely that test stimuli for the shared feature items were not suitable for the developmental stage under investigation given that the items were directly retrieved from Lecocq (2008) Also, the typically French test stimuli were most likely suitable for the developmental stage under investigation as the items were designed by switching around the syllables of test stimuli used by Duncan et al. (2006), who conducted a cross-linguistic examination of syllable awareness among French and English first and second graders. Therefore, the present study must have employed a feedback technique that was too elaborative. Previous studies namely did not replay items after mishearings or provided cues after the children correctly deleted the last instead of the initial syllable. The typically Dutch test series, however, was inadequately constructed as the items do not all share the same morphological category. Although the non-words with a Dutch diminutive structure were excluded in a second statistical analysis, the remaining bisyllabic singular novel nouns were not properly designed to reflect syllable boundaries that would present difficult for francophone children.

Secondly, the present study argues for the use of a syllable segmentation task or a final syllable deletion task instead of initial syllable deletion task in order to maximize the chances of uncovering any discrepancies in syllable boundary location that might occur due to the differences in French and Dutch phonology. The rationale is that a syllable segmentation task or final deletion task with certainty reveals ambisyllabic interpreted syllable boundaries, whereas the initial syllable deletion task used in the present study does not. French phonology does not restrict its speakers to follow the obligatory onset principle which states that the onset should be assigned to the vowel which it precedes. However, Dutch phonology is in violation with the obligatory onset principle as it prescribes that syllables containing a short vowel must be closed by a consonant, resulting in ambisyllabic syllable boundaries. However, the initial syllable deletion task failed to detect such tendencies as an ambisyllabic interpretation or interpretation according to the obligatory onset principle of non-words such as /drɑ.plɔf/ resulted in the same response. This would explain why Goetry, Kolinsky & Mousty (2002) only found significant differences between the Dutch-French bilinguals and Dutch monolinguals on the final syllable deletion task as opposed to the initial syllable deletion task.

Lastly, the conditions created within the initial phoneme deletion task deviated highly from normality, making it impossible to assess the influence of the phonological composition of the test stimuli at a onset-rime and phoneme level. As the deviation decreased as a result of combining the conditions, an increase in test stimuli per condition could lead to more normally distributed data. Lecocq et al. (2006) found bottom effects for typically Dutch items on the initial phoneme task at the end of first grade. The present study, which employed similar timing to assess subsyllabic awareness as Lecocq et al. (2006), remediated these effects through a decrease in phoneme length. This suggests that further decrease in phoneme length by, for example, presenting the children with one syllable words could enable the assessment of metalinguistic onset-rime and phoneme awareness at an earlier point in the developmental stage.

As a result of the aforementioned methodological flaws, the evidence obtained in the present study only yields suggestive insights; but nevertheless indicates that the line of investigation is worth pursuing.

5. CONCLUSION

The present study set out to examine the effects of bilingualism on the metaphonological development in first grade children attending immersion programmes. Of specific interest was to specify bilinguals' differential development in terms of selective language-specific, rather than universal effects reported in the literature (e.g. Bialystok et al., 2003; Bruck & Genesee, 1995). As it is believed that enhanced levels of metaphonological awareness is confined knowledge analytically acquired via instruction, it was expected to find levels of syllable awareness in the bilinguals children comparable to the Wallonian children enrolled in regular French educational programmes and superior to the Flemish children enrolled in regular Dutch educational programmes. Similarly, it was hypothesised that the bilinguals children would display levels of onset-rime and phoneme awareness superior to the French monolinguals and comparable to the Dutch monolinguals. The secondary aim was to specify whether an observed effect was best explained by cross-linguistic transfer or by the structural sensitivity theory. In order to do so, a phonological awareness test battery was designed which consisted of test stimuli designed to contain typically French phonological characteristics, typically Dutch phonological characteristics and phonological characteristics shared by French and Dutch. The findings did not confirm the hypotheses. However, the investigation did reveal several language specific as well as universal trends.

Firstly, the French monolinguals showed enhanced levels of syllable awareness in comparison to both the bilingual as the Dutch monolinguals. However, the French monolingual advantage disappeared on the shared feature stimuli. The subsequent error analysis revealed that the bilingual error pattern bore close resemblance to that of the Dutch monolinguals as the immersion children made errors that reflected Dutch phonology. Thus, it seems that the knowledge of Dutch and French caused interference in bilingual acquisition of dissimilar features. However, the bilinguals' linguistic knowledge simultaneously aided the acquisition of similar features, which allowed for a bilingual acquisition rate that falls within the monolingual acquisition rate on the shared feature items. As such, the present study supports the proposals for a more hybrid hypothesis which postulates that bilingual children can exhibit characteristics of transfer and of structural sensitivity simultaneously.

Secondly, no significant differences were observed between the groups on the initial phoneme deletion task in its entirety, although a general trend among the participants was noted to perform better on the typically Dutch stimuli as opposed to the typically French stimuli. This suggests that Dutch's stress timed quality facilitated the identification and manipulation of onsets and rimes, even for the francophone participants without exposure to Dutch. Even though the groups did not significantly differ on the initial phoneme deletion task in its entirety, closer examination revealed that the monolingual Dutch outperformed the francophone participants on the consonant cluster items. Therefore, it seems that the orthographic transparency of the Dutch language assisted the Dutch monolinguals to develop phonemic awareness at an accelerated rate in comparison with the francophone children, especially when taking into account the Dutch monolinguals' superior performance on the reading test. A similar bilingual advantage was, however, not observed inspite the fact that the immersion children received reading instruction in Dutch, which previous research has linked to influence of the proficiency level attained in the L2.

Lastly, the findings of the present study revealed a metaphonological development pattern which is general across languages as the children displayed heightened levels of syllable awareness in comparison with onset-rime awareness, and heightened levels of onset-rime awareness in comparison with phoneme awareness. In addition, the error analysis of phoneme deletion tasks revealed that the children were inclined to delete large phonological units – i.e. the initial syllable or initial two consonant onset – when the deletion of the initial phoneme was experienced as too difficult. It seems that the results are in line with the idea that the development of phonological awareness occurs in a sequence from large to small and involves overlapping stages in which more than one skill is being mastered simultaneously.

Bilingualism research in relation to phonological awareness has been plagued by contradictory findings as the outcomes range from bilingual advantages, disadvantages to an absence of a causal connection, sometimes even within the same experiment. Indeed, the present study forms no exception as it found a bilingual disadvantage for syllable awareness which subsequently disappeared when considering structures similar to both languages. As for awareness at the onset-rime and phoneme level, the mean scores did indicate that the French-Dutch bilinguals performed better than their monolingual French speaking peers. The individual variance at the developmental stage under investigation was, however, too large to speak of a significant effect. Therefore, to answer our general research question, bilingualism appears to affect metaphonological development. However, the exact nature of the effect is conditioned by various factors, such as the languages that are being acquired, the degree of bilingualism and the timing of assessment. It seems that encountering a bilingual advantage in terms of phonological awareness depends on looking at the right component skill at the right moment in the developmental stage, while taking into account the degree of bilingualism and language specific qualities. This would explain the great variety of outcomes within the research domain.

Even though the present study was troubled by methodological difficulties, it has set a basic line for new exploration methods in order to fully understand the mechanisms and factors which cause a differential metaphonological development in bilinguals. Further longitudinal research is warranted in order to map out the various effects that second language learning within an immersion context has on metaphonological skills in both the native as well as the target language. Fully unravelling the complex bilingual development course of phonological awareness will help to provide optimal assistance within bilingual communities.

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