Phonemic Awareness

Phonemes represent the smallest units of spoken language. Phonemic awareness (PA) is the ability to focus on and manipulate phonemes in spoken words. Students must understand that syllables are made of sounds to establish phonemic awareness (Shapiro, 2011). Students with developed PA skills recognize that the word ‘dog’ contains three distinct sounds. PA is essential in developing alphabetic principle and is necessary for learning to read (Kame’enui et al., 1997; Torgesen, Al Otaiba, & Grek, 2005). Students without PA will not benefit from reading instruction (Allor, Gansle, & Denny, 2006) and will struggle with more advanced reading skills in later grades.

There are several discrete skills associated with phonemic awareness. These skills include phoneme blending, phoneme segmentation, and phoneme deletion (Shapiro, 2011). Phonemic awareness is not the same as phonological awareness, which includes different types of awareness such as rhyming words and syllables. Interventions targeting letter sounds, segmenting sentences into words, and syllable deletion target phonological awareness, not phonemic awareness. As children develop PA, however, they can use letter-sound knowledge (phonics) to decode words.

The purpose of this paper is to integrate the findings of previous and more current research with implications on teaching PA skills, assessing PA skills, and intervening to increase students PA skills. This review included research that examined phonemic awareness rather than phonological awareness.

Summary of National Reading Panel Findings

In 2000, the National Reading Panel (NRP) conducted a meta-analysis of the evidence relating PA instruction to reading achievement. PA skills are among the best predictors of reading after two years of formal schooling and difficulties with PA are strongly linked to reading difficulties (Burns, 2003; Snow, Burns, & Griffin, 1998). PA was included in the report because it was of major interest to teachers, education leadership, and researchers.

The NRP meta-analysis showed that PA instruction had a large overall effect on PA outcomes (ES = .86). The effect size of PA instruction on students’ overall reading outcomes was moderate (ES = .53). The effects of PA instruction were significant on formal and informal assessments suggesting that teaching children to manipulate phonemes was an effective way to increase literacy skills.

The NRP report also examined the effects of several moderators on learning phonemic awareness and learning to read. Children had larger PA gains when receiving explicit and focused instruction on one or two PA skills. PA gains were smaller when instruction focused on three or more skills. Moreover, children taught in small groups evidenced larger PA gains than those taught individually or at the classroom level.

PA instruction had the largest impact on PA outcomes for students in preschool and
kindergarten. PA instruction was effective for students who were English Learners and students from low SES backgrounds. The most effective instructional programs lasted between 5 and 18 hours.

PA instruction had a more moderate effect on students’ reading skills. PA instruction had moderate effects on word reading and pseudoword reading as well as a small effect on reading comprehension. Again, PA instruction had the largest effect on reading skills when teaching focused on one or two PA skills and was taught in small groups. In fact, blending and segmenting instruction had a larger effect on reading outcomes than multiple-skill instruction. PA instruction was effective for English Learners but was more effective with mid-to-high SES students compared to low SES students.

The NRP drew several conclusions from these findings. First, the results suggested that phonemic awareness could be taught under several conditions and for a variety of learners. Second, PA instruction was beneficial for improving students reading skills. Third, PA instruction was beneficial for multiple groups of learners including at-risk children; students with learning disabilities; and pre-kindergarten, kindergarten, and elementary-aged students. Finally, PA instruction was most effective when (a) instruction uses letters, (b) instruction explicitly focused on one or two types of phoneme manipulations, (c) instruction is tailored to students’ developmental levels, and (d) programs last fewer than 20 hours with 25-minute sessions.

Summary of Current Research

There have been several studies regarding PA since the NRP report. Below we summarized this more recent PA research. The studies described below were conducted with below average readers but did not focus on students with diagnostic labels (e.g. dyslexia).

Implications for Teaching

It is important to note that developing student PA skills are a means rather than an end. PA skills are valuable for helping students understand the alphabetic principle. If a child cannot identify initial sounds or blend sounds together they are unlikely to develop later reading skills (Shapiro, 2011). When students demonstrate difficulty with decoding due to a lack of PA, it should be a target of instruction (Joseph, 2008). There are four major areas of phonemic awareness instruction: sound and word discrimination, rhyming, blending, and segmentation (Shapiro, 2011).

Commercialized packages

There are several empirically-based commercial packages for developing PA skills including (a) Phonological Awareness in Young Children (Adams, Foorman, Lundberg, & Beeler, 1998, (b) Ladders to Literacy (O’Connor, Notari-Syverson, & Vadasy, 1996), (c) Road to the Code (Blachman, Ball, Black, & Tangei, 2000), and (d) Project OPTIMIZE (Simmons &
Kame'enui, 1999). These packages contain several common aspects that are critical for PA instruction.

The NRP outlined key components of effective PA instruction including modeling, generalization to print, sufficient practice, and feedback. Santi and colleagues (2004) conducted a systematic review of eight commercial PA programs. The programs differed on several important qualities. All eight programs used modeling, blending/segmenting instruction, and sequenced PA tasks from easy to hard. However, only three programs contained specified feedback techniques. Moreover, two programs (Kindergarten Peer-Assisted Literacy Strategies and Phonological Awareness Training for Reading) provided criteria for demonstrating mastery. Educators should consider such key components when selecting from commercially available instruction packages.

**Classroom activities**

Regardless of which intervention package is used, there are key aspects of effective instruction of PA skills. Several years of research shows that reading skills and strategies across the five core areas of reading can be taught effectively with direct or explicit instruction. Direct or explicit instruction is active, reflective teaching that connects students with written language. Students do not infer knowledge but receive clear instructional targets, precise directions, modeling, and feedback (Allor et al., 2006).

Sound manipulation activities are useful for promoting PA skills. Sound manipulation helps children recognize sound elements in spoken language. Two activities that have been extensively studied include sound boxes and sound sorts. Sound boxes include the common *say it/move it* activities where a student slides a token as each sound in a word is articulated (Joseph, 2008). The instructor first models this procedure. Sound sort activities explicitly model that many words start with the same sounds. For example, children may sort picture cards into common initial sound groups. Children are instructed to identify which sounds are common among the picture groups.

Other activities used to teach PA skills include phoneme blending and segmentation, which are more critical to later reading skills than rhyming or alliteration (Yeh, 2003). Yeh found that children who received PA instruction using blending and segmenting had significantly larger gains in PA (ES = .92) and letter-sound knowledge (ES = 1.13) compared to rhyming instruction. Instructing students in phoneme segmentation is more likely to promote future reading ability than rhyming or vocabulary activities. Both groups had increased outcomes when teachers provided direct instruction on attention skills. The results were consistent with previous research suggesting that PA skills are best taught concurrently with reading and spelling instruction (Yeh, 2003).

Researchers have also studied if PA should be taught in isolation or in conjunction with other skills. Since the publication of the NRP report, there is some divergent evidence regarding whether to teach PA skills alone or along with other reading skills. Several studies have shown that PA instruction is best in isolation for kindergarten students (Ukrainetz et al., 2000; Ukrainetz et al., 2011). There was no advantage of teaching syllable awareness before teaching PA
skills to preschool students (Ukrainetz et al., 2011). Other research suggests that, although teaching letter-sound correspondence is not required for children to learn PA skills, it may enhance PA instruction (Castles et al., 2011).

Effective PA instruction should incorporate explicit instruction in sound manipulation activities. Children should be given the opportunity to read a variety of intervention books and practice segmenting while reading (Shapiro, 2011). Segmenting and blending instruction is more effective in promoting phoneme segmentation than rhyming or vocabulary instruction (Yeh & Connell, 2008). Instructing students in phoneme segmentation is more likely to promote future reading ability than rhyming or vocabulary activities.

A recent study examined the difficulty of four common PA tasks, (a) blending, (b) isolation, (c) segmenting, and (d) deletion (de Graff et al., 2011). Children performed better on blending and isolation compared to segmenting and deletion. This suggests that teachers should provide blending and isolation instruction prior to segmenting or deletion instruction. Phoneme location also affected student performance. Students performed better on isolation tasks when the targeted phoneme was presented first. Their performance was higher on blending tasks when the targeted phoneme was in the final position. For low readers, it is important to gradually increase the complexity of words and tasks to enhance PA skills. The developmental nature of phonemic awareness skills was found in other studies as well (e.g. Ukrainetz et al., 2011).

Linking and manipulation of speech sounds to alphabetic symbols strengthens phonological and phonemic awareness. A recent review (Weiser & Mathes, 2011) examined the evidence related to encoding instruction. Encoding instruction is not limited to teaching spelling but includes explicitly teaching word writing according to their phoneme-grapheme correspondences, building words using manipulatives, and to learn to manipulate phoneme-grapheme relationships to make new words. Evidence suggests that a combination of decoding and encoding instruction during intervention can support grapheme-phoneme recognition, decoding, fluency, and comprehension. Three studies used encoding instruction to supplement phonological processing and phonemic awareness instruction. Results from studies that met inclusion standards suggest that struggling readers who received encoding instruction with decoding instruction made significant gains in PA. More specifically, instruction in PA was more effective when explicit encoding instruction occurs. Thus, effective PA instruction may include an encoding as well as a decoding component.

Scaffolding is also an important part of teaching PA skills in early grades. Scaffolding (Vgotsky, 1978) is strategic support designed to allow children to complete a task they could not accomplish independently. McGee and Ukrainetz (2009) developed three levels of scaffolding for PA skills. Teachers provide intense scaffolding when they isolate and emphasize the beginning phonemes and explicitly model the correct sound. Then teachers repeat the word and model the correct number of sounds. Moderate scaffolding includes elongating the target sound and but students identify the sound themselves. Minimal scaffolding requires that teachers stress the first sound while saying a word. Students who do not need scaffolding are able to identify the first phoneme in a word when prompted. At first, students without PA skills will need intense
scaffolding and teacher support is reduced as the skill develops. McGee and Ukrainetz (2009) found that teachers were able to use scaffolding to effectively teach at-risk preschool and kindergarten teachers PA skills.

Summary

Research since the NRP (2000) report has shown that instruction should include modeling, generalization to print, practice, and immediate feedback. More recent research also suggests that PA instruction should be explicit and direct. Teachers should use intense scaffolding during initial instruction and this scaffolding can be reduced over time (McGee & Ukrainetz, 2009). Evidence-based instructional practices for teaching PA skills include sound manipulation, blending, and segmenting activities. Struggling readers will benefit from both decoding and encoding instruction provided the instruction is explicit (Weiser et al., 2011). There are several commercialized packages for teaching PA skills and educators should look for packages that use the best practices identified in the NRP (2000).

Implications for Assessment

A large amount of research published since the NRP report focused on assessing PA skills. There are two common types of assessments. General outcome measures (e.g. curriculum based measurement) are used to screen students for problems. General outcome measures are also suitable for progress monitoring toward a specific goal. The measures must be brief and easily administered (Shapiro, 2011). Decades of research has documented the reliability and validity of general outcome measures, such as curriculum based measurement. Curriculum based measures have been used for creating district norms and as universal screening tools. In contrast, specific subskill measures (e.g. curriculum based assessment for instructional design) are designed to make instructional decisions (Burns et al., 2004). These data are used to determine the skills a student currently has and the skills a student needs to develop. Standardized assessments of PA skills also exist (e.g. Comprehensive Test of Phonological Processing) but are often more time intensive.

Commercial assessment systems

Since the publication of the NRP report, researchers have validated several assessment tools of early literacy skills. The Dynamic Indicators of Basic Early Literacy Skills (DIBELS; Good & Kaminski, 2003) and AIMSweb are popular assessment systems that measure phonemic awareness. Both measure initial sound fluency and phoneme segmentation fluency. DIBELS, as an example, contains benchmark goals for early learners that document risk status in fall, winter, and spring. Recent research has documented the relationship between early performance on DIBELS measures and later reading performance on state tests in second and third grade (Goffreda, DiPerna, & Pedersen, 2009).

The work on DIBELS for kindergarteners has been extended to measures for preschool
aged students and younger, aptly called the Individual Growth and Development Indicators (IGDIs). These measures were developed based on the large body of research on curriculum-based measures (McConnell, McEvoy, & Preist, 2002) and have adequate psychometric properties for the screening and progress monitoring of preschool aged children (Phaneuf & Silbergliitt, 2003). The rhyming task measures sound awareness and were moderately correlated with DIBELS initial sound fluency. Student performance in preschool on these measures predicted performance in reading at the end of kindergarten (Missall et al., 2007). Taken together, the research on DIBELS and IGDIs suggest that these general outcome measures of PA skills can identify students at-risk for later reading failure and are suitable for universal screening measures.

Beyond research on commercialized assessment systems, research published since the NRP report has strengthened the relationship between PA assessment and rapid letter naming skills. A meta-analysis (Swanson et al., 2003) examined the relationship between rapid naming, PA, and word reading. The sample, drawn from 35 studies, provided 49 independent samples. There was a small to moderate sized correlation between word reading and PA (.48) and between real word reading and rapid naming (.46). Moreover, there were small to moderate correlations between PA, rapid naming, and reading comprehension.

Sunseth and Bowers (2003) also found significant correlations between naming speed and PA skills. Students with deficits in both areas performed lower on writing tasks. Students in this sample who evidenced deficits in naming speed and PA were more likely to be classified as poor readers than students with deficits in PA alone. These findings corroborate the NRP report, which suggested PA skills are necessary but not sufficient for fluent reading. Students who score in the at-risk range in oral reading fluency in grades 1-3 may need intervention in PA skills and letter naming. Both skills should be the target of our assessments.

Research conducted since the NRP supports a growth model for initial sound fluency, phoneme segmentation fluency, and combined segmentation tasks (Linklater et al., 2009). The rate of improvement on the combined segmentation task for the first semester was highest for low-skilled English learners. This task may be useful for monitoring literacy development for students whose language skills are low. Feedback, modeling, and practice for incorrect responses improved student responses during administration of the test.

Initial sound fluency had the highest association with English vocabulary. English learners may struggle on these measures due to limited exposure to English language and a limited vocabulary. Phoneme segmentation fluency did not significantly predict end of K reading better than ISF for English learners or English only speakers. The combined phoneme segmentation assessment (O’Connor et al., 1995) predicted more variance and had higher correlations with NWF and connected text reading than ISF. A combined segmentation assessment may better identify deficient PA skills for students with a low English vocabulary.

Summary

Commercialized assessments (e.g. IGDIs, DIBELS) often include measures of PA skills.
Research on these packages since the publication of the NRP (2000) report indicates these measures have adequate psychometric properties. Rapid naming measures also provide a picture of students PA skills. For English learners, combined segmenting tasks are a useful monitoring tool. Initial sound fluency measures may not provide a clear picture of EL students PA skills due to their correlation with English. Combined segmentation tasks (O’Connor et al., 1995) may be better assessments of PA skills for students with English learners.

**Implications for Intervention**

There has been less research on PA intervention since the publication of the NRP report. Previous research has shown that teaching children to segment words into phonemes increases reading and spelling outcomes. Castiglioni-Spalten and Ehri (2003) studied the use of articulation pictures in combination with phonemic segmentation instruction. The intervention occurred in three to six one-on-one sessions that lasted approximately 20 minutes. The intervention used small blocks displaying eight different mouth conditions (lips and tongue positioning) to depict one or more sounds or a picture of an ear. Students were explicitly taught relationships between the blocks and sounds (correspondence) and to pronounce words and pseudowords while positioning the blocks for each sound. There were two intervention conditions. In the mouth condition, students received explicit instruction on moving their mouth to pronounce words. Students used blocks to represent mouth movements necessary for sound articulation. In the ear condition, students were taught to associate blocks with sounds. Students tapped on the block for each separate sound they heard.

Both PA interventions were effective in teaching children to segment (ES (mouth) = 1.47; ES (ear) = 1.53). However, students only segmented 58% of the phonemes correctly on the posttest. The positive results transferred to spelling tasks were students wrote more correct phonemes in words than a control group. Only articulation training effects transferred to word reading. The results suggest that teaching articulation awareness explicitly can help students learn PA skills. The intervention was not time intensive and did not require letter knowledge.

Previous reading intervention research has used multiple theoretical models of early reading. Mathes and colleagues (2005) compared supplemental interventions that used a cognitive strategy (responsive reading) and an approach based on direct instruction (proactive reading). Both interventions included PA instruction and instruction in advanced reading skills. The interventions had significant and positive effects on students PA skills (which were included with phonological awareness) compared to a control group that consisted of enhanced core instruction. Their results suggest that the underlying theoretical orientation was not as important as the inclusion of evidence-based intervention practices (Mathes et al., 2005).

Longitudinal examinations of PA intervention effects have also occurred since the publication of the NRP (2002) report. Students who receive early interventions make more progress in primary grades and are at lower risk for later reading failure (Vellutino et al., 2003; Coyne et al., 2004). Moreover, strong responders to intervention continue to maintain reading
gains after the intervention ends. Cartledge et al. (2011) studied the effects of a PA intervention 1 and 2 years following intervention.

Treatment consisted of instruction in PA and alphabetic principle as presented in the Early Reading Intervention curriculum (Simmons & Kame’enui, 2003). During year 3, students completed oral reading fluency benchmark assessments. Students were split into three groups, students who received 1 year of PA intervention and were exited, students who received 2 years of PA intervention, and a control group.

After three years of core instruction, students who received 1 year of supplemental intervention out-performed the control group and the students who required two years of PA instruction on the Word Attack subtest. By the end of year three there was a non-significant difference between students who received 2 years of PA intervention and control students. Results on DIBELS measures showed that by year 3, 62% of students who received one year of PA instruction met benchmarks whereas only 45% of the control group met benchmarks. The majority of students (93%) receiving two years of PA instruction did not meet benchmarks at the end of year 3. Many of the students who were at risk for reading failure at pre-test but exited tier 2 continued to make gains and performed at grade level in year 3. Moreover, an early intensive and explicit intervention for at-risk students was enough for at-risk readers who exited the program after 1 year of intervention to maintain gains throughout year 3.

Recall that the NRP found that PA interventions have small to moderate effects on word reading, pseudoword reading, and reading comprehension. Loeb and her colleagues examined the efficacy of the Fast ForWord (FFW) Language intervention (Agocs et al., 2006), which uses adaptive computerized exercises (e.g. acoustically modified speech, intensive training) to teach early literacy skills. This study compared the FFW intervention to a different computerized intervention, individualized language intervention and a control condition. Subtests of the CTOPP (blending sounds, elision subtests) were used as dependent variables for phonemic awareness. Children in the FFW intervention demonstrated significant improvement on blending sounds but not on reading skills. Moreover, the FFW intervention had a moderate effect on blending and passage comprehension. The significant gains in blending did not transfer to phoneme deletion.

Research within a multi-tiered model

McIntosh et al. (2007) compared the effects of a 10-week language and PA intervention in preschool classrooms delivered at Tier I. Students who received the intervention had higher gains in rhyme and isolation tasks than the control students. Students who received the intervention also demonstrated higher gains at a 3-month follow up.

Another study examined the effectiveness of PA interventions in the second tier of a multi-tiered system of support (Koutsoftas, Harmon, & Gray, 2009). Treatment groups were decided by benchmarking scores on a curriculum based measure. The intervention focused on teaching initial sound identification within CVC words. The intervention was scripted and provided multiple opportunities to practice learning with immediate feedback. Intervention was
effective for 71% of the children ($n = 34$). The intervention was associated with significant gains on PALS-PreK beginning sound awareness and DIBELS initial sound fluency. There results suggest that benchmark data could be used to determine students that needed supplemental intervention and that increased intervention would positively impact students PA skills.

Research has also examined the effectiveness of more intensive interventions. Allor and colleagues (2006) studied the effectiveness of the stop and go PA game delivered by a paraprofessional. During the intervention students practice segmenting spoken words into phonemes and blending phonemes into spoken words. The game also includes practice in letter-sound correspondence and simple consonant-vowel-consonant words. The procedures are relatively simple and one intervention session lasted approximately 15 minutes. Students picked a letter card and were instructed to place the card next to a traffic signal (red for stop sounds, green for continuous sounds). Students received praise for correct responses and immediate corrective feedback for incorrect responses. When students flipped enough letter cards to form a word, the tutor formed a word and asked the student to sound it out. The students moved tokens toward a finish line for correct responses. Two separate studies documented the effectiveness of the Stop-Go intervention for building kindergarten and first grade students’ PA skills (Allor et al, 2006; Allor & McCathren, 2004).

PA interventions can be combined with phonics and other reading interventions. Hudson and colleagues (2011) tested whether practice in lower-level skills, without text level practice, would transfer to decoding and eventually reading fluency and comprehension. Students began with phonemic awareness training using the “say it and move it” intervention. Students then received a repeated reading intervention with letter sounds and single words. This intervention package had significant effects on students connected text reading and decoding skills.

**Summary**

Research conducted since the NRP (2002) has validated multiple interventions (e.g. Fast ForWord, Stop & Go Interventions) and suggests that PA interventions fit within a multi-tiered support system. Many of these findings are promising (e.g. Castiglioni-Spalten & Ehri, 2003) but more research is needed to validate these interventions. Effects of PA interventions may transfer to advanced reading skills and the positive effects over time. Finally, PA interventions can be combined with other reading interventions.

**Conclusions**

Research on PA after the NRP report has corroborated their findings and advanced our knowledge of assessment, intervention, and instruction. PA skills are crucial for the development of later reading skills. Students with deficits in PA, determined with psychometrically sound assessment tools, will need further instruction or intervention. Evidence suggests that direct and explicit instruction in phonemic skills will have the largest effect on struggling readers PA skills. Educators should carefully examine the evidence for interventions before implementing them in
the classroom.

References


Kame’enui et al., 1997


