

# Is a Phone-Based Literacy Assessment a Reliable and Valid Measure of Children's Reading Skills for Low Resource Settings?



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## INTRODUCTION

COVID19-related school closures have forced education researchers to pivot from in-person to remote research methods. Researchers have leveraged technology, like Skype and Zoom, to collect data remotely. However, the use of technology-based remote data collection methods is often not feasible for participants who may not have access to smartphones/computers and adequate internet service. These barriers are further exacerbated in rural, low-resource communities, particularly in low and middle income countries.

We developed and deployed a simple mobile phone-based language and literacy assessment for primary-school children participating in an ongoing study of reading development in rural Côte d'Ivoire.

### Research questions:

1. Is a phone-based literacy and language assessment reliable and valid?
2. Is it as reliable and valid as an existing in-person literacy and language assessment?

## METHODS

**Participants.** 692 ( $M_{age}=10.8$  years;  $SD_{age}=1.45$  years) fifth grade children from 32 schools in rural Côte d'Ivoire participated in this study. Children were a part of a larger study of reading development.

**Procedure.** Children completed in-person assessments in Nov 2019, and phone-based assessments one year later in Nov 2020.

**In-person:** Children completed phonological awareness (PA), vocabulary, oral language comprehension, and reading (letter, word, pseudoword and passage reading) tasks (EGRA; Gove & Wetterberg, 2011; RTI International, 2015; Woodcock, McGrew & Mather, 2001; Bruce, 1964; Yopp, 1995).

**Phone-based:** Children completed the same tasks using text messaging and voice call over a simple mobile phone.



**Figure 1.** Picture of an experimenter and a child completing the in-person assessment.

**Figure 2.** Picture of a child using the simple mobile phone to complete the phone-based assessment.

## RESULTS

**Table 1.** Reliability (Cronbach's alpha and inter-item mean).

Tasks	Cronbach's Alpha		Inter-item Mean		Alpha Coefficient
PA	0.81	0.81	0.11	0.29	$t(677.5)=0, p=1$
Vocabulary	0.62	0.59	0.14	0.13	$t(676)=1.126, p=.260$
Letter Reading	0.94	0.96	0.15	0.18	$t(676)=6.515, p<.001$
Word Reading	0.85	0.82	0.11	0.19	$t(689)=3.755, p<.001$
Pseudoword Reading	0.87	0.83	0.17	0.09	$t(421)=4.326, p<.001$

■ in-person

■ phone-based

**Reliability - Internal Consistency.** Overall, there was high internal consistency for the phone-based assessment and in-person assessment.

No significant differences between the phone-based and in-person alpha values for PA and vocabulary tasks were observed. However, the phone-based letter, word, and pseudoword reading tasks showed significantly different alpha values compared to the in-person reading tasks (higher for phone-based letter reading, but higher for in-person based word and pseudoword reading).

**Table 2.** Regression results for in-person and phone-based measures.

	Letter Reading		Word Reading		Pseudoword Reading	
	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)
PA	3.77(0.21)***	2.97(0.27)***	3.33(0.14)***	2.88(0.19)***	2.59(0.11)***	3.12(0.26)***
Vocabulary	0.77(0.18)***	1.38(0.29)***	0.40(0.11)***	0.72(0.22)**	0.38(0.09)***	1.24(0.31)***
R <sup>2</sup>	0.43	0.27	0.56	0.33	0.57	0.43
Model	$F(2, 656)=247.7***$	$F(2, 676)=124.2***$	$F(2, 657)=421.7***$	$F(2, 676)=168.5***$	$F(2, 661)=433.2***$	$F(2, 413)=156.9***$
N	659	679	660	679	664	416

■ in-person

■ phone-based

$p<.05^*$ ,  $p<.01^{**}$ ,  $p<.001^{***}$

**Criterion Validity.** PA and vocabulary, known predictors of reading, should predict reading scores across both in-person and phone-based measures. We found that PA and vocabulary for both the in-person and the phone-based assessments predicted letter, word, and pseudoword reading. PA was more robustly associated with in-person than phone-based reading scores, but vocabulary was more robustly associated with phone-based reading scores. R<sup>2</sup> values were higher for all in-person versus phone-based models.

**Table 3.** Correlations between in-person and phone-based measures.

Measures	PA	Vocabulary	Letter Reading	Word Reading	Pseudoword Reading
PA	.59	-	-	-	-
Vocabulary	-	.48	-	-	-
Letter Reading	-	-	.58	-	-
Word Reading	-	-	-	.77	-
Pseudoword Reading	-	-	-	-	.77

■ in-person

■ phone-based

**Convergent Validity.** Moderate to strong correlations observed between in-person and phone-based assessments, indicating validity.

## DISCUSSION

In this study, we developed a simple mobile phone-based language and literacy assessment to be used in low-resource settings.

**1. Is a phone-based language and literacy assessment reliable and valid?** Yes. A phone-based language and literacy assessment is a reliable and valid measure, seen by the high internal consistency and moderate to high correlations.

**2. Is a phone-based language and literacy assessment as reliable and valid as an existing in-person language and literacy assessment?**

Our phone-based assessment had different internal consistency for reading tasks compared to an in-person assessment. We also found differences in the statistical relationships between PA and vocabulary, and letter, word, and pseudoword reading measures for phone-based and in-person tasks, suggesting a need for additional analysis (including factor analysis for validity).

Our preliminary work supports the reliability and validity of simple phone-based language and literacy assessment. We show that low-cost technologies offer the potential to measure children's literacy and language development.

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