Two Paths Postulate: A TCLP Working Paper

on

The Impact of Phonological Awareness on Hindi Reading

The Community Library Project

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Author's Note

This paper is a product of the collective work of the TCLP curriculum team: Rajni and Premjyoti contributed to data collection and data entry. Amita Nowal contributed to study design and helped collect, organise and analyse data. She also helped develop the research tools and trained the research team. Prachi Grover and Michael Creighton assisted in data collection and worked with Amita Nowal on study design and research tool development. They coordinated the literature review and data analysis. This study was supported by a grant from the WIPRO Foundation. The authors report no conflict of interest. The research tools and datasets generated and analysed during the current study are available from the corresponding authors on reasonable request. Correspondence concerning this article should be addressed to Prachi Grover at prachigrover@live.com or Michael Creighton at mocreighton@gmail.com.

Abstract

This paper investigates the relationship between phonological awareness and Hindi reading proficiency in young community library members in New Delhi. We review the literature on orthographic mapping in alphabetic languages and phonological awareness in South Asian alphasyllabaries. We suggest a theoretical framework to explain how orthographic mapping might work in an alphasyllabary as compared with an alphabet. We postulate that there are likely ‘two paths’ to reading acquisition in an alphasyllabary: a ‘syllabic path’ and an 'alphasyllabic path’. The ‘syllabic path’ would require syllabic awareness, ‘whole akshara’ knowledge and a great deal of paired-associate learning. The ‘alphasyllabic path’, in contrast, would require insight into what Sonali Nag (2022) calls the ‘Alpha-Syllabic Principle’– syllabic and phonemic awareness, along with understanding of the phonemic markers within complex akshara. Because this path would allow readers to orthographically map, rather than memorise, complex akshara, it would likely result in faster reading acquisition. Our analysis suggests that 'akshara knowledge’ should be defined as the understanding of the relationships between the basic consonant and vowel (full form and diacritic) set of akshara and the sounds they represent; ‘knowledge’ of complex akshara is better understood to be a kind of ‘akshara reading’. Based on our literature review, we hypothesised that automaticity in tasks used to measure phonemic awareness (e.g., substitutions, deletions and blending) would predict fluency and accuracy in reading. One hundred sixty-seven library members, grades 1-8, were assessed with one-minute unseen, grade-level Hindi reading passages and a Hindi adaptation of David Kilpatrick’s (2017) Phonological Awareness Screening Test. We found phonemic awareness in Hindi was a far better predictor of reading fluency and accuracy than syllable level phonological awareness. If confirmed by further research, our findings would have major implications for reading instruction in South Asian syllabaries.

Introduction

As librarians and reading teachers in The Community Library Project, a free library organisation, which serves nine thousand mostly working class and poor members in the New Delhi area, we have long noted that most of our members can read, but few can read their primary[1] language, Hindi, with anything like the fluency expected from their peers in English speaking developed countries such as the US or UK. Since the pandemic, this situation has worsened; we have seen increasing numbers of members who cannot read connected text at all. The reading programs we have developed to address fluency, stamina, comprehension and reading enjoyment have shown consistent, measurable gains by relying primarily on read alouds, reading practice, and mini-lessons on comprehension and phonics (The Community Library Project, 2020, 2021). Still, although most members show improvement, a substantial minority continue to struggle to read effectively, even after intervention. Given our scarce time and resources, it is important that we make the most impact in the least amount of time.

We recognize there has been a tendency among many scholars to focus primarily on reading in alphabetic scripts, and even, sometimes, to suggest that alphabets are superior to other forms of writing–a problem David Share (2014) calls, 'alphabetism in reading science.' At TCLP, we do not subscribe to this thinking. We aim to stock books in the languages and scripts our members read and think in–yes, Hindi and English, but also Urdu, Dari, Pashto, Arabic and Bangla. When we read aloud to members, something we do many times every day, we most frequently read in Hindi, because that is the language most of our members speak at home; and unlike many NGOs, who privilege English learning, our first and largest reading intervention programs have been in Hindi, again because that is the primary language of most of our members.

[1] A large proportion of the library members have migrated from different states and would thus have different home languages. Hindi, however, is a primary language in use for everyday conversation, at least in contexts outside of their homes, for example, at school, in the library, with friends, in the market etc.

Having said this, we know that reading research in English and other alphabetic languages is much better funded and more extensive than research into South Asian alphasyllabaries. Of course that does not mean that insights arising from the study of alphabetic scripts will necessarily apply to South Asian scripts. In fact for several years, we assumed they would not. We defaulted, for example, to teaching Hindi more as a syllabary, and less as an alphabet because that's what the limited research we found seemed to suggest we do. Still, as we encountered more members who could not read at all, or who read very poorly, we began to build programs to serve them. As we did, we felt it was our responsibility to learn everything we could about effective, research based instructional techniques and the theories behind them. The fact Pratham (2023) recently found that 57 percent of rural fifth grade students were unable to read even a second grade level text suggests reading difficulties extend far beyond the borders of Delhi. This is a national problem of great urgency.

Our review of the existing reading science, both from South Asia and abroad, led us to ask several questions that seem important. Of particular interest to us was whether the extensive analysis and research coming out of the West regarding orthographic mapping, phonemic awareness and sight word acquisition might have bearing on reading instruction in Hindi, an alphasyllabary most commonly written in Devanagari. Though some of this research has been associated with the US based 'science of reading' (SOR) movement, we agree with Thomas (2022) and other critics that advocates of SOR at times either oversimplify or misconstrue the actual reading research. In particular, though we are interested in finding efficient ways to demystify the code of writing, we resist any suggestion that this can be best achieved by deemphasizing meaning making.Teachers can and must do both: we must both teach the code and nurture the curiosity and thinking skills needed to make meaning of text once the code is unlocked.

In looking for answers to these questions, we started by reading; afterall, we are librarians and readers as well as teachers. Since we consider ourselves part of a 'lab' aimed at developing library best practices for free, anti-caste libraries working in communities like ours all over South Asia, when we met with questions we could not answer through reading, we turned to action research. Our first questions centred around phonological awareness: how important is it for readers of Hindi? If it is important, what kind is important? What implications does this have on how we teach the script?

Literature Review

What follows is a review of some of the most important studies we have encountered regarding the science of reading in South Asian alphasyllabaries. While our focus is on studies that look at the role phonological awareness plays in reading acquisition, we'll also touch briefly on some of the work that has been done around other unique aspects of South Asian orthographies, including their visual complexity and nonlinearity.

Phonemic Awareness

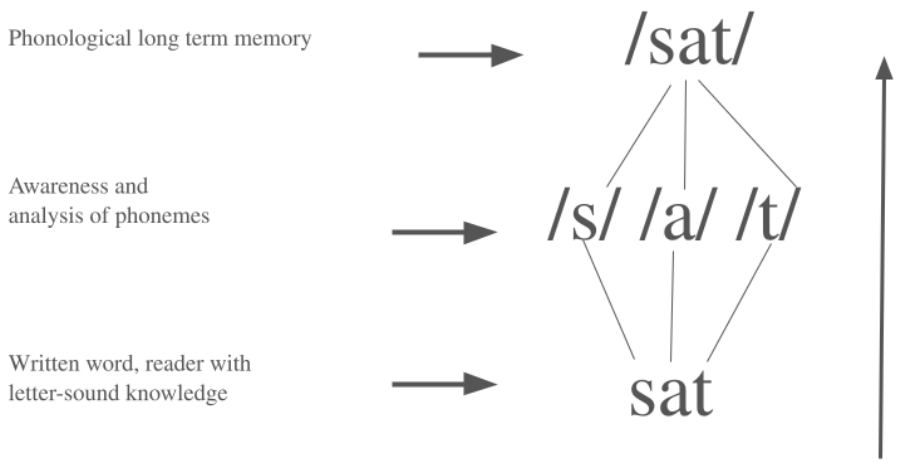
Phonological awareness refers to the awareness of any sounds that exist in spoken languages (e.g., 'onsets', rhymes, syllables, etc.) Phonemes are the smallest, most discreet sounds that exist in words (e.g., /s/ or /स्/). Phonemic awareness involves the explicit awareness of the phonemic structure of words. It can be demonstrated and measured by tasks that involve identification and manipulation of phonemes, and it is typically acquired in relation to literacy. Phonemic awareness is distinct from the implicit ability to distinguish sounds within languages, an ability that is typically present at birth (Share, 1995). It is worth emphasising that phonemic awareness does not typically emerge absent reading instruction or oral instruction that calls attention to phonemes in words. Because few remember learning these skills, many adults assume they have 'always known this', or that children will 'naturally get it', but the research does not support these assumptions. Phonemic awareness is

not natural: all of us have to learn it, and for some, this process requires more teaching than others.

In English, phonemic awareness has long been understood to be an important prerequisite to and predictor of skilled reading. Thirty years ago, David Share (1995), called the evidence for this ‘vast’, and it has only expanded since (Share, 2021). Ability to blend and segment sounds is clearly important in decoding and spelling, respectively; without these skills, it is impossible to ‘sound out’ or spell unfamiliar words. But Ehri (2005, 2014), Kilpatrick (2015, 2017), (Kilpatrick and O’Brian, 2019) and others have shown that in alphabetic languages phonemic awareness is also needed for orthographic mapping–the process by which readers subconsciously connect their knowledge of letter-sound combinations with their awareness of phonemes to make a mental map of words. By connecting graphemes (i.e., script) and phonemes (i.e., pieces of sound), readers anchor words in their long term memory, where they remain, available for instant recall. Though educators use the term ‘sight words’ to refer to a variety of things (e.g., common words, irregular words, or words that must be memorised), in this paper it simply refers to words that are instantly and automatically recognizable to a reader, as opposed to unfamiliar words or words that must be decoded.

Figure 1

Orthographic Mapping-Simplified



Kilpatrick's (2015, 2017) and Kilpatrick and O'Brian's (2019) review of reading research suggests that in order to efficiently 'map' new sight words for future automatic recall, readers in alphabetic languages must be able to both hear the phonemes in words and manipulate them with relative ease, with proficiency. They find that while phonic blending (i.e., /c/ /a/ /t/= cat) is necessary for decoding, skills like deletion (e.g., 'Say sheep … now say sheep, but don't say /p/') or substitution (e.g., 'Say lift … now say lift, but instead of /f/ say /s/'), learned to an automatic level, are better predictors of efficient orthographic mapping and long term sight word acquisition. This is an interesting hypothesis. But though there is broad agreement that effective reading in alphabetic scripts requires some degree of phonemic awareness, even Kilpatrick acknowledges that the exact nature and extent of awareness required is not a settled question (Shanahan, 2021).

South Asian akshara writing systems that grew out of the ancient Brahmi script are often called alphasyllabaries or abugidas. They are similar to alphabets in some ways and syllabaries in others. These scripts are based on consonant characters that include an inherent vowel sound, typically /a/. Other vowel sounds are represented by adding specific marks, or

diacritics, to these base characters. Additionally, these scripts often use composite characters, or ligatures, to represent consonant clusters. What orthographic mapping theory might tell us about reading in Indic scripts has not been resolved, but the existing research, though it conflicts in places, points in directions that have important instructional implications.

Alphasyllabic Principle and the Influence of Scripts on Phonological Awareness

The existing research shows that the nature of alphasyllabaries influences the kind of phonemic awareness that typical readers develop. Prakash et al. (1993) found that literate monolingual speakers of Hindi had more phonemic awareness than those who could not read but struggled with deletion of initial consonants in cases where consonants were followed by the inherent schwa – a task that readers of English typically find relatively easy. They surmised that this was because the schwa is not expressed in Devanagari. Similarly, Bhide et al. (2014) found that English-Marathi bilingual readers of Marathi were also less aware of the inherent schwa when reading Marathi. Both these studies strongly support the idea that the scripts we read influence the way we conceive of the phonemes represented by those scripts. This in turn suggests that the phonological awareness required to effectively read an alphabetic script might not be the same as what is required to read an alphasyllabary.

In fact, many researchers have wondered which would be more important, phonemic awareness or syllabic awareness, when it comes to reading scripts which contain phonemic markers organised in syllabic units. In a four year longitudinal study, Nag (2007) looked at the development of orthographic knowledge, phonological awareness and word reading skills of 374 five to ten year old students in Kannada medium schools. She found that phonemic awareness among those students developed slowly, compared to that reported in the literature on English readers and suggested that this slow development of phonemic awareness was likely related to the amount of time it took for readers to learn Kanada's complex orthography which includes more than 400 consonant-vowel (CV) akshara, or syllable symbols. Her study

found that by the beginning of fourth standard, nearly a third of students scored less than 50 percent accuracy on a test measuring their knowledge of CV akshara. More than half scored under 50 percent accuracy when tested on more complex akshara, such as those involving consonant blends. She found over time there was a reciprocal relationship between knowledge of complex akshara and phoneme awareness. Both syllable and phoneme level knowledge were significant predictors of reading skills; in grade 1, syllable awareness was slightly more predictive than phonemic awareness; the predictive value of these variables had reversed by grade 3.

Of particular interest to us was a study by Nag and Snowling (2012) of 9-12 year old, less affluent government school students in Kannada medium schools. They found that taken together, orthographic knowledge, Rapid Autonomous Naming (RAN), and awareness of syllables and phonemes all contributed to reading fluency and accuracy. Building on the earlier findings of Nag (2007) they found that phonemic awareness developed more slowly than would be expected in readers of alphabetic languages. They noted that the schools under study emphasised the syllable level (i.e, 'whole akshara') structure rather than the phoneme level markers within akshara. In spite of this, they found that phonemic awareness was strongest among the most skilled readers, and though syllable awareness remained a predictor of reading accuracy, phonemic awareness and Rapid Autonomous Naming (RAN) were the significant concurrent predictors of fluency. They explain:

> *...our interpretation is that better readers, who are more familiar with the akshara, are more likely to be able to attend to the internal details of these symbols to uncover their phonemic constituents. This perhaps triggers a process of reciprocal interaction such that increased orthographic knowledge precipitates the development of explicit phoneme awareness. Indeed, although the present data are cross-sectional and we are careful not to assume causality, our findings suggest that better readers, who are more*

> *familiar with the akshara, are more likely to show improved phonemic awareness. We propose that this analytic process is a universal aspect of reading development. Just as Byrne (1998) argued that children must abstract the alphabetic principle to become proficient readers, here we propose that children must infer the "alphasyllabic principle," the awareness that akshara map to phoneme as well as syllable units and both may be used to decode print. (p. 418)*

While Snowling and Nag (2012) found a significant relationship between phonemic awareness and reading accuracy and fluency, there does not appear to be a consensus among researchers on the question of how and whether phonological awareness relates to reading in alphasyllabaries generally, and orthographic mapping more specifically. Other researchers have come to different conclusions regarding the relative contribution of syllable level awareness and phonemic awareness to reading skills. For instance, Nakamura et al. (2017) studied 488 students in Telugu and Kannada medium schools. They reported that although phonemic awareness was a significant predictor of word reading accuracy, a closer analysis showed that the real predictor was syllabic awareness; the effect of phonemic awareness was small and decreased over time.

The 'alphasyllabic principle' advanced by Nag and Snowling (2012), however, is an important postulate, and one we will return to. It largely fits with our understanding of how the theory advanced by Ehri (2005, 2014) and Kilpatrick (2015, 2017) would be expected to explain orthographic mapping in an alphasyllabary. We would, however, suggest an interpretation that puts more emphasis on the bidirectional nature of this process: readers who recognized the salience of the phoneme level markers and who, based on this recognition and/or other factors (e.g., method of instruction) developed deeper insight into the phonemic structure of both words and script, were more likely able to use those insights to decode and 'map' new akshara and words more efficiently, thus increasing their knowledge of complex

akshara and their reading skills. We will discuss this possibility in more detail below, but one important implication of this interpretation would be to encourage teachers to direct students towards phonemes in words and phonemic markers in akshara sooner rather than later.

Other Factors Influencing Akshara Learning

Research recognises many factors that influence how children learn to read. Some of these factors can be controlled through instruction or are 'teachable', while others are more internal and not subject to teaching. From an educational point of view, it is important to note these factors that we teachers have no control over, such as the visual complexity of the scripts or the phonological complexity of the syllables our students must learn to read. Rapid Automatized Naming (RAN), the ability to quickly name known colours, shapes and/or digits, has been shown to be a strong predictor of reading skills in English and other scripts, but so far, research does not support the idea that we can teach it directly (Kilpatrick, 2015; Shanahan, 2020). We can, however, teach other important skills. For example, we can teach vocabulary by surrounding our students in a literature and language-rich environment. We can also teach phonemic awareness; in fact our reading of orthographic mapping theory would suggest that we must teach it if we expect all students to recognize and understand the phoneme markers within akshara.

Nag et al. (2014) explored how the visual complexity of akshara and the phonological complexity of the syllables they represent, coupled with various 'in-child' factors such as Rapid Automatized Naming (RAN), vocabulary knowledge and phonemic awareness, impacted the early stages of akshara learning. They studied 113 four to seven year old Kannada speaking children and found that the more visually and phonologically complex the symbol or the syllable, the more difficult it was to learn. Akshara learning over time was significantly predicted by RAN, student vocabulary and phonemic awareness. Interestingly, visual memory skills were not a predictor of future akshara learning, though they did predict

concurrent knowledge. The researchers were not clear why vocabulary knowledge was predictive in this context; they suggested it might be a proxy for something else, such as verbal-visual paired-associate learning ability.

In another study, Wijaythilake et. al (2019) examined the factors that influenced the reading acquisition of 200 Sinhala medium school students in grades 1-4. They found that Akshara knowledge and RAN were the best predictors of word and pseudoword reading accuracy and fluency. Their analysis showed the impact of phonological memory and syllable awareness was mostly accounted for by akshara knowledge and that phonemic awareness did not seem to play a major role. They suggested that one explanation for this might be found in the nature of instruction: through fourth grade, instruction focussed on learning each akshara as a whole; a more analytic approach was only introduced in grade five. In fact, the same researchers took up the question of instruction and its influence on phonemic awareness in a separate study - more on this will be discussed later.

The above studies remind us that it is not enough to consider whether an orthography is phonetically transparent or opaque–or even if it is predominantly alphabetic or syllabic. Daniels and Share (2017) point to emerging research on reading difficulties in non-alphabetic scripts and propose ten different kinds of complexity found in writing systems around the world. Three of these are notable from this review's point of view: differences between spoken and written language; spatial arrangement and nonlinearity; and visual uniformity and complexity. Differences between spoken and written language is likely to impact reading acquisition and performance of many readers in India, where dialectic and linguistic diversity is the norm. In our library context, for example, standard Hindi, as represented by Devanagri, is phonetically transparent, but many members speak regional variations of Hindi that vary significantly from 'textbook Hindi' in terms of pronunciation and vocabulary.

There is little doubt that Akshara, Chinese, and Arabic-derived orthographies are more visually complex in terms of feature density and number of characters, as compared to Hebrew and alphabetic orthographies (Nag et al., 2014). The question of spatial arrangement also arises, as alphasyllabaries are not written or read in a consistently linear manner. In Hindi, for example, the sounds in the syllable represented as 'हूँ' ('/h/ /u/ /nasal/') are displayed vertically, and the 'short i' diacritic, (as in 'दिन') precedes the consonant it follows in speech. Vaid and Gupta (2002) and Vaid et al. (2017) found that the short i in particular incurs processing costs on readers.

More research is needed to see how this finding challenges, supports or qualifies our understanding of how orthographic mapping works in alphasyllabaries. Regarding that, it might be interesting to see if analogous complexities in alphabetic scripts incur comparable costs on readers. For example, how might English letter pattern inconsistencies (e.g., saddle/camel, battle/metal or though/through) or examples of nonlinearity (e.g., 'silent e' and accent marks) impact accuracy, spelling and naming latency? Comparative research might help us get a sense of the relative magnitude, in practical terms, of the processing costs incurred by nonlinear features of Hindi. While the nature of the scripts we teach is not something educators have control of, a better understanding of these issues might help us find more effective ways to pace instruction or to introduce 'tricky matras'. For now, it seems safe to say that further research is needed to uncover the relevance of these insights to our pedagogy and practice.

Instruction for Phonemic Awareness

There is ample research that focuses on instruction for reading development, but views on the role and scope of the instruction, especially to develop phonemic awareness in alphasyllabaries, has been contentious. Wijaythilake et al. (2018) looked at two cohorts of 50 students in Sinhala medium schools, one in fourth grade, one in fifth. In Sri Lanka, fifth grade

students are taught to analytically decompose complex akshara into their component parts (e.g., the symbol for the consonant and the diacritic representing the subsequent vowel). This study found that in line with Nag (2007), phonemic awareness developed slowly as long as the focus of teaching was on the whole akshara unit, but increased rapidly when students were asked to attend to the phoneme markers within the akshara. Interestingly, in this study phonemic awareness did not significantly predict growth in word reading accuracy over time, at least as measured by pre and post untimed word list reading assessments. Looking at these results, researchers concluded that phonemic awareness developed as akshara knowledge deepened, but the relationship appeared unidirectional.

Also downplaying the role of phonemic awareness in alphasyllabary reading was a three year longitudinal study by Menon et al. (2017). Following more than 700 students in Kannada and Marathi medium government schools, this study looked at a wide variety of instructional practices and learning outcomes, and provided practitioners with practical suggestions based on case studies and data from both surveys and assessments. Researchers reported that by the end of third grade, fewer than a quarter of students assessed could accurately read a grade level word list. Many ineffective teaching practices were identified, including extensive and often meaningless ‘copywriting’ and a focus on symbols in isolation from the sounds they represent. The report found that akshara knowledge was the most important predictor of word reading skills. In a context where akshara knowledge is slowly emerging, this finding is not surprising, since it is impossible to read any language without first understanding the symbols it uses to represent words. Still, it does highlight the difficulty many students in India seem to have in acquiring orthographic knowledge sufficient for effective reading.

Importantly for this review, Menon et al. (2017) tracked only two phonemic awareness tasks, segmentation and blending, and found the scores on both those measures to

be ‘negligible’ through the end of grade three (p. 52). At one point, the report describes a teacher using an analytic approach to teach consonant-vowel combinations (i.e., फ+ए= न+ए= ट+ए=). This practice was criticised for two reasons: first, the teacher assigned the task and left the room after assigning it; and second, the very act of breaking up the CV akshara into their component parts was judged by the researchers to be ‘incomprehensible’ to students (p. 62). Another interpretation of this incident, based on the findings of Ehri (2005, 2014) and Share (1995, 2008), might be that the task would of course be incomprehensible for students unable to segment or blend phonemes. Had the students earlier been exposed to the kind of phonemic awareness instruction suggested for learners of English by the Early Literacy Initiative’s (ELI) Handout 5 (Das and Pyadah, 2019), and had the teacher stayed in the room and clearly taught the concept, there is no reason to assume that this kind of approach would be incomprehensible–or even if it were initially incomprehensible to some, that it would not eventually lead to revelatory and necessary insights. This will be discussed in more detail below.

In exploring reading development in akshara-based scripts, researchers have long wondered about the role instruction might play in influencing the way students learn to read generally, and the kind of phonological awareness they rely on, more specifically. Jayaram (2008) cited traditional teaching practices, along with classroom experience and her reading of current research, to advocate a whole-syllable approach. Importantly, however, she and Nag (2007) both rejected the idea that actual reading should wait until akshara learning was complete. As noted above, though Wijaythilake et al. (2018, 2019) did not find a strong connection between phonemic awareness and reading skills in Sinhala, they did find that students' phonemic awareness increased when instruction called attention to phoneme markers in the script, and they suggested that earlier analytic instruction might support young readers in their ‘decoding of akshara’ (Wijaythilake et al. 2019, p. 24). This insight that

phonemic awareness in alphasyllabaries may depend to a large extent on instruction is critical, but there is an additional insight here that we will return to later. By using the word 'decoding' to refer to akshara acquisition, the researchers here suggest an active process, a kind of 'reading'. This suggests a new way to think about 'akshara knowledge', one that does not depend so much on the rote, paired associate learning associated with 'alphabetic knowledge.'

In her more recent writing, Sonali Nag (2022) is explicit about the importance of early introduction of analytic approach to akshara teaching:

> *Keeping beginning instruction for the akshara writing system at the syllable level is also psycho-linguistically appropriate because the syllable is perceptually more discernible than the phoneme. But knowledge about markers is clearly beneficial for reading progress because it allows for an analytic approach to reading the extensive inventory of symbols in akshara languages. The implication then is to begin activities with phonemic/phonetic markers early after a first introduction to singleton akshara through a syllable-focused program. Explicit instruction about phonemic markers in parallel with the introduction of singleton akshara is useful for many reasons: It increases potential for transfer of insights from taught akshara to new akshara, and it affords insights about an influential aspect of the alpha-syllabic principle (p. 380).*

The Central Role of 'Akshara Knowledge'

It is worth noting the prominence researchers of alphasyllabary reading have given to 'akshara knowledge'. Alphabetic knowledge is a strong predictor of future reading skills, but most students master it by the end of their first year in primary school even when other factors are controlled (Nag, 2007; Piasta et. al, 2021). This stands in contrast to students Nag studied in Kannada medium schools, many of whom still struggle with complex akshara in fourth grade. In fact from Nag (2007) onwards, a large body of literature, including most of

the studies cited here, start from the assumption that South Asian alphasyllabaries have large orthographies composed of hundreds of unique akshara, and as a result, can be expected to take longer to learn than scripts with smaller orthographies (Nag 2007; Jayaraam, 2008; Nag and Snowling, 2012; Nag, 2014; Nag & Narayanan, 2019; Nag et al., 2014; Menon et al., 2017; Nesan et al., 2019; Wijaythilake et al., 2018; Wijaythilake & Parrila, 2019; Wijaythilake et al., 2019).

This makes intuitive sense: paired-associate learning of symbol-sound correspondence is difficult and time consuming, even when students are only required to learn a script with a comparatively small orthography, such as English. In the US, for example, where most teachers are well trained and most children come to school with some alphabet knowledge, letter-sound learning takes up most of the year in many kindergarten classes; Jones et al. (2012) argue that more efficient, research tested teaching methods can yield faster results, but there is no avoiding repetition and review. Memorising over 400 unique sound-symbol relationships would be an enormous task, especially because being able to read real-sounding, meaningful text would depend on readers having extensive knowledge of these akshara. Not surprisingly, most of the researchers here find that akshara knowledge is either the best or one of the best predictors of alphasyllabary reading skills (Nag, 2007; Nag and Slowling, 2012; Nag et al., 2014; Menon et al., 2017; Wijaythilake et al., 2018; Wijaythilake et al. 2019). As we will argue below, however, there are both theoretical and practical problems with this conception of 'akshara knowledge'.

Key Insights from the Literature Review

Before considering the above and the other findings in light of David Share's Self-Teaching Hypothesis (Share,1995, 2008), and the orthographic mapping theory outlined by Ehri (2005, 2014), Kilpatrick (2015, 2017) and Kilpatrick and O'Brian (2019), let's first review several key ideas emerging from this literature review. First, there is convincing

evidence and broad agreement that the nature of alphasyllabaries has an influence on the kind of phonemic awareness readers develop, especially with regard to the inherent, unexpressed schwa. There is also agreement that certain kinds of visual complexity and nonlinearity found in South Asian alphasyllabaries can be challenging for young readers, but more work would be needed to understand the extent and the instructional implications of those challenges. There is also broad agreement that the orthographic breadth of the akshara is challenging for readers and that orthographic knowledge takes longer for readers to master than alphabetic knowledge, though we will argue that there are fundamental problems with the way most researchers conceive of 'akshara knowledgeable'.

Regarding the role of phonological awareness in alphasyllabary reading, there is general agreement in the studies reviewed that phonemic awareness tends to emerge more slowly in readers of alphasyllabaries than would be expected in readers of alphabets, but there is no clear agreement on the relative importance of syllable level awareness as compared with phonemic awareness when it comes to reading acquisition.

Finally, there appears to be growing acceptance of the idea that the nature of instruction likely plays a key role in the acquisition of both phonemic awareness and reading skills. Recently, there has also been more openness to the idea that an analytic approach to early reading instruction, one which focuses on both phoneme-level and syllable-level markers, might offer readers important advantages.

Though we do not question the findings of the research cited here, our reading of the broader literature on orthographic mapping has led us to interpret some of them in novel ways. Our motivation for questioning some of the existing assumptions discussed here is not the quest for a universal theory of reading, but for more effective instructional strategies in a country where millions of people have been effectively excluded from the world of reading.

Two Paths Postulate

Our reading of the research is that the varied findings regarding the relative contribution of phonemic awareness and syllabic awareness can be best and most simply explained by what we call a 'two paths postulate'. As noted above, Ehri (2005, 2014) has shown that in alphabetic scripts, orthographic mapping is a process by which readers 'map' new words by connecting graphemes on the page to the phonemes in the spoken words they represent–it is this process that allows readers with the requisite alphabetic knowledge and phonemic awareness to learn thousands of instantly recognizable words, with relative ease. This is a flexible, unconscious process; it is able to accommodate even the many inconsistencies in phonetically opaque orthographies such as English. Early instruction in phonemic awareness and phonics supports the development of this skill, but the fact that relationships between graphemes and phonemes are explicitly represented in alphabets likely explains why most young readers of alphabets arrive at the insights required for efficient orthographic mapping even without systematic, explicit instruction.

We postulate that unlike alphabets, with their clear grapheme-phoneme relationships, the dual nature of most South Asian scripts opens two paths to orthographic mapping. Young readers may take either a 'syllabic path' or an 'alphasyllabic path' towards akshara knowledge and word reading. Which 'path' they take might depend on many factors. The fact that phoneme level markers are less prominent in alpha-syllabaries as compared with alphabets, coupled with instructional practices which often focus exclusively on the syllable, likely play an important role in deciding this question.

Students who take the 'syllabic path' acquire only syllable level awareness and thus must learn each new complex akshara separately as a unit; segmenting akshara into phonemic parts and blending (i.e., 'sounding out') those parts into syllables in order to decode new akshara is impossible without a degree of phonemic awareness. The problem with this path is

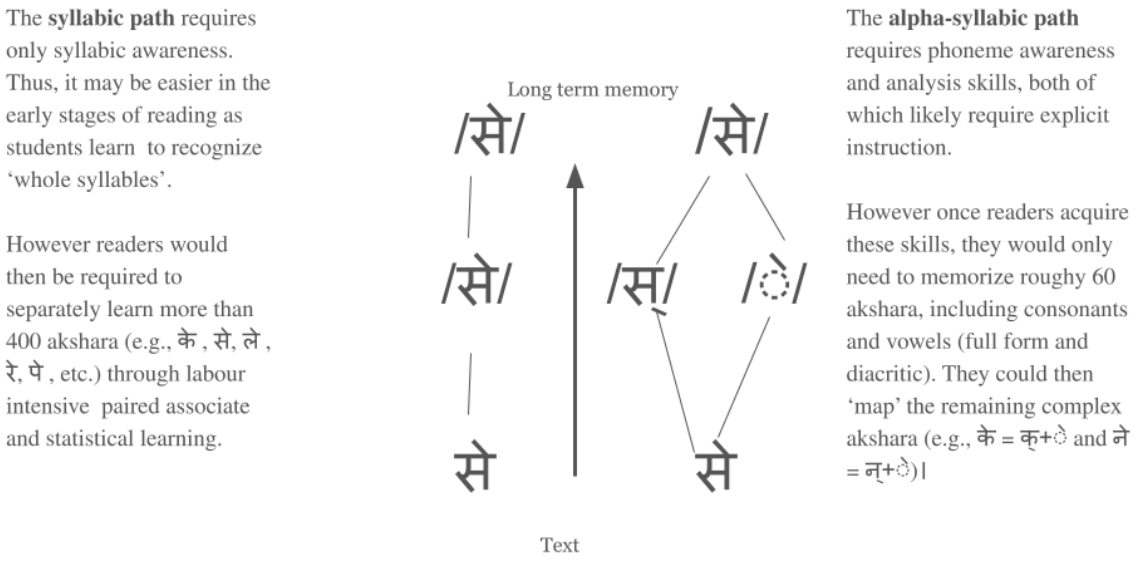
that it requires readers to put in a tremendous amount of effortful, paired associate learning before they are able to experience the joys of reading real, meaningful text. Students taught to 'think in syllables', without being explicitly directed towards the phonemic structure of the symbols they are reading, or the sounds and words those symbols represent, must rely on 'whole akshara' knowledge and phonological awareness at a syllable level to orthographically map new sight words, 'syllable by syllable'. This path to literacy might be relatively straightforward in a syllabary with a small number of symbols such as the one Sequoyah invented for Cherokee– that script with its 86 characters was so effective that the Cherokee nation obtained mass literacy within a few years of formally adopting it in 1825 (Georgia Historical Society, 2016). But learning a South Asian alphasyllabary in this manner–syllable by syllable, symbol by symbol–would be an entirely different matter; it would require years to learn an orthography with more than 400 characters well enough to enable efficient orthographic mapping of new words. A few students would no doubt deduce the 'hidden patterns' of the code quickly, but most would either not do so at all, or would do so slowly. The existence of this labour intensive 'syllabic path' might explain why several of the studies cited here (e.g., Nag, 2007; Nag and Snowling, 2012; Nakamura et al., 2017; Menon et al., 2017) find syllable level awareness plays such an important role in reading acquisitions. It might also explain the late emergence of phonemic awareness, akshara knowledge, and reading skills found in most of the studies cited here. It is possible that many of the 57 percent of rural fifth graders who Pratham (2023) judged unable to read second grade text are 'failing' in large part because they have been led down a path to reading that is very nearly impossible– which is to say, they are not failing, they have been failed.

Fortunately, our reading of the research suggests there is another way: the 'alphasyllabic path'. As Nag (2022) points out, early explicit instruction in both syllable and phoneme level markers within akshara (e.g., matras) would likely support a deeper insight

into what she calls the ‘alpha-syllabic’ principle. Based on our reading of orthographic mapping theory, young readers who received effective instruction in ‘alphasyllabic’ phonics and phonological awareness should learn to read much more quickly than those who take the ‘syllabic path’– as long as they are also given the opportunity to ‘map’ new words while reading meaningful text. The orthographic mapping process they used would not be exactly the same as young readers of alphabetic scripts, because they would be mapping words at both the syllable and phoneme levels. But given how this process seems to work in so many different scripts–even phonetically opaque ones like English, until proven otherwise we hypothesise that it would be flexible enough to work in alphasyllabary reading.

Figure 2

Two Paths to Orthographic Mapping in Hindi



Self-Teaching-The Mechanism by which We ‘Map’ New Words

To understand the potential advantages available to readers of alphasyllabaries who take the ‘alphasyllabic' path to reading proficiency, it is important to understand David Share’s Self-Teaching Hypothesis (Share, 1995, 2008). Kilpatrick (2015, 2017), Kilpatrick and O’Brian (2019) and Ehri (2014) argue that ‘self-teaching’ is the central mechanism

behind orthographic mapping. Share postulates that it is through successful instances of 'phonological recoding'– the act of breaking the symbols representing new words into sounds and then putting those sounds together to make a word–that readers acquire most of the 'cutting edge' of their lexicon of automatically recognizable words. This process begins very early– as soon as readers have the letter-sound knowledge and phonological awareness needed to produce real words out of 'decoded' sounds they recognize from script. The way we do this changes over time, but the process itself is not limited to childhood: even as our phonological awareness and orthographic knowledge expands, self-teaching continues for as long as we encounter new words. (Share, 1995, 2008).

'Self-teaching' through orthographic mapping is so powerful because it happens in the background, with relative ease, as we decode new words. Kilpatrick's (2015) review of the literature finds that beginning around second grade, it takes typical readers only one to four exposures to most words in order to move them into long term memory, where they remain available for instant recall. This is why the readers of this paper, like all competent adult readers, did not require years of flashcard drills in order in order to learn the 30,000 and 80,000 words that research shows we can now instantly recognize (Kilpatrick and O'Brian, 2019). Readers need only two things to map new words with such efficiency: automatic understanding of sound-symbol relationships and a degree of phonemic proficiency. In order for them to become fluent readers of complex text, readers need a third thing: access to extensive, and hopefully interesting, reading practice where they can encounter and 'map' thousands of common and uncommon words.

Implications for Reading Instruction and Research in Alphasyllabaries

This has major implications for reading instruction in Hindi and other South Asian scripts. Students taught using an analytic approach that matras (i.e., vowel diacritics) are simply one of the two forms a vowel can take, and that all consonants make two sounds

sounds (i.e., a ‘full sound’ that includes the inherent schwa and a ‘half sound' that does not), would be more likely to take the ‘alphasyllabic path’ to reading acquisition. They would only need to learn sixty or so unique symbols in order to read most of the text they would be likely to encounter. An ‘analytic’ approach to teaching akshara, by calling attention to the representation of phonemes in the script, would in itself increase students’ phoneme level awareness, a process that could be enhanced by explicit instruction in phonemic awareness skills similar to those suggested by Das and Paydah (2019). In this mode of instruction, rather than ‘mugging’ क and को (ka and ko) as separate symbols, students would learn to ‘decode’ and then ‘map’ को’ as (क् + ो). Because they would decode and then ‘map’ rather than ‘mug’ akshara, students would be able to read connected, meaningful and interesting text much sooner than they otherwise would. If paired with access to books, to make meaningful reading practice possible, and read alouds, to demonstrate why stories are intrinsically interesting, we might expect readers to reach true proficiency much, much quicker than the research reviewed here suggest they are.

Though at first glance, this ‘analytic’ approach might look more complex than the ‘whole akshara’ method, it is worth keeping in mind that many teacher training programs in the English speaking world used to advise teachers to rely on flashcards to teach ‘whole words’ to young readers. The approach makes intuitive sense, but research has since shown it is not the best way to teach reading because, except in the case of deaf people, almost none of us learn to read most words 'visually' as ‘whole words’; we learn by orthographic mapping, regardless of how we are taught (Kilpatrick, 2015; Ehri, 2005, 2014; Share 1995, 2008). As it happens, young readers all over the world can and do come to understand that script can be written in two forms according to rules (e.g, vowels in alphasyllabaries or upper and lowercase letters in alphabets) and that symbols can represent more than one similar but

distinct sounds. Learning by rote hundreds of apparently meaningless symbols is another matter.

A recent study in Brazil involving sixty 5-7 year old non-readers by Sargiani, Ehri and Maluf (2021) supports the idea that it is important to focus on phonemes early. Though Portuguese is written in an alphabetic script, syllables are prominent in the spoken language and schools often take an approach that starts with syllable level instruction. In this study, researchers broke students into three groups. One group was taught to decode consonant-vowel (CV) syllables by sounding out and blending their grapheme-phoneme parts (i.e., letters). A second group was taught to decode in whole syllable units. The third group was taught individual grapheme-phoneme units, but with no instruction in decoding. After the treatment, students were assessed by measures including reading unknown syllables, words and multisyllabic words. Phonemic awareness and spelling were also evaluated. Results showed instructing students to sound out and blend grapheme-phoneme units was 'much more effective' than the other two teaching strategies. Researchers concluded, 'Results support theories that reading instruction is most effective when it begins by teaching students to decode with small grapheme–phoneme units rather than with larger syllabic units, even when syllables are salient spoken and written units in the writing system' (p. 1).

All of this suggests that the way 'akshara knowledge' has been defined in most of the studies reviewed here is flawed in ways that have theoretical implications for researchers and practical implications for teachers. It is our contention that 'akshara knowledge' should be understood to involve an understanding of the relationships between the basic consonant and vowel (full form and diacritic) set of akshara and the sounds they represent. It would also be fair to include a few high frequency, and/or opaque consonant-conjunct akshara; all other 'knowledge' is more properly understood as akshara reading or askhara decoding. The CV akshara 'पे, को, जा, सो' are words (and word parts) just as much as 'on, to go, so' are; and

reading small words and word parts is best understood as a reading skill, not an arbitrary set of knowledge to master. To define it otherwise invites conclusions that approach tautology: saying 'akshara knowledge is a predictor of reading skills' is akin to saying,'reading skills predict reading skills', or more precisely, 'small word and word part reading skills predicts more advanced types of word reading skills'. This is almost certainly true, but also very nearly a truism. On a more practical level, using the term 'akshara knowledge' to refer to a student's ability to read over 400 akshara not only rests on, but also reinforces, the assumption that complex akshara are symbols that must be independently memorised rather than words or parts of words to be decoded and learned via self-learning and orthographic mapping. In other words, it encourages teaching which is likely to be ineffective.

To be clear, there is not a consensus on the best sequence of instruction for truly beginning readers–in any language. While Sargiani et al. (2021) suggested a phoneme-only approach from the start, Kilpatrick (2015, 2017) has suggested that in the first months of school many young readers may lack the requisite phonemic awareness to be able to effectively decode even very small words. He suggests that during those early days before phonemic awareness has had a chance to develop, it makes sense, in an alphabetic context, to focus on rime units (e.g., making words with -at or -it or -ap). This would get students 'reading' even before they had the phonemic awareness to fully sound out many words. This approach is consistent with that advocated by Nag (2022). It also fits nicely with the 'varna samooha' approach used by the Early Literacy Project (Jayram, 2008), as long as efforts were made from the start to call explicit attention to the phoneme markers in akshara and the phonemic structure of words. Again, our reading of the research suggests attention to both phonemes and syllables is crucial; phonemic awareness, perhaps especially in alphasyllabaries, will grow slowly or not at all without instruction, and until readers have the alphasyllabic awareness (i.e., awareness of both the syllabic and phonemic structure of

words) to decode new akshara and new words, they will be faced with memorising hundreds of characters, syllable by syllable.

Hypothesis: Automaticity Matters

Another insight from the recent research on orthographic mapping that has influenced the hypotheses in paper comes from Kilpatrick (2012, 2015, 2017) and Kilpatrick and O'Brian (2019). They found that automaticity in relatively complex phoneme manipulations such as deletion and substitution predicts orthographic mapping skills and reading automaticity better than phonemic manipulation skills that require conscious thought, or more basic skills, such as phoneme blending and segmenting. Blending and segmenting skills are necessary in decoding and spelling, but they do not appear to be sufficient for efficient sight word acquisition. As noted above, the exact nature and extent of the phonemic awareness required for orthographic mapping is not known, even in alphabetic scripts (Shanhan, 2021); and based on our reading of Prakash (1993) and Bhide et al. (2014), we did not assume that the same kinds of phonological awareness would predict orthographic mapping efficiency in Hindi. Still, we were interested in the idea that a process such as orthographic mapping that happens unconsciously would most likely rely on insights that were 'automatic' rather than ones requiring conscious effort.

Though the research reviewed here suggests that as a group young readers of alphasyllabaries tend to acquire phonemic awareness more slowly than their alphabet reading peers do, we would expect this to vary, depending on the kind of instruction received by students. In Delhi, we understand anecdotally that some schools and tutors use an analytic approach to teaching the alphasyllabary, and many other teachers, seeing their students' needs, use an eclectic approach that points to both the phonemic and syllabic markers in the script they are teaching and the words represented by the script. Based on this, we would expect some students to gain insight into the 'alphasyllabic principle' as a result of such

teaching. Other students might come to awareness of phonemes and the the alphasyllabic principle in spite of instruction that emphasises the syllable, just as many readers of alphabetic scripts 'figure out' phonemic awareness and phonic patterns without explicit, systematic instruction in phonics or phonemic awareness. Still other readers might acquire phoneme level awareness through exposure to English, Urdu or Dari instruction and then be able to apply it to their reading in alphasyllabaries.

Based on our review of the relevant literature, we hypothesised that automaticity in phonemic awareness skills such as phoneme substitution and deletion, however acquired, would contribute to increased accuracy and automaticity in reading as measured by oral reading rate when reading a grade level text. As per Bhide et al. (2014), we predicted that Hindi readers might have more difficulty than their peers with tasks involving deletion of the first consonant (i.e., onsets and rimes). We did not assume which phonemic awareness skills would be most predictive of skilled reading so we developed a tool (PAST-H) that looked at a variety of phonological awareness skills.

Methodology

The Community Library Project runs three libraries in the Delhi NCR region. Total membership is around 9,000. Roughly half of those are under sixteen years of age; half are sixteen or older, with most of these being young adults. Though TCLP does not have detailed data on the socio-economic background of our members, most, but not all, are working class or poor; which is to say they are broadly representative of Delhi NCR residents. Of the members in grades 1-6 who participated in this study and for whom we had data about school enrollment, 63 percent reported attending government schools; 15 percent reported attending private schools; and 12 percent reported attending non-profit, government aided schools. Five percent were not enrolled in school and five percent reported schools we could not locate. We did not collect data on the language of instruction or the quality of any of these schools. We

did not ask for gender, but of those who participated in this study, our membership data indicates that 45 percent were girls, 55 percent were boys. One member did not report a gender or enrolled as nonbinary / 'other'.

To assess the reading strengths and needs of library members, TCLP holds an annual 'universal screener' as part of a 'Reading Mela'. In addition to games and read alouds, members are invited to participate in a 'reading challenge'. The data presented here was gathered over two Saturdays in February and one Saturday in March, 2023. Data was collected from three TCLP libraries located in the National Capital Region: South Ex-Kotla, Delhi; Khirki Extension, Delhi; and Sikanderpur, Gurugram. Given the timing of our study, all references to 'grade level' refer to the 'end' of that grade level.

At the time of joining TCLP, parents or guardians of members sign a membership application which grants permission for their children to issue books and participate in on-site library activities run by library staff or volunteers. Additionally, parents are required to visit the library once for an orientation; the few who cannot attend are contacted by phone or home visit. Additional permission is only required for off campus library field trips, or for special workshops run by outside organisations. We invited all members to participate in reading activities, by explaining that they would take only a few minutes and would help us improve library programs; participation, however, was completely voluntary.

Assessment Tools

In 2023, our 'reading challenge' included two activities. In the first activity, students read a one minute unseen Hindi grade level fluency passage, chosen from a textbook not available in Delhi schools[2]. These passages were scored for correct words per minute and accuracy. Assessments were administered by trained TCLP teachers with experience doing

[2] We used texts from Eklavya Foundation's open-source, graded textbook series for primary grades, 'Khushi Khushi'. The texts were formatted for readability, uniformity and ease of assessment, and all images were removed from the texts. The original textbooks can be accessed here: https://www.eklavya.in/books/eklavya-books-pdf/451-primary-education-programme-pdf

fluency assessments. We followed commonly used administration guidelines for Oral Reading Fluency measures: substitutions, omissions and words provided by the examiner were counted as errors; self-corrected words, insertions and repetitions were not. If students hesitated for more than three seconds, the examiner provided the correct word. There is a great deal of data to support the reliability and validity of procedures such as these[3]. Our tools were not standardised, however, and we gave different prompts to students in first through fifth grades. This means that when evaluating reading rate and accuracy, we had to treat each grade level as a separate sample, except for grades 6-8; we used the same passage for those students. This is a design limitation we will address in future research. For sixth through eighth graders, we used the same text; we were able to combine them in one larger sample.

In the second activity, we completed an orally administered Phonological Awareness Screening Test-Hindi (PAST-H) (see Appendix A), based on the short form of the English Phonological Assessment Screening Test (PAST-S) by David Kilpatrick (2017). Kilpatrick based his assessment on tools used by previous researchers; hence the name 'PAST'. Kilpatrick conducted several studies to establish the reliability and validity of the PAST; his results show the PAST, when administered with fidelity, strongly correlates to other measures of phonological awareness and tests of word reading skills (Kilpatrick & McInnis, 2012; Kilpatrick, 2017).

TCLP curriculum team members collaboratively and carefully adapted the PAST into Hindi and tested our Hindi version on a variety of librarians, teachers, friends and library members. In the adaptation process, we matched the phonological skills being assessed by the PAST (e.g., deletion of final consonant in a one syllable word), using Hindi words. We dropped Level K, deletion and substitution of the second sound in an initial consonant blend

[3] See for example, University of Oregon, Center on Teaching and Learning (2018). Understanding the research behind DIBELS® 8th Edition (Technical Report 1801). Eugene, OR: Author. https://dibels.uoregon.edu/sites/default/files/DIBELS8thEdition_TechRpt1801_ResearchBrief.pdf

(e.g., 'say *cram*... now say *cram*, but instead of /r/ say /l/….*clam.'* We also dropped Level M2, substitution of the first sound in a final consonant blend (e.g., 'say *best*... now say *best*, but instead of /s/ say /n/…*bent)*. We were interested in condensing the test to allow for more efficient administration, and we found that compared with English, Hindi provided fewer one syllable, simple words with which to construct these test items. This is a potential design limitation, but we felt the basket of skills we did assess would likely be broad enough to give meaningful results.

The PAST-H, like the English PAST, consists of four sections: Syllable levels; Onset Rime Levels; Basic Phonemic Levels and Advanced Phoneme Levels. These levels include deletions and substitutions of syllables and phonemes (e.g., say, 'pyaar'; now say pyaar, but don't say 'p'). In scoring the PAST, we counted both correct and automatic (i.e., in two seconds or less) responses, but we only analysed automatic responses, as those have been shown in English to be more predictive of skilled reading (Kilpatrick & McInnis, 2012; Kilpatrick, 2012, 2017).

We administered the PAST-H as per standard instructions, with two small modifications. We discontinued testing if readers scored a total of 0 or 1 (i.e., one correct, but non-automatic response or fewer) for two entire consecutive levels. After the syllable levels were complete, we also discontinued testing if a member was unable to answer any questions across three consecutive sublevels of the assessment (e.g., H, I, J). Second, if students did not seem to understand the instructions, we took a few minutes to explain the first compound word syllable level deletion task using a model such as, 'This is a pencil (show pencil). This is a box (show box). …Say pencil-box... now say pencil-box, but don't say box…(withdraw box)...what's left?' We judged that this level of phonological awareness could not be 'taught' with one concrete example, but such an example could help lessen confusion among students who had never seen a task like this before, or for whom language might be an issue. This

seemed reasonable because the PAST itself has the administrator give the correct answer after every mistake anyway; the reasoning being, one cannot ‘learn’ a skill like phonological awareness by simply hearing a few incorrect answers corrected.

Given that we followed consistent administration protocols and used adaptations of tools that have been established as reliable and valid, it is likely that our tools will also prove to be reliable and valid. However we acknowledge that our condensing of the PAST and the lack of independent assessments of reliability and validity are design limitations that should be addressed in future research.

Over 180 members took part in these activities. In analysing the data, we eliminated students who were not enrolled in school or for whom we had no reliable grade level information. The data in this study includes 167 students: 116 in grades 1-5 and 51 in grades 6-8.

The testing environment was not uniformly quiet, because TCLP libraries are very popular and our space is limited. We arranged one room apart from other library activities. We brought members into the testing room three to five at a time and held assessments in different corners of the room, as we do when we collect progress monitoring data in our reading fluency program. If members said they could not hear a question, to minimise repetition effects, we skipped that question, moved on to the next one and then returned to the missed question at the end of the section. We believe the data was not compromised by noise; in any case, any effect would have been random as we did not test any particular kind of member during particularly loud or quiet times.

There were many other variables at play in the group of readers we assessed, most of which we were not able to control for. First, most of our members go to government schools of varying quality, but some also go to private schools–also of varying quality. The majority of our members attend Hindi medium schools, but some attend English medium schools,

where Hindi is taught as a subject. Most, but not all members, are working class or poor. Most speak a version of Hindi as their first language, but many speak different regional variants of Hindi, and a few members come from Afghanistan and have stronger literacy skills in languages other than Hindi (e.g., Dari or English).

Since the question we were asking was not how students acquire different kinds of phonological awareness, but rather how phonological awareness, however acquired, related to Hindi reading skills, most of these confounding factors were unlikely to have a major impact on our investigation. That includes knowledge of English or other languages: few people in Delhi are truly monolingual or monoliterate; English is taught as a subject in most schools, and the widespread use of English/Roman script in the market and on the internet motivates many people to learn it. There was one potentially important factor that may have affected our results. If members from Afghanistan had acquired phonemic awareness through instruction in Dari or English, but had not had time to acquire Hindi reading skills, they might skew the data toward showing less of a relationship between fluency and accuracy in Hindi and phonemic awareness. We did not collect data about time spent in India or schooling experience, so we were not able to control for this variable.

Data Analysis

First, to compare the development of phonemic awareness in our sample to typical readers of English and to the readers in the studies cited above, we analysed descriptive statistics to see how phonological awareness expressed itself differently at the different grade levels represented in our sample. Like the PAST, we grouped phonological awareness into four levels: Syllable Level; Onset-Rime Level; Basic Phoneme Level; and Advanced Phoneme Level. We also created a Basic-Advanced Phoneme Level Composite. We wanted to see if a broader measure would be a better predictor of phonemic proficiency; it made sense to do this because the correlations in Kilpatrick's reliability and validity studies were

based on data from a combination of basic and advanced phoneme level skills, as they were the skills that best predict reading in English (Kilpatrick, 2012).

Syllable level tasks involved various kinds of syllable deletion (e.g., the first syllable in a compound word; a two syllable word and a three syllable word). Onset Rime Level tasks assessed a specific kind of phonemic awareness involving deletion or substitution of the first consonant (i.e., 'onset'). Basic Phoneme Level tasks involved deletion and substitution of the first consonant in a consonant blend, and deletion of a final consonant of a one syllable word. Advanced Phoneme Level tasks involved substitution of a medial vowel; substitution of a final consonant and deletion of the first consonant in a final consonant blend (e.g., in English this might be: 'Say 'camp'. Now say 'camp' but don't say /m/').

In order to get a broad sense of the relationships between reading rate and accuracy and different kinds of phonological awareness, we conducted a variety of statistical analyses using the open source statistical software, JASP. We first converted the scores on each section of the PAST-H into a 10 point average score. By relying on scaled scores, we hope to make it easier to adjust the length of future assessments without compromising the potential predictive value of the skills they measure.

We initially tried to analyse our entire grade 1-6 sample in one multi-linear regression, but feedback on our initial draft paper pointed out that the non-standardised nature of our grade level fluency assessments meant we would need consider readers in grades 1-5 as as separate samples; members in grades 6-8 read the same text, so they could be included in one larger sample. Though the sample sizes were small (i.e., n=19-51), we looked at each to find how different measures of phonological awareness correlated with both reading rate and accuracy.

We also ran linear regressions on each sample to see which, if any, phonological awareness skills significantly predicted reading rate and/or accuracy. We did not analyse our grade 1 members as the sample size was so small, only 10 readers.

Finally, we broke down the 'baskets of skills' measured by the PAST-H to see if any specific skill(s) emerged as (a) better predictor(s) of reading rate and accuracy.

Results

Reading Rate and Accuracy Across the Grades

Our results were in line with previous findings in several important ways. Though the unstandardised nature of our fluency probes makes reliable comparisons impossible, the first through sixth grade readers in our sample, like readers in the US (Hasbrouck and Tindal, 2017), increased their reading rate across grade level, even as the text became more difficult. Interestingly, in our sample we saw no significant correlation between reading rate and grade level between grades 6 and 8, even though those readers all read the same sixth grade level text. Because of this, and the small sample sizes involved, we report sixth graders (n=23); seventh graders (n=20) and eighth graders (n=8) together below.

Table 1

Correct Words per Minute (CWPM) by Grade Level

Grade:	1 (n=10)	2 (n=19)	3 (n=27)	4 (n=33)	5 (n=27)	6-8 (n=51)
Median	7.5	12.00	27.00	48.00	56.00	75.00
Mean	17.60	19.79	36.85	49.42	58.48	74.75
Std. Deviation	33.73	22.46	33.29	35.14	39.90	33.61
Minimum	0.00	0.00	0.00	0.00	0.00	20.00
Maximum	110.00	70.00	134.00	143.00	121.00	147.00

Similar to what we saw in terms of reading rate, the older readers in our sample tended to read more accurately than the younger readers, even though the texts read became more difficult from grade 1 to grade 6. Grade 6, 7 and 8 readers all read from the same text and are reported as a group because no significant difference in accuracy was noted when we looked at the different grades in that group of readers.

Table 2

Accuracy (Percentage) by Grade Level

Grade:	1 (n=10)	2 (n=19)	3 (n=27)	4 (n=33)	5 (n=27)	6-8 (n=51)
Median	43	57	92	93	96	93
Mean	40	47	74	80	78	91
Std. Deviation	39	43	35	30	35	10
Minimum	0	0	0	0	0	54
Maximum	100	100	100	100	100	100

Initial Consonant Deletion and Development of Phonemic Awareness

Regarding the nature of phonemic awareness observed in our sample, we found deletion of the first consonant sound was much more difficult for readers than substitution of the first consonant sound: on average students answered 19 percent correctly on the deletion tasks vs. 45 percent on tasks involving substitution. This is the opposite of what would be expected in English, as substitutions tend to be more difficult than deletions, all things being equal.

Like Nag (2007) and others, we found phonemic awareness, on the whole, grew over time, but more slowly than would be expected in English. While the PAST has not been normed, in its administration guide Kilpatrick (2017) says typical readers of English would be expected to have mastered, with automaticity, all levels assessed by fourth grade. Eighty percent is the PAST expectation for mastery, but as we used a Hindi version of the ‘short

form', with fewer than five questions on some levels, we might set the bar for mastery a little lower, somewhere between 67 and 75 percent (i.e., one or fewer errors out of three or four prompts).

For the students at the end of fourth grade in our sample, the mean score in terms of accurate-automatic responses on the composite of phoneme and advanced phoneme levels was 25 percent; the median was 18 percent. At the 75th percentile, members' mean accurate-automatic score was 43 percent. When looking at the Basic Phoneme Level of the PAST-H, the mean score was 33 percent; the median was 29 percent; at the 75th percentile the accurate-automatic response was 57 percent.

By the end of sixth grade, things had improved significantly, but were still below expected levels for fourth grade English readers. For our sixth graders, the mean accurate-automatic score on the Basic-Advanced Composite of the PAST-H was 54 percent; the median was 49 percent. It was at the 75th percentile that members began scoring in the range expected for English readers, with 85 percent of responses being accurate and automatic on the Basic-Advanced Composite. On the Basic Phoneme Level, the mean accurate-automatic score was 63 percent; the median was 86 percent; the score at the 75th percentile was also 86 percent.

Between grades 1 and 8, moderate, positive and significant ($p<.001$) correlations were present between grade level and all kinds of phonological awareness assessed: grade/syllable levels (r=.35); grade/onset-rime levels (r=.38); grade/basic phoneme levels (r=.36); grade/advanced phoneme levels (r=.40); grade/basic-advanced composite (r=.40).

Though all kinds of phonological awareness showed an upward trend between first and sixth grade, we did not see any statistically significant increase in phonological skills from sixth through eighth grade when we analysed that group separately. The small sample sizes at these grade levels makes it impossible to draw any firm conclusions from this, but it

does call for further research. In tables B1-B5 (see Appendix B), we summarise the different kinds of phonological awareness assessed, grade-by-grade.

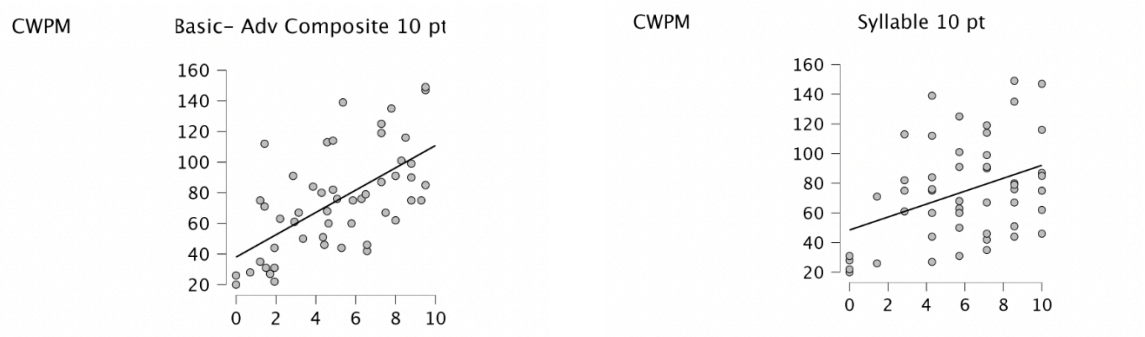
Phonemic Awareness and Reading Skills: Grade Level By Grade Level

Because we assessed reading fluency of students in grades 1-5 with different, unstandardised grade level passages, we were not able to combine those grade level samples into one large sample to evaluate the overall impact of different kinds of phonological awareness on reading skills across grade levels. Instead, at each grade level we have separately analysed the correlations between different baskets of phonological skills measured by the PAST-H and both reading rate (CWPM) and accuracy. This design limitation makes it impossible to directly compare the impact of different phonological skills on reading at different grade levels, but it does allow us to consider the size of the relationship between different kinds of phonological awareness and reading skills within each smaller sample.

In each of our grade level samples, the Basic Phoneme Level score and the Basic-Advanced Composite score were significantly correlated with both reading rate and accuracy; overall, these measures performed similarly. While Syllable Level and Onset-Rime Level Scores were also significantly correlated with reading skills at most grade levels, these relationships were more moderate. For example, Basic-Advanced Composite/CWPM correlations were much stronger than the Syllable Level/CWPM correlations at each grade level: at second grade (r=.66 vs. r=.54); third grade (r=.75 vs. r=.38); fourth grade (r=.61 vs. r=.43); fifth grade (r=.65 vs. r=.54); and sixth-eighth grades (r=.62 vs. r=.39).

Graph 1

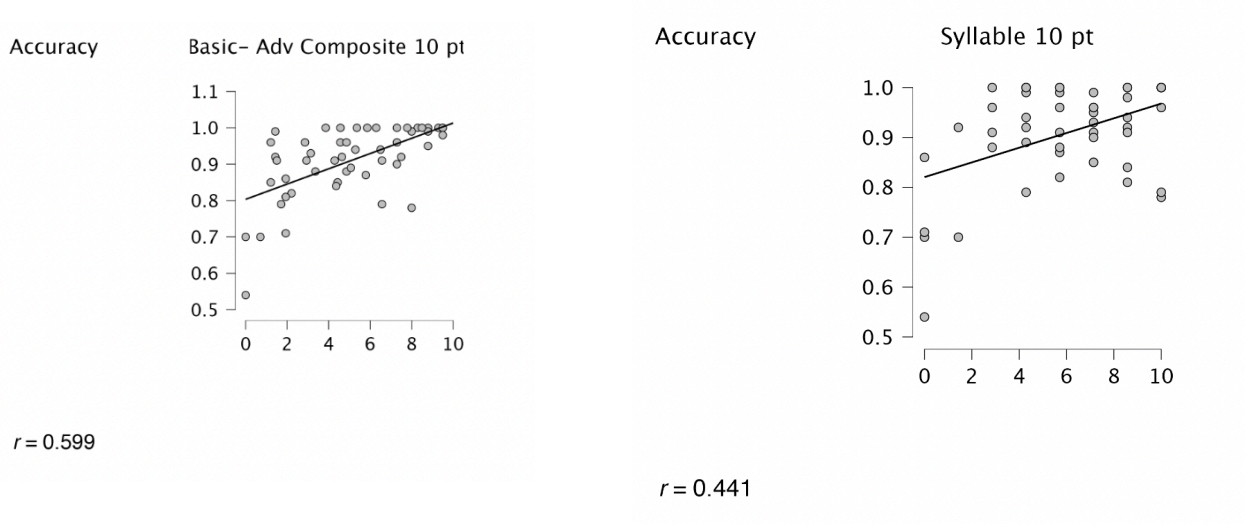
Grades 6-8: CWPM Vs. Basic-Advanced Composite. and Syllable Levels



A similar pattern can also be seen when we look at accuracy's relationship to phonological skills. At each grade level, Basic-Advanced Composite/Accuracy correlation is stronger than the Syllable Level/Accuracy correlation, though the differences are much less pronounced: at second grade (r=.66 vs. r=.63); third grade (r=.42 vs. r=.32); fourth grade (r=.43 vs. r=.42); fifth grade (r=.55 vs. r=.49); and sixth-eighth grades (r=.60 vs. r=.44).

Graph 2

Grades 6-8: Accuracy Vs. Basic-Advanced Composite and Syllable Levels



In Appendix B (Tables B6-B10) we report correlations between correct words per minute, accuracy, and the different baskets of phonological skills measured by the PAST-H at each grade level.

Grade Level Linear Regressions

When we ran linear regressions grade-by-grade for members in 2nd-through 5th grade, and for 6th through eighth grade, we found that Basic Phoneme Level Skills and the Composite of Basic and Advanced Phoneme skills performed similarly and were the best predictors of reading rate and accuracy at each grade level. The models were not improved by adding other variables (e.g., Syllable Level or Onset-Rime Level), and when we put all

variables in backward stepwise regressions at each grade level, Syllable and Onset-Rime Levels fell out each time.

For context, scores on the Basic Phoneme Levels predicted 35-55 percent of the variation in Hindi reading rate and 20 and 49 percent of the variation in accuracy. Looking at fourth grade, the grade where Basic Phoneme Levels did relatively poorly at predicting the variation in CWPM (35 percent), this model indicated that a 10 percent increase in the Basic Phoneme Level score was associated with an increase in rate of 6.5 correct words per minute. In Table B11 (see Appendix B), we summarise predictive power of the two best linear regression models at each grade level for both reading rate and accuracy.

Finally, we converted each level of the PAST into a 5 point scale and ran a correlational and multiple regression analyses at each grade level to see what we might learn about the contribution of individual phonological awareness skills to reading skills. We did not find any individual level that worked as well or consistently as the Basic Phoneme Level Model or the Basic-Advanced Composite Levels model. Of all the individual levels, PAST-H Level I, deletion of a final consonant, emerged as the best single-skill predictor of reading rate, and to a lesser extent, accuracy, but other skills also surfaced as influential in several samples.

Discussion

Language is one thing humans universally share: every human culture has one, and though languages vary in wonderful ways, each one, given time and space to adapt, is capable of expressing an infinite number of different thoughts (Johansson, 2021). But while language itself is ‘natural’ and intrinsic to being human; reading, writing and the skills they demand are not. The vast majority of people require instruction in literacy to learn scripts and become aware of the individual sounds in words. The kind of phonological awareness they construct will almost certainly be influenced by the script they are learning, but many other factors will

also play an important role in this learning. These include the inherent strengths and weaknesses of each learner; the sounds that occur in their home language and the language of instruction; the kinds of songs and poetry they may hear at home; and of course the way they are taught.

Regarding the nature of phonemic awareness in readers of Hindi, our results extend the finding of Prakash et al. (1993) and Bhide et al. (2014), who found that the kind of script readers read influences the kind of phonemic awareness they develop and employ. Those studies focused on the difficulty readers of Hindi and Marathi had identifying the inherent, unwritten schwa. In our sample, readers had great difficulty deleting the first consonants of one syllable words. Though we did not analyse the difference between initial consonant deletions involving inherent schwa and other vowels, the fact that readers were twice as accurate in their automatic substitutions of initial consonants as they were in their initial consonant deletions (45 percent vs. 19 percent), is striking. This suggests that many readers have awareness of the first phoneme–afterall, they can substitute one for another. But they also appear to be aware of the fact that the script does not 'allow' deletions: vowels in an alphasyllabary are always attached to a consonant, and when the constant drops, the form the vowel takes undergoes a radical change in appearance. A deletion that would be written in English as shaam-aam, would look like शाम → आम in Hindi; kab →ab in English would look like कब → अब in Hindi. Though people who reach automaticity in phonemic awareness skills do not imagine letters or akshara as they delete or substitute phonemes, our results add new support to earlier findings that show the way people come to conceive of phonemes in the first place is influenced by the scripts they learn to represent those sounds. On a side note, our study suggests that practising deletion of the first consonant may not be necessary or even helpful to readers of alphasyllabaries.

Like Nag (2007), we also found that phonemic awareness in the readers we assessed appeared to be slower to emerge and less robust than might be expected in readers of English in predominantly English speaking countries. Our experience since collecting this data has confirmed that a few minutes a day of explicit instruction is all that is required for most Hindi readers to make significant gains in phonemic awareness, an experience that is in broad alignment with the reading research in English and with the findings of Wijaythilake et al. (2018). Moreover, we found a minority of students we assessed had in fact acquired relatively strong levels of phonemic awareness in Hindi. Both of these factors suggest that the overall weakness in phonemic awareness that we observed almost certainly stems not from the nature of the script alone, but from an interaction between the nature of the script, where some phoneme-level markers are less prominent than those in an alphabetic script, and the nature of instruction, which often makes little or no effort to give students insight into the phoneme level markers that are clearly present in the script.

As expected based on our past experience (The Community Library Project, 2020, 2021) the reading rate of readers observed in our sample was much lower than the reading rate of typically English readers in the US. It is likely that our sample is not representative of the range of readers we would expect from a population of readers who had received reasonably effective instruction. We don't have good data from effective schools–in fact we don't even know for sure what 'effective' would mean in this context. If taught well, Hindi may be easier to acquire than English–or more difficult. Because of these and other factors, including the non-standardised nature of our assessment tools, direct comparisons with readers of English are impossible, but it is worth noting that, as a group, the readers in our data were much less fluent than their English reading American peers. Hasbrouk and Tindal (2017) collected data from over 100,000 US students and found that the second graders at the 10th percentile in the US read 42 correct words per minute at the end of second grade. The

second grade reader at the 75th percentile in our sample read 43 correct words per minute. At all other grade levels, the readers in our sample at the 75th percentile read slower than 90 percent of their US peers, which is to say they would qualify for intensive reading intervention in most US government schools if they were reading in English.

In terms of accuracy, it is not until third grade that half the readers in our sample were able to decode a text with enough accuracy to engage with it in any meaningful way: at second grade, the median reader read a grade level text with 57 percent accuracy. In third grade, the median accuracy jumped to 92 percent. Still 'frustration' level by most informal reading inventories, but not completely incomprehensible.

Our results regarding reading accuracy should be interpreted with caution because of the range of word reading skills in our sample. For readers who are just learning to read, large jumps in accuray–from 0 or 10 percent to 70 or 80 percent are expected. Similar jumps are not possible for readers who are already reading above 90 percent, but small increases at this level are nonetheless meaningful. For example, even a five percent difference between two readers, one reading with 97 percent and another with 92 percent accuracy is salient: the first reader is likely to have the word reading skills to read the text at an 'independent' or 'instructional' level as measured by most informal reading inventories; the second has word reading skills, but is likely to find the text frustrating and difficult to understand.

There is no way to know to what extent the lack of reading skills in our sample is due to inadequate instruction, lack of access to reading material, factors related to poverty, or other variables. The script itself might even play a role, but unlike many of the researchers cited in this paper, we do not assume this to be the case. We do not believe readers of Hindi need to memorise more than 400 sound symbol relationships; they only need to learn about 60–as long as they are taught in a way that allows them to develop adequate levels of alphasyllabic awareness.

At every grade level in our sample, several kinds of phonemic awareness tasks were significantly correlated with reading fluency and accuracy in Hindi. Although syllabic awareness was also significantly correlated with reading skills in most of our samples, measures of phonemic awareness were more strongly mor consistently correlated with reading rate and accuracy. These findings support our hypothesis that phonemic awareness skills such as phoneme substitution and deletion, however acquired, would contribute to increased reading accuracy and automaticity. The fact that we found such a strong association between certain kinds of phonemic awareness and reading skills may be due to our focus on automatic (e.g., two seconds or less) responses. The importance of automaticity in this context is in line with the findings of Kilpatrick (2012, 2015, 2017) and Kilpatrick and O'Brian (2019) who found that phonemic proficiency as measured by automatic responses on phoneme manipulation tasks is the best predictor of reading skills.

Our use of several 'buckets of skills' also allowed us to get a better sense of what kinds of phonemic awareness are most closely associated with Hindi reading skills. We found that in most of our second to fifth grade samples, the 'bucket' of skills most closely correlated with reading rate and accuracy was the 'Basic Phoneme Level' as measured by the PAST-H. But given that our group as a whole had likely received less than ideal instruction, and the number of skilled readers was less than might be expected had the schools been more effective, it is reasonable to ask if other kinds of phoneme manipulations might better predict truly proficient readers. The Basic-Advanced Composite performed similarly to the Basic Phoneme Level in most grade level samples and did slightly better in our larger 6th to 8th grade sample. There are theoretical reasons to think that basket might be a more stable predictor of reading skills, especially for older readers and readers of more complex text. In any case, one interpretation of these findings is that while we do not know exactly which kind of phonemic manipulations best predict Hindi reading skills, it is clear that in our sample

proficiency with a variety of phonemic manipulation skills was very closely associated with more skilled reading.

Given that our data is cross sectional, our findings do not prove causation. They do, however, provide support for our 'two paths postulate'. Our interpretation of David Share's Self-Teaching Hypothesis (Share, 1995, 2008) and orthographic mapping theory as laid out by Ehri (2005, 2014), Kilpatrick (2015, 2017) and Kilpatrick and O'Brian (2019) suggests that students who acquire an adequate level of alphasyllabic awareness (i.e., insight into the syllabic and phonemic structure of the script they are reading in and the words represented by that script), would be able to learn new complex akshara and new words through an alphasyllabic version of Share's 'self-teaching' mechanism. Students taking this 'alphasyllabic path' would be able to begin effectively reading meaningful text sooner than peers who might take years to develop complete orthographic knowledge through rote learning; this reading in turn might lead to a 'virtuous cycle': people who read more typically become better readers. In line with Nag and Snowling (2012) our postulate holds that readers with better phonemic awareness skills should be more fluent and accurate readers than readers who lack phonemic awareness. This is exactly what our results showed.

As we postulated above, there seems to be another path open to reading acquisition in alphasyllabaries, via syllabic awareness only. Our 'two paths postulate' suggests that readers taking this 'syllablic path' would likely have to learn by rote or pattern recognition most of the hundreds of akshara used in South Asian alphasyllabaries. Taking this route would likely be impossible for some readers, but even those who managed to successfully travel this path would be expected to take longer to get to the point where they could read meaningful text effectively. Consistent with our 'two paths postulate', several studies have shown that for many students in schools taking a 'whole akshara' approach, 'akshara knowledge', (i.e., reading of CV and other complex akshara) is still developing as late as fourth grade (Nag,

2007; Menon et al., 2017; Wijaythilake et al., 2019). We did not attempt to measure 'akhara knowledge', but the reading rate and accuracy we observed makes it clear that for many readers in our sample, reading is an effortful and frustrating process. Only by the end of third grade do we see the median reader decoding with more than 90 percent accuracy–and the median reading rate of those third graders was only 27 correct words per minute, suggesting that reading for them was nothing if not laborious.

Like Nag and Snowing (2012), we found that less fluent, less accurate readers tended to have more limited phonemic awareness. Our interpretation of these findings is that syllabic awareness alone does not enable readers to decode and orthographically map complex akshara efficiently. Though it may be possible to decode and map words in an alphasyllabary with syllable level awareness only, more research would be required to find out whether and how readers taking this 'syllablic path' could ever proceed to reading proficiency– or whether all effective readers of South Asian alphasyllabaries eventually arrive at 'alphasyllabic' insights.

Instructional Implications

There are many factors in reading acquisition that educators and local policy makers have little or no control over: the kind and complexity of the scripts we are teaching, for example, or the language they represent. Similarly, there are child-level factors, like RAN, that are important, but which we cannot directly influence. Then there are problems which have a great impact on learning, but which society as a whole will have to solve: chronic hunger, casteism, class size, gender inequality, and working conditions that makes it impossible for many families to spend time together playing, reading, resting and thinking.

Our library members, and working class Delhi children generally, face many challenges, but we refuse to believe they cannot learn to read well and powerfully, given the right instruction and access to books to read. Here we've focussed on the low hanging fruit,

by asking what teachers can do in our classrooms to improve reading outcomes for students right now.

Our data, our experience, and our interpretation of the research reviewed here suggests that if we put our minds to it, we can do a great deal–right now. From an early age, children will benefit from explicit oral alphasyllabic awareness instruction before and as they begin to learn to read Hindi. Students would first learn to be aware of syllable sounds and would then learn to hear the phonemes in words. Unlike RAN, alphasyllabic awareness can be taught. Our experience and that of teachers who work in alphabetic languages suggests that a few minutes every day in Pre-K/Kindergarten/ Anganwadi and first grade could make a large impact on future reading success.

Our data also suggests that students will benefit early on from an analytical approach to Hindi script instruction where they are taught that matras are separate written forms of the Hindi vowels and that consonants also have a 'half-sound' (i.e, the sound they make without the inherent schwa.) By giving children the tools they need to orthographically ‘map’ complex akshara, they will ‘map’ rather than ‘mug’ the complex symbols we expect them to learn. The sooner they do this, the sooner they can begin reading meaningful text. There are many things teachers can do to encourage this, including asking students to identify through gestures or words, what part of a written word makes a given sound.

The emphasis here has been on phoneme level instruction, in part because that seems to be what is lacking. It is also likely that syllable level features of Indic scripts are more prominent and thus require less explicit instruction; decades of reading research has also established that syllable level awareness develops first, even in readers of alphabetic scripts, where phoneme markers are prominent (Kilpatrick, 2017). The kinds of instructional activities suggested here would not require a complete curricular overall; in 10-20 minutes a day, a few minutes at a time, teachers can call attention to phonemes we hear in words and the

phoneme level markers present in symbols. If we do this consistently, every day, students are unlikely to struggle with matras or complex akshara in general.

Older students who struggle to read effectively–which is to say the majority of the readers in our sample– will likely also benefit from alphasyllabic/phonemic awareness instruction. However it should be noted that in alphabetic scripts phonemic awareness instruction alone has not been found to improve reading among older, struggling readers; some instruction in phonics to help students connect their new phonemic awareness to script features, along with practice reading connected text is also required.

In terms of assessments, with the possible exception of the Onset Rime levels, we found the PAST-H gave meaningful, actionable information about student learning strengths and needs. A mini-version of the Basic Phoneme section of the PAST-H could be adapted as a screener in situations where class size would not allow time to assess the whole class using the PAST-H. Such an assessment could be designed to take about 90 seconds per student, as opposed to six minutes for the full PAST-H.

Even the best alpha-syllabic phonics and phonological awareness instruction will fail if students are not given access to meaningful text to read; access to meaningful text is not a ‘bonus’ it is a necessary feature of any successful reading program, because ‘self-teaching’ cannot happen without reading practice. All students will benefit from free libraries which provide unfettered access to books as well as read alouds which build vocabulary, thinking skills, and a love of reading.

Conclusions

In line with the 'alphasyllabic principle' proposed by Nag and Snowling (2012) and Nag (2022) and the theories of orthographic mapping and self-teaching advanced by Erhi (2005, 2014), Share (1995, 2008), and Kilpatrick (2015, 2017), our results underscore the pivotal contribution of phonemic awareness to reading skills in Hindi. Should these findings

be substantiated by subsequent research, they would significantly reshape our understanding of the instructional practices required to effectively teach reading in Hindi and potentially other South Asian alphasyllabaries.

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Appendix A

The Phonological Awareness Screening Test – Short Form - हिंदी (PAST-S/H-2)

FOR UNIVERSAL SCREENING
Adapted by TCLP from PAST-S by David A. Kilpatrick, Ph.D.
Name: _____ Date: _____ Grade _____
Age _____ School: _____ D.O.B.: _____ Member Number: _____
Evaluator: _____
Correct: English ____/____ Automatic: English ____/____

INSTRUCTIONS: See *Equipped for Reading Success* Chapter 11: "Assessment of Phonological Awareness" for instructions on the PAST.

RESULTS:

	Correct || Automatic
Basic Syllable	____/7 || ____/7
Onset-Rime	____/9 || ____/9
Basic Phoneme	____/7 || ____/7
Advanced Phoneme	____/10 || ____/10
Test Total	**____/33 || ____/33**

Highest Correct Level: _____
Levels not passed below the highest correct level: _____
Highest Automatic Level: _____
Non-automatic levels passed below highest automatic level: _____

Note: The grade levels listed throughout the *PAST* are estimates based on various English based research studies and clinical experience. There are no formalized norms. Hindi progression may vary.

I. SYLLABLE LEVELS

Basic Syllable Levels (D, E2: Preschool to mid kindergarten; E3 - mid kindergarten to mid first) **Level D Deletion :** "बोलो भूकंप। अब बोलो भूकंप पर भू मत बोलो।" समीक्षा: अगर हम भूकंप बोलते हैं, भू बोलने के बिना, हम कंप कहेंगे। ओके? एक और कोशिश करें।
D1 (भू) कंप ____ (आप) का ___ (हम) दर्द ____
D2 (सोम) वार ____ (फेंक) ना___

Correct / Automatic
____/5 A: ____/5

____/2 A: ____/2
Basic Syllable Total:
____/7 A: ____/7

LEVELS E2-3 "बोलो अनुसार। अब बोलो अनुसार पर अ मत बोलो।" समीक्षा: अगर हम अनुसार बोलते हैं, अ बोलने के बिना, हम कहेंगे । ओके?

अनुसार	समझाया
-(अ) नुसार ____	-(सम) → झाया____

II. ONSET-RIME LEVELS

Onset-Rime Levels (Kindergarten to mid first grade)

LEVEL F "बोलो काम अब बोलो काम पर क् मत बोलो।" समीक्षा: अगर हम काम बोलते हैं, क् बोलने के बिना, हम आम कहेंगे । ओके? एक और कोशिश करें

काम	दिन	राज
-(क्) → आम ____	-(द्) → इन ____	-(र्) आज ____
तब	मत	कब
-(त्)→ अब ____	-(म्) → अत ____	-(क्)→ अब ____

Correct / Automatic

____/3 A: ____/3

____/3 A: ____/3

____/3 A: ____/3

Onset-Rime Total:

____/9 A: ____/9

LEVEL G: "बोलो हाल। अब बोलो हाल पर ह् की जगह , ब् बोलो।" समीक्षा: अगर हम हाल बोलते हैं, पर ह् के बजाय, हम ब् बोलते हैं, तो हम बाल कहेंगे। हाल-बाल । ओके?

हाल	दल	गोल
ह्→ ब्= बाल ____	द् → फ्→ फल ____	ग् →ब् = बोल ____

III. PHONEME LEVELS

Basic Phoneme Levels (Early to late first grade)

LEVEL H

H1 (Deletion): "बोलो प्यार। अब बोलो प्यार पर प् मत बोलो।" समीक्षा: अगर हम प्यार बोलते हैं, प् बोलने के बिना, हम यार कहेंगे प्यार -यार। ओके?

प्यार	श्लोक
-(प्)→ यार ____	-(श्) → लोक ____

H2 (Substitution) "बोलो भ्रम। अब बोलो भ्रम पर भ की जगह, बोलो क् ।" समीक्षा: अगर हम भ्रम बोलते हैं, पर भ की बजाय, हम क् कहते हैं, तो हम क्रम कहेंगे। भ्रम-क्रम।

भ्रम	श्रम
भ् → क्= क्रम ____	श् → ड = ड्रम ____

Correct / Automatic

____/4 A: ____/4

____/3 A: ____/3

Basic Phoneme Total:

____/7 A: ____/7

LEVEL I "बोलो खास। अब बोलो सेब पर ब् मत बोलो।" समीक्षा: अगर हम ख़ास बोलते हैं, स् बोलने के बिना, हम खा कहेंगे खास -खा ओके? एक और कोशिश करें

सेब	कोष	भूत
-(ब्)= से ___	-(ष) = को___	-(त्) = भू__

Advanced Phoneme Levels (Late first to late second grade; Level M: Late second grade to adult)

LEVEL J (Substitution) "बोलो कम । अब बोलो कम पर अ की जगह, आ बोलो।" समीक्षा: अगर हम कम बोलते हैं, पर अ की बजाय, हम आ कहते हैं, तो हम काम कहेंगे। कम -काम। ओके? एक और कोशिश करें

कम	मेल
अ → आम = काम ___	ए→आ = माल ___
दम	कौन
अ → आम = दाम ___	औ →इ = किन ____

LEVEL L (Substitution) **"**बोलो काट । अब बोलो काट पर ट की जगह, म् बोलो।" समीक्षा: अगर हम काट बोलते हैं, पर न की बजाय, हम म् कहते हैं, तो हम काम कहेंगे। काट -काम। ओके? एक और कोशिश करें।

काट	मन	बीत
ट्→म् = काम ___	न्→त् = मत ___	त् →स् → बीस ___

LEVEL M

M1 (Deletion) "बोलो बंद। अब बोलो बाँट पर न् मत बोलो।" समीक्षा: अगर हम बाँट बोलते हैं, ण् बोलने के बिना, हम पास कहेंगे बाँट - -बाट।। ओके? एक और कोशिश करें

बंद	कंप	मस्त
-(न्)→ बद ____	-(म्)→ कप ____	-(स्) → मत ___

Correct / Automatic

____/4 A: ____/4

____/3 A: ____/3

____/3 A: ____/3

Advanced Phoneme Total:

____/10 A: ____/10

English reading real words[4] *(x=automatic; 1=correct)*

Cat sit get

slot hope

Notes for Interpreting the PAST-S

This short form is designed for universal screenings. While still longer than the one minute phonological awareness (PA) tasks found on most universal screening batteries, it is shorter than the full PAST (1-4 minutes vs. 3-8 minutes). The PAST-S can be used at any grade level while the PA screeners in the universal screening batteries are discontinued after first grade.

- The PAST-S yields two scores, a "correct" score and an "automatic" score. A level is considered to be passed if the student gets all items on that level correct or at most, one item incorrect. So, 2 out of 3 correct or 3 out of 4 correct are considered passing.
- Many students may pass a level using the correct scoring but not the automatic scoring. This indicates that the student has not mastered that level and depending on the student's

[4] Though we assessed readers on this parameter, we decided that the results obtained were beyond the scope of this study. It might be useful to conduct further research to study the relationship between English reading skills and phonemic awareness in Hindi.

age, may require remediation. See the instructions for the PAST the Equipped for Reading Success manual for how to interpret levels relative to a student's grade.

Appendix B

Table B1

PAST-H Syllable Levels by Grade Level (10 point scale)

Grade:	1 (n=10)	2 (n=19)	3 (n=27)	4 (n=33)	5 (n=27)	6-8 (n=51)
Median	0	4.29	2.86	4.29	4.29	5.71
Mean	1.57	3.91	3.28	3.68	4.82	6.02
Std. Deviation	2.47	3.56	2.96	3.31	3.48	2.97
Minimum	0	0	0	0	0	0
Maximum	7.14	10	8.5	10	10	10

Table B2

PAST-H Onset-Rime Levels by Grade Level (10 point scale)

Grade:	1 (n=10)	2 (n=19)	3 (n=27)	4 (n=33)	5 (n=27)	6-8 (n=51)
Median	0	1.11	1.11	1.11	2.22	3.33
Mean	0.55	2.22	1.69	1.75	3.91	4.14
Std. Deviation	1.20	2.77	1.91	2.24	3.56	2.67
Minimum	0	0	0	0	0	0
Maximum	10	7.78	7.78	10	10	8.89

Table B3

PAST-H Basic Phoneme Levels by Grade Level (10 point scale)

Grade:	1 (n=10)	2 (n=19)	3 (n=27)	4 (n=33)	5 (n=27)	6-8 (n=51)
Median	0	0	2.86	2.86	5.71	7.14
Mean	2.29	2.56	3.44	3.29	4.44	6.05
Std. Deviation	3.64	3.55	3.22	3.30	3.76	3.19
Minimum	0	0	0	0	0	0
Maximum	10	10	10	10	10	10

Table B4

PAST-H Advanced Phoneme Levels by Grade Level (10 point scale)

Grade:	1 (n=10)	2 (n=19)	3 (n=27)	4 (n=33)	5 (n=27)	6-8 (n=51)
Median	0	0	0	1.00	2.00	3.00
Mean	0.40	1.21	1.30	2.39	3.19	4.00
Std. Deviation	0.97	2.20	1.92	2.89	3.31	3.02
Minimum	0	0	0	0	0	0
Maximum	3.00	7.00	6.00	10.00	10.00	10.00

Table B5

PAST-H Basic-Advanced Composite Grade Level (10 point scale)

Grade:	1 (n=10)	2 (n=19)	3 (n=27)	4 (n=33)	5 (n=27)	6-8 (n=51)
Median	0	0	2.14	2.00	3.86	4.86
Mean	1.34	1.88	2.37	2.84	3.82	5.05
Std. Deviation	2.26	2.63	2.32	2.89	3.42	2.84
Minimum	0	0	0	0	0	0
Maximum	6.50	7.79	7.50	10.00	9.29	9.50

Table B6

Grade 2: Pearson's Correlations Between PAST-H Sections, CWPM and Accuracy

Number of Students: 19 (9 girls; 9 boys; 1 non-specified or non-binary)

	CWPM	Acc-uracy	Syllable	Onset-Rime	Basic Phon-eme	Adv. Phon-eme	Basic-Adv. Comp.	PAST Total
CWPM	—-							
Accuracy	0.90***	—						
Syllable	0.54*	0.63**	—					
Onset-Rime	0.47*	0.55*	0.68**	—				
Basic Phoneme	0.66**	0.69**	0.65**	0.81***	—-			
Adv. Phoneme	0.50*	0.50*	0.52*	0.76**	0.54*	—		
Basic-Adv.	0.66**	0.66**	0.66**	0.86***	0.47*	0.50*	—	
PAST Total	0.62**	0.68**	0.82***	0.93***	0.90***	0.90***	0.95***	—

*p<.05, **p<.01, ***p<.001

CWPM=Correct Words Per Minute; Syllable=Syllable Levels; Onset-Rime=Onset-Rime Levels; Basic Phoneme = Basic Phoneme Levels; Adv. Phoneme=Advanced Phoneme Levels; Basic-Adv.= Basic-Advanced Composite; PAST Total= Total Past-H Score.

Table B7

Grade 3: Pearson's Correlations Between PAST-H Sections, CWPM and Accuracy

Number of Students: 27 (14 girls; 13 boys)

	CWPM	Acc-uracy	Syllable Levels	Onset-Rime	Basic Phon-eme	Adv. Phon-eme	Basic-Adv. Comp.	PAST Total
CWPM	—-							
Accuracy	0.67***	—						
Syllable	0.38	0.32	—					
Onset-Rime	0.33	0.34	0.27	—				
Basic Phoneme	0.75***	0.53**	0.51**	0.54**	—-			
Adv. Phoneme	0.56**	0.12	0.42*	0.31	0.60***	—		
Basic-Adv.	0.75***	0.42*	0.53**	0.52**	0.97***	0.79***	—	
PAST Total	0.67**	0.44*	0.73***	0.67***	0.88**	0.77***	0.93***	—

*p<.05, **p<.01, ***p<.001

CWPM=Correct Words Per Minute; Syllable=Syllable Levels; Onset-Rime=Onset-Rime Levels; Basic Phoneme = Basic Phoneme Levels; Adv. Phoneme=Advanced Phoneme Levels; Basic-Adv.= Basic-Advanced Composite; PAST Total= Total Past-H Score.

Table B8

Grade 4: Pearson's Correlations Between PAST-H Sections, CWPM and Accuracy

Number of Students: 33 (18 girls; 15 boys)

	CWPM	Acc-uracy	Syllable	Onset-Rime	Basic Phon-eme	Adv. Phon-eme	Basic-Adv. Comp.	PAST Total
CWPM	—-							
Accuracy	0.69***	—						
Syllable	0.43*	0.42*	—					
Onset-Rime	0.31	0.25	0.64***	—				
Basic Phoneme	0.61***	0.48**	0.69***	0.65***	—-			
Adv. Phoneme	0.52**	0.32	0.55***	0.70***	0.74***	—		
Basic-Adv. Comp.	0.61***	0.43**	0.67***	0.73***	0.94***	0.92***	—	
PAST Total	0.55**	0.43*	0.82***	0.85***	0.89**	0.88***	0.95***	—

*p<.05, **p<.01, ***p<.001

CWPM=Correct Words Per Minute; Syllable=Syllable Levels; Onset-Rime=Onset-Rime Levels; Basic Phoneme = Basic Phoneme Levels; Adv. Phoneme=Advanced Phoneme Levels; Basic-Adv.= Basic-Advanced Composite; PAST Total= Total Past-H Score.

Table B9

Grade 5: Pearson's Correlations Between PAST-H Sections, CWPM and Accuracy

Number of Students: 27 (14 girls, 13 boys)

	CWPM	Acc-uracy	Syllable	Onset-Rime	Basic Phon-eme	Adv. Phon-eme	Basic-Adv. Comp.	PAST Total
CWPM	—-							
Accuracy	0.79***	—						
Syllable	0.54**	0.49**	—					
Onset-Rime	0.58**	0.49**	0.85***	—				
Basic Phoneme	0.67***	0.57**	0.81***	0.81***	—-			
Adv. Phoneme	0.57**	0.50**	0.78***	0.86***	0.87***	—		
Basic-Adv. Comp.	0.65***	0.55**	0.83***	0.86***	0.97***	0.96***	—	
PAST Total	0.63***	0.55**	0.91***	0.95***	0.93**	0.95***	0.97***	—

*p<.05, **p<.01, ***p<.001

CWPM=Correct Words Per Minute; Syllable=Syllable Levels; Onset-Rime=Onset-Rime Levels; Basic Phoneme = Basic Phoneme Levels; Adv. Phoneme=Advanced Phoneme Levels; Basic-Adv.= Basic-Advanced Composite; PAST Total= Total Past-H Score.

Table B10

Grade 6-8: Pearson's Correlations Between PAST-H Sections, CWPM and Accuracy

Number of Students: 51 (14 girls, 37 boys)

	CWPM	Acc-uracy	Syllable Levels	Onset-Rime	Basic Phon-eme	Adv. Phon-eme	Basic-Adv Comp	PAST Total	Grad e
CWPM	—-								
Acc-uracy	0.73***	—							
Syllable	0.39**	0.44**	—						
Onset-Rime	0.52***	0.44**	0.67***	—					
Basic Phon-eme	0.61***	0.60***	0.66***	0.74***	—-				
Adv. Phon-eme	0.52**	0.50**	0.62***	0.79***	0.67***	—			
Basic-Adv. Comp.	0.62***	0.60***	0.70***	0.83***	0.92***	0.88***	—		
PAST Total	0.58**	0.56***	0.82***	0.91***	0.87**	0.90***	0.97***	—	
Grade	0.17	0.14	-0.01	0.07	0.006	-0.01	.002	0.01	___

CWPM=Correct Words Per Minute; Syllable=Syllable Levels; Onset-Rime=Onset-Rime Levels; Basic Phoneme = Basic Phoneme Levels; Adv. Phoneme=Advanced Phoneme Levels; Basic-Adv.= Basic-Advanced Composite; PAST Total= Total Past-H Score.

Table B11

Comparison of Top Two Models Measuring Predictive Value of Two 'Baskets' of Phonemic Awareness on Reading Rate and Accuracy at Different Grade Levels.

Grade Level	Number of Students	R sq-adj Basic Phoneme/ CWPM	R sq-adj Basic-Advanced Composite/ CWPM	R sq-adj Basic Phoneme/ Accuracy	R sq-adj Basic-Advanced Composite/ Accuracy
2	19	0.40	0.40	0.44	0.41
3	27	0.55	0.55	0.25	0.14
4	33	0.35	0.35	0.20	0.16
5	27	0.43	0.39	0.30	0.28
6-8	51	0.35	0.37	0.34	0.35

Note. All models significant (P=0.03 or better)