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Silvija Hanžić Deda
University of Zagreb, Croatia

PHONOLOGICAL SENSITIVITY OF BILINGUAL AND MULTILINGUAL (PRIMARY) SCHOOL STUDENTS

Summary. This literature overview presents findings stemming from eleven contemporary studies dealing with various aspects of phonological sensitivity in bilingual and multilingual individuals within the context of formal education. The selected studies were published in English, during the past decade, but they include several languages in various combinations. The main objective of this review is to inquire about the nature of phonological sensitivity in bilingual and multilingual individuals while they are developing their early literacy or expanding their literacy to new languages. To achieve that, findings from the selected studies were categorized according to the targeted aspects of phonological sensitivity, i.e. phonological units. The most common research designs, instruments and self-reported limitations were listed to provide a better understanding of the circumstances in which research was conducted. Phonological sensitivity of young bilinguals and multilinguals who are developing their literacy skills appears to be complex, but no distinctive advantages or disadvantages were reported in comparison to monolinguals. However, multiple varying characteristics of research participants frequently interfere with the research design, mainly because of group heterogeneity and small sample size unsuitable for generalization. For a better understanding of the topic, further research is needed, especially in the area of multilingualism.

Keywords: early literacy; phonological awareness; phonemic awareness; bilingual; multilingual.

Introduction

While researching literacy skills development, among other relevant factors, many researchers include phonological awareness and phonemic awareness. To unify the two processes, and possibly to resolve the terminology inconsistencies, a single term that includes both types of awareness was constructed: phonological sensitivity. So far, abundant research results have confirmed the benefits of factors going by all three terms, on the development of literacy skills in multiple languages around the world. Intending to report on the contemporary understanding of this topic in bilingual and multilingual primary education settings, this paper brings an overview of the publications available online over the past ten years. Only publications in the English language are included due to their potential of

reaching a wider audience. The following paragraphs describe the theme and key terms, various research conducted around the world, discussion and closing remarks.

Terminology and Brief Theoretical Background

The term *phonological sensitivity* has been around for almost three decades. Stanovich describes it as a "continuum ranging from *deep* sensitivity to *shallow* sensitivity. Tasks indicating deeper levels of sensitivity require more explicit reports of smaller sized units" (1992, p. 317). Based on that, phonological sensitivity was recognized as a broader term comprising both phonological and phonemic awareness since it refers to "the ability to detect and manipulate the sound segments of spoken words" (Puffpaf, 2009, p. 1). Mott and Rutheford argue that "the phrase *phonological sensitivity* better illustrates the phonological processing abilities related to how children developmentally navigate and work with sound units" (2012, p. 1).

According to Gillon (2004, p. 11), *phonological awareness* "refers to the understanding that spoken words can be broken down to smaller parts", such as syllables, onset-rime and phonemes, which makes it a 'multilevel skill' (ibid). The level of phonological awareness is typically measured by applying tasks varying in difficulty, depending on children's age and linguistic knowledge, and they include identification, segmentation, and manipulation of phonological units (see Dodd et al., 2000). Word meaning is irrelevant while such manipulations are taking place (Snowling et al., 1994; Stackhouse & Wells, 1997).

Phonological awareness has been acknowledged as the fundamental predictor of imminent reading skills in an individual (e.g., Bradley & Bryant, 1983; Snow et al., 1998; Ehri et al., 2001). As a result, there is a large number of publications available online, examining connections between developing reading skills and both phonemic and phonological awareness (e.g., Ehri et al., 2001; Gillon, 2004; McGee & Ukrainetz, 2009; Suggate, 2014). According to Bialystok (2013), in the period of the beginning school years, "phonological awareness appears to be the most challenging aspect of metalinguistic development that children master" (p. 635).

The third term, phonemic awareness is defined as an "ability to focus on and manipulate phonemes" in terms of 'phoneme isolation', 'identification', 'categorization', 'blending', 'segmentation' and 'deletion' (Ehri et al., 2001, p. 253). Høien and colleagues (1995) identified phonemic awareness as the most reliable predictor of success in reading. Treiman and Zukowski (1996) argued that phonemic awareness can be developed as a result of teaching and learning of alphabetic writing systems.

In comparison, phonological awareness is a broader term between the latter two (Invernizzi, 2003), and apart from phonemes, it deals with other aforementioned elements of spoken language on the sub-word level. Phonemic awareness is narrower, i.e. it focuses on phonemes and their roles in the spoken language. Both types of awareness have been confirmed to facilitate reading skills development (e.g., Carroll & Snowling, 2004; Catts, Fey, Zhang, & Tomblin, 2001; Ehri et al., 2001; Gillon, 2004; Hogan et al., 2005).

Reading is one of the essential skills of literacy in a general sense. Learning to read in one's mother tongue is a process that includes various teaching methods, learning strategies and personal effort. The duration and demands of such a learning process are largely dependent on the language and script in question. Mastering reading in one language, i.e. mother tongue, has been heavily researched and the importance of phonological sensitivity has been confirmed, as can be seen from the examples provided in the previous paragraphs. Nevertheless, a logical question arises, based on the new reality of numerous schoolchildren: how significant is the role of phonological sensitivity in building the (early) literacy of bilingual and multilingual children?

The definitions of bilingualism and multilingualism reveal some overlapping characteristics, such as "coexistence, contact, and interaction of different languages" (Wei, 2013, p. 26). The following two sections present several research examples of phonological sensitivity in both contexts.

Phonological Sensitivity and Bilingualism

Bilingualism is typically defined as an individual's 'use of at least two languages', and it can be simultaneous or sequential, depending on whether an individual started acquiring both from birth, or one of the languages was developed subsequently, but "before they are old enough to explicitly or consciously understand that their input comes from two linguistic sources" (Paradis, 2007, p. 17). According to Baker (2001, pp. 2–3), bilingualism can be observed as a possession, i.e. 'individual bilingualism' and 'societal bilingualism' covering several dimensions: 'ability', 'use', 'balance of two languages', 'age', 'development', 'culture', 'contexts' and 'elective bilingualism' (ibid). Edwards (1994, p. 1) suggests that being bilingual or multilingual is (…) a normal and unremarkable necessity for the majority in the world today".

Phonological structure awareness and letter naming are considered the most important reading predictors in bilingual preschoolers, as specified by Bruck, Genesee, and Caravolas (1997). According to Bialystok, Majumder, and Martin (2003), bilingualism does not change the developmental course of phonological sensitivity. However, phonological and orthographic similarities between the languages may facilitate reading development. In their meta-analysis, Wren, Hambly, and Roulstone (2012) found no disadvantages in bilingual children's development of phonological sensitivity, in comparison to monolingual children. They could identify no advantages either, apart from the phonemic awareness skills which were transferrable across languages. Similarly, Unsworth (2013) compiled the evidence stemming from previous studies and concluded that monolingual and bilingual children show similar phonological development. Branum-Martin, Tao, and Garnaat (2015) consider phonological awareness a transferrable skill across languages.

Scientific research of phenomena occurring in bilingual school settings might be dubious in terms of establishing solid research methodology due to numerous dissimilarities of bilingual participants coming from a single study group (Willig, 1985). As it was proposed, ideal conditions for exploring bilinguals in education contexts were in "research programs that compare the effectiveness of various types of program models" (ibid, p. 312).

Phonological Sensitivity and Multilingualism

Multilingualism, as a 'positive phenomenon', "conveys the ability of societies, institutions, groups, and individuals to have regular use of more than one language in their everyday lives over space and time" (Franceschini, 2011, p. 346). A considerable number of children around the world receive some of their education in a language other than their mother tongues (Tucker, 1998). According to him, support and involvement of parents and community, and development of children's first languages to ensure cognitive development and facilitate the learning of other languages are the major preconditions for successful multilingual education. Once developed cognitive or academic language skills, and once acquired language content both transfer across languages. It is imperative that teachers have an excellent command of the language of instruction (ibid).

Limited research of multilingual phonological development proposes that an individual's languages interact during the process, which renders it qualitatively different from a monolingual's phonological development (Holm & Dodd, 1999).

Muter and Diethelm (2001) isolated rhyming, implicit and explicit segmentation as clear phonological subskills emerging from a group of multilingual first-graders attending an international school with classes in English. Unlike rhyming measures, letter knowledge and phonological segmentation ability emerged as valid predictors of success in reading regardless of participants' mother tongues. Andreou (2007) detected higher phonological awareness in trilinguals than in bilinguals, and she attributed it to the trilinguals' routine tending to their language while constructing their vocabulary and differentiating across the languages. Moreover, high phonological awareness in their third language might have been associated with their experience in their first two languages. Yang and Zhu Hua (2010) studied the phonological acquisition of a trilingual boy who had been acquiring Spanish, Mandarin and Taiwanese since birth. The study began when the boy was 15 months old, and the speech production recorded and transcribed over 9 months revealed the evidence of language transfer and interaction, but the child's ability to distinguish between his languages

was apparent. His phonological development in three languages exhibited similarities to a monolingual child's development.

Current Study

The main objective of this study is to create an overview of contemporary research inquiring about phonological sensitivity and its role in the literacy development of bilingual and multilingual primary school students. Other objectives include the classification of research methods and accompanying measures used for obtaining data. Lastly, common limitations are listed. To achieve that, eleven research papers were selected from various online databases. They were examined and categorized according to the aspects of phonological sensitivity they study, or its relation to the development of early literacy and other aspects of metalinguistic awareness in bilingual and multilingual schoolchildren.

The selected research papers are coming from the context of formal education and include participants with regular and near-regular language development. This indicates that this study is designed to provide a more profound insight into the modern understandings of the role of phonological sensitivity (i.e. phonemic and phonological awareness) in bilingual and multilingual individuals during their early and later formal education.

Research Questions

Based on the abovementioned objectives, this study will attempt to answer the following questions:

R.Q. 1: What is the nature of phonological sensitivity in bilingual and multilingual preschool and primary school students?

R.Q. 2: What research methods are most commonly applied in researching phonological sensitivity of young bilinguals and multilinguals?

R.Q. 3: What instruments are considered suitable for measuring the level of phonological sensitivity of bilingual and multilingual schoolchildren?

R.Q. 4: What are the most common limitations in studying bilingual and multilingual school children's phonological sensitivity?

Procedure

The following section begins by listing and outlining eleven studies involving phonological awareness and bilingualism or multilingualism, as can be seen in Table 1. The studies are listed chronologically, and the sample column includes school grade and age to add more clarity since grade ages may differ from country to country. To answer the first research question, the elements of phonological sensitivity pertinent to the phonological development of bilingual and multilingual school children are categorized as they appear in the selected studies. Next, research instruments are itemized as a possible answer to the third research question. Finally, self-reported limitations are listed, along with research methods, as possible answers to the second and fourth research questions.

Table 1

List of selected studies

Author(s)	Year	Title	Languages	Sample(s)
Fabiano-Smith, & Goldstein	2010	Phonological Acquisition in Bilingual Spanish-English Speaking Children	English, Spanish	Kindergarten (3–4 y/o)
Chen, Li, Li, Wang, & Wu	2012	The effect of dialect experience on Chinese children's Mandarin phonological awareness (three experiments)	S1: Mandarin, Mandarin and one dialect (Minnan or Puxian)	Grades 2, 4, 6 (8, 10, 12 y/o)
			S2: Mandarin, Mindong	Grades 1, 2, 3 (7, 8, 9 y/o)
			S3: Mandarin, Mandarin and one dialect, Mandarin and two dialects	Grades 1, 2, 3 (7, 8, 9 y/o)
Goodrich, Lonigan, & Farver	2014	Children's expressive language skills and their impact on the relation between first- and second-language phonological awareness skills	Spanish, English	Preschool (3,5–5,5 y/o)
Lesniak, Myers, & Dodd	2014	The English phonological awareness skills of 5;0–6;0-year-old Polish-English,	English, Polish, Portuguese	Grade 1 (5–6 y/o)

Author(s)	Year	Title	Languages	Sample(s)
		Portuguese-English bilingual speakers and English monolingual children		
Lund, Werfel, & Schuele	2014	Phonological awareness and vocabulary performance of monolingual and bilingual preschool children with hearing loss	English, Spanish	Preschool (3–6 y/o)
Rocha de Souza, & Conceição Leite	2014	Profile of phonological awareness in bilingual and monolingual children	Brazilian Portuguese, English	Grade 3 (7–9 y/o)
Wise, D'Angelo, & Chen	2015	A school-based phonological awareness intervention for struggling readers in early French immersion	English, French	Grade 1 (6 y/o)
Kuo, Uchikoshi, Kim, & Yang	2016	Bilingualism and Phonological Awareness: Re-examining Theories of Cross-Language Transfer and Structural Sensitivity	English, Japanese	Grades 1, 2 (7,5 y/o)
le Roux, Geertsema, Jordaan, & Prinsloo	2017	Phonemic awareness of English second language learners	English, Setswana	Grade 3 (8–10 y/o)
Kopečková	2018	Exploring metalinguistic awareness in L3 phonological acquisition: the case of young instructed learners of Spanish in Germany	German, English, Spanish	13–14 y/o
O'Brien, Mohamed, Yussof, & Chin Ng	2019	The phonological awareness relation to early reading in English for three groups of simultaneous bilingual children	English in combination with Chinese, Malay, and Tamil	Kindergarten (4–6 y/o)

Fabiano-Smith and Goldstein (2010) tested the contribution of language interaction to the phonological acquisition of bilingual kindergarteners (Spanish-English). They found evidence of cross-language transfer in bilinguals even though they distinguished between their two languages. The accuracy in either phonetically similar or dissimilar sounds characteristic

of Spanish and English could not be predicted by sound frequency. The authors recorded a slower rate of phonological accuracy acquisition in bilinguals, but those rates were still within the scope of monolinguals' rate. In 2012, Chen and colleagues studied the influence of Min dialect on Mandarin phonological awareness among Chinese primary school children. Their results revealed that Min dialect experience hindered children's performance in the Mandarin phonological awareness, but that interference vanished as the children progressed to higher grades. Goodrich, Lonigan, and Farver (2014) attempted to evaluate the dependence of first and second language oral skills on phonological awareness. After testing Spanish-English speakers attending preschool, and interviewing their teachers, their results showed that oral language skills in one language could influence children's lexical restructuring in that language, and also advance their phonological awareness skills in another language. Lesniak, Myers, and Dodd (2014) compared phonological awareness skills in the English language among three groups of 5–6-year-olds: Polish-English speaking, Portuguese-English speaking and English-speaking monolinguals. Their findings indicated no advantage among bilinguals regarding phonological awareness, which led to the conclusion that English literacy was somewhat challenging for beginners. Lund, Werfel, and Schuele (2014) studied phonological awareness skills and vocabulary performance of English monolingual and Spanish-English bilingual children with and without hearing loss. Based on participants' test achievements, the following two indications emerged: bilingual children may have benefitted in the area of phonological awareness, and children with hearing loss tended to build their phonological awareness skills in a different manner than children with normal hearing. Rocha de Souza and Conceição Leite (2014) compared the phonological awareness skills of bilingual (Portuguese-English) and monolingual Portuguese-speaking third graders in Brazil. Generally speaking, bilingual children showed a higher level of phonemic awareness, i.e. male bilinguals outperformed male monolinguals, but no such difference was found between the two female groups. Wise, D'Angelo, and Chen (2015) investigated the impact of phonological awareness training on reading development of the children who were recognized as at-risk readers, in a French immersion school in Canada. They

concluded that a phonologically based intervention in English could successfully resolve phonological awareness shortfalls and support children's reading in French. Kuo and colleagues (2016) reviewed the *structural sensitivity theory* and supported it with empirical evidence after testing Japanese-English bilingual 7-year-olds attending an immersion in dual-language program in the USA. They found that bilingual children produced better results in processing onsets that were common to both their languages. In addition, their evidence implied that cross-language transfer might take place at a phonetic level. Le Roux and colleagues (2017) inquired about the phonological awareness of third-grade Setswana speakers in South Africa, who learned English as a second language. Their findings supported the theory that children, whose first language has a simple phonological structure, could have lower phonological awareness, which could directly affect their decoding and encoding skills. Kopečková (2018) studied the metalinguistic awareness in the phonological acquisition of teenage learners of a third language, with various linguistic histories. Her findings showed that such individuals were highly capable of analyzing their speech and demonstrated a high awareness of crosslinguistic interactions. In a longitudinal study of three groups of bilingual kindergarten children, O'Brien, Mohamed, Yussof, and Chin Ng (2019) found that most bilingual preschool children demonstrated syllabic awareness, and many of them reached the phonemic awareness level in their second kindergarten year, which is in line with the widely-accepted progression, moving from larger units to smaller. The Tamil-English group had the highest phonemic awareness, while syllabic awareness was also well-developed in the Chinese-English and Malay-English groups. The authors suggested that children's additional language influenced their phonological development. With time, onset-rime and phonemic awareness gained a stronger correlation to reading for the Chinese-English group.

The Nature of Phonological Sensitivity in Bilingual and Multilingual Schoolchildren

Chen, Li, Li, Wang, and Wu (2012) revealed that monolingual Mandarin speakers outperformed their peers who spoke an additional dialect in most

phonological awareness tasks, whereas they outperformed their peers who spoke two additional dialects in all tasks. In their case, those differences slowly melted over time, as children received more education. Generally speaking, older children performed better in phonological tasks than younger, which is in line with the phonological development hierarchy.

Goodrich, Lonigan, and Farver (2014) found a moderate, language-specific correlation between English-Spanish speaking children's phonological awareness and oral language skills in both languages. The cross-language transfer of their elision skills was based on the level of the language the skills were transferred to. They argued that, in part, phonological awareness skills developed separately from any language.

In the study performed by Rocha de Souza and Conceição Leite (2014), bilingual third-graders had a better overall performance on the phonological sensitivity tests.

For the group of Malay-English speakers in the study by O'Brien, Mohamed, Yussof, and Chin Ng (2019), reading maintained steady correlations with all elements of phonological awareness.

Words

Kuo, Uchikoshi, Kim, and Yang (2016) found that all study groups had better achievements in reading real words than non-words, i.e. the bilingual effect was not confirmed, which was attributed to diverse language backgrounds of participants, as well as the insufficient challenge that non-words might have represented appearing in tasks.

Lund, Werfel, and Schuele (2014) found a significant correlation between rhyming skills and receptive vocabulary knowledge in both monolingual and bilingual groups of preschoolers with normal hearing, but no such correlation was found for the matching group of children with hearing loss.

In a study by Kopečková (2018), teenage learners of Spanish as a third language demonstrated a moderate awareness of word stress and fluency in speech while reflecting on the audio recordings of their speech production.

Syllables

Lesniak, Myers, and Dodd (2014) found that all language groups, i.e. Polish-English, Portuguese-English bilinguals, and English monolinguals, had similar scores in English syllable identification and segmentation tasks.

The study of Rocha de Souza and Conceição Leite (2014) revealed that monolingual third-graders outperformed their bilingual peers in word segmentation and syllabic reversal tasks, which was explained by the syllabic-based characteristics of their language, making syllables more accessible units. However, both groups performed similarly on the syllable addition and substitution tasks.

In the study by O'Brien, Mohamed, Yussof, and Chin Ng (2019), Chinese-English and Malay-English speaking children demonstrated high syllable awareness, which was language-specific, as stated by the authors.

Onsets and Rimes

Chen, Li, Li, Wang, and Wu (2012) recorded lower performance in bilingual (bidialectal) children on onset-rime tests than in their monolingual peers, but that difference vanished by the time the children reached the sixth grade.

In the study conducted by Lesniak, Myers, and Dodd (2014), rhyme detection tasks showed a significant difference between English monolinguals and Portuguese-English bilinguals, whereas, in the rhyme generation tasks, the monolingual English group significantly outperformed the two bilingual groups.

Upon administering rhyming tasks, Lund, Werfel, and Schuele (2014) found that monolingual children without hearing loss performed similarly to bilingual children with hearing loss, which was better than the other two groups' performance (monolinguals with hearing loss and bilinguals without hearing loss).

Rocha de Souza and Conceição Leite (2014) recorded a better performance of bilinguals in sequential rhyming tasks, which was attributed to bilinguals' broader experience in distinguishing between phonological components while using their languages.

Bilingual English-Japanese students demonstrated a better processing of the onsets common to both languages, which Kuo, Uchikoshi, Kim, and Yang (2016) attributed to the *cross-language transfer theory*. However, all groups performed similarly in the English-specific onsets. In the study of O'Brien, Mohamed, Yussof, and Chin Ng (2019), reading strongly correlated with onset rhyme in the group of Chinese-English speakers.

Phonemic Awareness

Bilingual Spanish-English children developed typical consonant inventories for their age, except for some later-developing phonemes monolingual children normally acquire (e.g.,, flap, trill, and spirant [ð] in Spanish, as well as [θ] and [ð] in English), as stated in the study by Fabiano-Smith and Goldstein (2010). Some evidence of language transfer was recorded, but bilingual children showed a clear distinction between the two sound systems. Generally speaking, lower consonant accuracy and low accuracy on all unshared phonemes were documented in bilingual children (ibid).

Lesniak, Myers, and Dodd (2014) found that the English monolingual group had better results in alliteration tasks than the two bilingual groups of children which performed similarly. Along with that, the monolingual group achieved better results in phoneme identification and phoneme segmentation tasks, whereas the two bilingual groups performed similarly. Lund, Werfel, and Schuele (2014) corroborated the notion that initial sound segmentation skills develop later than rhyming skills.

Rocha de Souza and Conceição Leite (2014) found their bilingual group more successful in phonemic awareness, which was attributed to their exposure to 'richer linguistic input' that was likely to facilitate skill development.

Teenage learners of Spanish as their third language from Kopečková's study (2018), demonstrated the highest level of awareness about their pronunciation of consonants, whereas the vowel awareness level was somewhat lower.

Tamil-English speaking preschool children demonstrated early phonemic awareness in the study by O'Brien, Mohamed, Yussof, and

Chin Ng (2019), whereas phonemic awareness strongly correlated with reading in the Chinese-English group.

The Role of School-Based Phonological Training

The study conducted by Wise, D'Angelo, and Chen (2016) showed a positive effect of English phonological awareness training combined with letter-sound correspondence instruction occurring in the experimental group, where it was observed that at-risk readers managed to improve their skills considerably. Apart from reading in English, the positive effect of the training was observed in French reading, as well. Similarly, Le Roux, Geertsema, Jordaan, and Prinsloo (2017) found a significant improvement in word discrimination skills, phonological segmentation skills, and reading skills after exposing children to phonological training. Nevertheless, the training generated little effect on spelling skills and no effect on phonological blending skills.

Research Instruments Applied in the Selected Studies

In this selection of studies, research data were obtained through various research methods and instruments depending on the objectives. Table 2 shows phonological sensitivity measures and other measures for each study. Most instruments measuring phonological sensitivity were English standardized test batteries, such as the Preschool Comprehensive Test of Phonological and Print Processing, the Preschool and Primary Inventory of Phonological Awareness, the Phonological Awareness and Literacy Screening for Preschool, the Phonological Assessment Battery, the Test of Auditory Processing Skills, etc., and their versions in other languages, such as the Spanish P-CTOPPP applied in Goodrich et al. (2014). In some cases, experimental measures were designed for specific purposes (e.g., Wise et al., 2015). Phonological sensitivity tasks include identification, blending, elision, segmentation, and oddity both on syllabic and subsyllabic level, along with word rhyming and word discrimination.

Table 2

Testing materials applied in the selected studies

Author(s)	Phonological sensitivity measures	Other measures
Fabiano-Smith & Goldstein (2010)	Bilingual English Spanish Assessment (BESA) - eliciting sounds in single words	Voice recordings of single words and connected speech samples; a conversational speech sample from each bilingual child in English and Spanish and from each monolingual child in English or Spanish (toy)
Chen, Li, Li, Wang, & Wu (2012)	Study 1: same-different judgment of onset and rime awareness	-
	Study 2: onset oddity, rime, syllable deletion, rhyme oddity, tone oddity	IQ measure (Raven's Standard Progressive Matrices)
	Study 3: onset oddity, rime, syllable deletion, rhyme oddity, tone oddity	Vocabulary test, reading comprehension test
Goodrich, Lonigan, & Farver (2014)	Blending and Elision subtests from the Preschool Comprehensive Test of Phonological and Print Processing (P-CTOPPP); Spanish version of P-CTOPPP	Oral language: Expressive Communication Subscale of the Preschool Language Scales in both English (PLS-4); Spanish version (SPLS-3)
Lesniak, Myers, & Dodd (2014)	Syllable segmentation (Preschool and Primary Inventory of Phonological Awareness, PIPA), syllable identification (Queensland Inventory of Literacy), alliteration (Phonological Assessment Battery; PhAB), rhyme detection (PhAB), rhyme generation (specially developed), phoneme isolation (PIPA), phoneme segmentation (PIPA)	Letter knowledge (PIPA)
Lund, Werfel, & Schuele (2014)	Rhyme Awareness subtest from the Phonological Awareness and Literacy Screening for Preschool (PALS-PreK), Initial Sound Awareness subtest of the Phonological Awareness and Literacy Screening for Kindergarten (PALS-K)	English and Spanish-English Bilingual versions of the Expressive and Receptive One Word Picture Vocabulary Tests (EOWPVT, ROWPVT)
Rocha de Souza & Conceição Leite (2014)	Syllabic analysis – initial, medial, and final; syllable and phoneme addition, deletion, and substitution; sentence and word segmentation; rhyme reception; syllabic reversal; articulation image	Questionnaire (children's history of auditory, visual, neurological, and emotional impairments, learning disabilities, languages spoken)

Author(s)	Phonological sensitivity measures	Other measures
Wise, D'Angelo, & Chen (2015)	Elision and Blending subtests from the Comprehensive Test of Phonological Processing (CTOPP); elision and blending tests in French	Nonverbal reasoning (Matrix Analogies Test); English word reading (Letter-Word Identification subtest from the Test of Achievement, Woodcock Johnson-III; WJ-III); French word reading
Kuo, Uchikoshi, Kim, & Yang (2016)	Onset-awareness (oddity tasks)	English oral receptive vocabulary (Peabody Picture Vocabulary Test; PPVT); Japanese oral receptive vocabulary (Japanese Picture Vocabulary Test – Revised)
le Roux, Geertsema, Jordaan, & Prinsloo (2017)	Word Discrimination, Phonological Segmentation, and Phonological Blending subtests from the Test of Auditory Processing Skills (TAPS-3)	One-Minute Reading Test; UCT Spelling Test
Kopečková (2018)	Audio recordings; a stimulated recall protocol	Interviews in German and English; reading tasks in Spanish; pre-task video
O'Brien, Mohamed, Yussof, & Chin Ng (2019)	Elision and Blending subtests from the Comprehensive Test of Phonological Processing Subtests of Elision and Blending (CTOPP-2)	Nonverbal reasoning (Raven's Colored Progressive Matrices, RCPM); Receptive vocabulary (Bilingual Language Assessment Battery, BLAB); reading (Wide Range Achievement Test, WRAT-4)

Other measures applied in the studies, most probably to gather supplementary data adding to a better understanding of the participants, were **IQ measures** (e.g., the Raven's Standard Progressive Matrices in Chen et al., 2012; the Raven's Colored Progressive Matrices in O'Brien et al., 2019), **vocabulary tests** (e.g., the Expressive and Receptive One Word Picture Vocabulary Tests in Lund et al., 2014; the Peabody Picture Vocabulary Test in Kuo et al., 2016), **reading comprehension**, **letter knowledge** (e.g., the Preschool and Primary Inventory of Phonological Awareness in Lesniak et al., 2014), **spelling** (e.g., the UCT Spelling Test in Le Roux et al., 2017), **reading** (e.g., the Wide Range Achievement Test in O'Brien et al., 2019; the Letter-Word Identification Subtest from the Test of Achievement, Woodcock Johnson-III; WJ-III in Wise et al., 2015).

Research Methods and Self-Reported Limitations of Analyzed Studies

Research methods and self-reported limitations applied in the selected studies are listed in this section to help identify common weak points of research design regarding bilingual and multilingual samples, and to propose possible solutions for future research endeavors. Table 3 shows that eight studies were designed as cross-sectional studies testing some aspects of phonological sensitivity at a certain point in time. One longitudinal study, as well as two interventions with pre-tests and post-tests were conducted. The most common limitation reported was working with a small sample, which implies the inability of generalization.

Table 3

Self-reported limitations in selected studies

Author(s)	Research method	Self-reported limitations
Fabiano-Smith, & Goldstein (2010)	Observational cross-sectional study	**Small sample** (24); difficulties in matching bilingual participants in age and language level to create a homogeneous group
Chen, Li, Li, Wang, & Wu (2012)	Observational cross-sectional study	Too **general questions for collecting demographic information** such as parental education; only phonological awareness in Mandarin was tested
Goodrich, Lonigan, & Farver (2014)	Observational cross-sectional study	Cross-sectional data open to different interpretation; low reliability of Spanish elision measure; only low SES sample was included; the language and PA measures not typically conceptualized; **limited generalizability**
Lesniak, Myers, & Dodd (2014)	Observational cross-sectional study	Unclear
Lund, Werfel, & Schuele (2014)	Observational cross-sectional study (pilot study)	**Small sample**; variations in the range of hearing loss, language experience, and socio-economic status; possible use of suboptimal assessment methods
Rocha de Souza, & Conceição Leite (2014)	Observational and descriptive cross-sectional study	**Small sample** (17); limited data
Wise, D'Angelo, & Chen (2015)	Experiment with 2 case studies	Limited number of struggling readers; partial randomization of assigning to

Author(s)	Research method	Self-reported limitations
	(intervention)	groups; instructor-by-condition for all three years; experimental PA and reading measures in French; **inability to generalize**
Kuo, Uchikoshi, Kim, & Yang (2016)	Observational cross-sectional study	The use of a single PA task; lack of distinctiveness in stimuli evaluating structural sensitivity theory; participants' comparability possibly not comprehensive enough
le Roux, Geertsema, Jordaan, & Prinsloo (2017)	Quasi-experiment with an intervention	Relatively dated spelling and reading tests; **small sample** (12 and 15) no diversity in socio-economic status, languages, locations
Kopečková (2018)	Observational cross-sectional study	**Small sample** (20); limited linguistic background of participants
O'Brien, Mohamed, Yussof, & Chin Ng (2019)	Longitudinal study	Variable socio-economic status (SES) indicators of participants; variable time of exposure to English phonics or reading; phonological awareness was measured only in English

Other limitations involved variations in participants' age, language level, socio-economic status (SES), locations, or exposure to reading. In addition, some authors reported testing in only one language, using outdated testing materials, or collecting limited demographic information.

General Discussion and Conclusion

Upon analyzing eleven abovementioned studies that researched the aspects of phonological sensitivity of preschool and primary school bilinguals and multilinguals, several arguments emerged describing the nature of their phonological sensitivity in an attempt to answer the first research question. In line with earlier propositions (e.g., Bialystok, Majumder, & Martin, 2003; Unsworth, 2013; Yang & Zhu Hua, 2010) the same order of phonological development demonstrated by monolinguals could be observed in bilinguals and multilinguals. In other words, sensitivity to larger units such as words and syllables develops earlier than sensitivity to smaller units such as onsets, rimes, and phonemes (see Chen, Li, Li, Wang, & Wu; Lund, Werfel, & Schuele (2014). However, sensitivity to syllabic or subsyllabic units may depend on

language characteristics. For instance, if the first or dominant language is syllable-based, then it is very likely that children will be more sensitive to them due to intensive exposure. Conversely, if the connection between phonemes and graphemes is rather direct, generating shallow orthography, exposure to such systems may result in a higher level of sensitivity to phonemes (see Goodrich, Lonigan, & Farver, 2014; Kuo, Uchikoshi, Kim, & Yang, 2016; O'Brien, Mohamed, Yussof, & Chin Ng, 2019; Rocha de Souza & Conceição Leite, 2014).

Phonological sensitivity skills appear to be transferrable across languages, and in part, their development is language-independent (see Goodrich, Lonigan, & Farver, 2014; Kuo, Uchikoshi, Kim, & Yang, 2016), which follows the pattern of earlier research (for review, see Branum-Martin, Tao, & Garnaat, 2015).

In accordance with earlier suggestions (e.g., Andreou, 2007) and the findings presented in the selected studies propose that bilingual and multilingual individuals are capable of distinguishing between their languages from a young age, and that particular capability does not decline over time (see Fabiano-Smith & Goldstein, 2010; Kopečková, 2018; Rocha de Souza & Conceição Leite, 2014).

There is no clear evidence of bilingual or multilingual general advantage in developing phonological sensitivity (e.g., Kuo, Uchikoshi, Kim, & Yang, 2016; Lesniak, Myers, & Dodd, 2014; Rocha de Souza & Conceição Leite, 2014). However, a negative interference between languages may occur during earlier education, but it vanishes with time (see Chen, Li, Li, Wang, & Wu, 2012). Phonological sensitivity can be additionally developed through specially designed interventions (e.g., Le Roux, Geertsema, Jordaan, & Prinsloo, 2017; Wise, D'Angelo, & Chen, 2016).

As for the third research question, inquiring about the most commonly administered instruments in researching phonological sensitivity of bilingual and multilingual individuals in the context of preschool and primary education, it can be concluded that standardized testing batteries in English serve the purposes in bilingual and multilingual settings, provided that English is involved at some level. This supports the understandings of Muter and Diethelm (2001), where they argue that the screening instruments in

English are valid measures for identifying at-risk readers whose first language is other than English. "Administering measures of phonological segmentation ability and letter knowledge after non-English L1 children have had only minimal exposure to their new language of education can be viewed as a reliable and valid means of identifying and consequently targeting young children who might fail in reading" (ibid, p. 216). For testing purposes in other languages, materials had already been available or were developed for a particular study (Table 2).

The most common self-reported limitation pertains to the issue of complete or near-complete homogenization of study groups, especially in attempts to create group sizes sufficient for statistical analyses and generalization (see Willig, 1985). To answer the second and fourth research questions, it can be said that researchers seemed to be struggling with groups of bilinguals or multilinguals for at least two major reasons: a) the group sizes were inadequate for statistical processing, and b) diverse language backgrounds of participants from a single group may create several different variables that are difficult to control, such as the number of languages spoken, time and age of exposure to different languages, maternal and paternal languages, language(s) of education, duration of living in different countries, SES and parental education, etc. However, cross-sectional studies with small samples, quasi-experiments, and case studies provide in-depth information thus building more detailed profiles of individual participants with diverse language histories. One of the possible solutions might be developing a reliable research methodology and replicating it in several small-sample settings, with follow up meta-analyses.

In conclusion, the research of phonological sensitivity of bilinguals and multilinguals in the educational context holds great importance in outlining contemporary, research-based educational policies and their practical implementation. That would result in making mainstream education systems more accessible to bilingual and multilingual individuals, particularly during the delicate time of building early literacy skills or expanding literacy skills to additional languages. There is a growing body of research on bilinguals' phonological sensitivity, but multilinguals' phonological sensitivity appears to be fairly under researched. The presented research results reveal

the complexity of phonological sensitivity development in bilinguals and monolinguals, accompanied by multiple variables with the potential of interfering with research design. The English language is frequently involved in studies, as *lingua franca*, and many people have it as another language in their repertoires, which makes testing and data collection easily accessible due to a number of phonological sensitivity test batteries available in English (Table 2). Future research should aim at including more world languages and larger groups of multilinguals, with possible adjustments and translations of the existing tests, or designing and piloting new research instruments.

Limitations

Although it brings an overview of contemporary research available online, concerning phonological sensitivity in the context of formal education of bilingual and multilingual individuals, this study could not cover all studies published during the selected time frame as a result of either the inability of accessing them or because they were published in a language other than English which was the target language of publications in this review.

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Silvija Hanžić Deda
Zagrebo universitetas, Kroatija; silvija.hanzic@gmail.com

DVIKALBIŲ IR DAUGIAKALBIŲ (PRADINĖS) MOKYKLOS MOKINIŲ FONOLOGINIS JAUTRUMAS

Santrauka. Šioje literatūros apžvalgoje pateikti duomenys iš vienuolikos šiuolaikinių tyrimų, nagrinėjančių įvairius dvikalbių ir daugiakalbių asmenų *fonologinio* jautrumo aspektus formaliojo švietimo kontekste. Atrinkti tyrimai per pastarąjį dešimtmetį publikuoti anglų kalba, tačiau juose įvairiais deriniais analizuotos kelios kalbos. Pagrindinis šios apžvalgos tikslas – išsiaiškinti, koks dvikalbių ir daugiakalbių asmenų *fonologinio* jautrumo pobūdis tuo metu, kai jie ugdo savo ankstyvąjį raštingumą arba plečia savo raštingumą mokydamiesi naujų kalbų. Šiam tikslui pasiekti atrinktų tyrimų rezultatai buvo suskirstyti pagal tikslinius *fonologinio* jautrumo aspektus, t. y. *fonologinius* vienetus. Siekiant padėti geriau suprasti tyrimų atlikimo aplinkybes buvo apžvelgti dažniausiai taikomi tyrimo modeliai, instrumentai bei autorių nurodyti tyrimų ribotumai. Pastebėta, kad *fonologinis* jaunų dvikalbių ir daugiakalbių asmenų, kurie lavina savo raštingumo įgūdžius, jautrumas yra sudėtingas procesas. Tačiau šiuo atžvilgiu tyrimais nebuvo išskirta pranašumų ar trūkumų tarp minėtų asmenų ir vienakalbių. Vis dėlto tyrimo dalyvių charakteristikos skiriasi ir tai dažnai daro įtaką tyrimo modeliavimui, ypač dėl to, kad grupė yra nevienalytė ir dėl nedidelio imties dydžio negalima padaryti apibendrinimų. Norint geriau suprasti šią temą, reikia išsamesnių tyrimų, ypač daugiakalbystės srityje.

Pagrindinės sąvokos: ankstyvasis raštingumas; fonologinis supratimas; fonetinis supratimas; dvikalbiai; daugiakalbiai.