



Commissioned Paper
April 2022

Examining Individual Differences in PIAAC Literacy Performance: Reading Components and Demographic Characteristics of Low-Skilled Adults From the U.S. Prison and Household Samples

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Suggested Citation: Tighe, E. L., Reed, D. K., Kaldes, G., Talwar, A., and Doan, C. (2022). *Examining Individual Differences in PIAAC Literacy Performance: Reading Components and Demographic Characteristics of Low-Skilled Adults From the U.S. Prison and Household Samples*. Retrieved from PIAAC Gateway website: [insert link]. Washington, D.C.

This project has been funded by the American Institutes for Research through a contract with the National Center for Education Statistics (NCES) of the U.S. Department of Education. This report is based on 2012/2014 PIAAC data released in March 2016 and 2014 PIAAC Prison Study data in November 2016. The views expressed in this paper do not necessarily reflect the views or policies of the American Institutes for Research, National Center for Education Statistics, or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement of same by the U.S. Government.

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Acknowledgments

We would like to thank the AIR PIAAC team for their generous financial support of this paper as well as their time, efforts, and feedback on multiple drafts. We would also like to thank our two anonymous external reviewers for their helpful comments.

Examining Individual Differences in PIAAC Literacy Performance: Reading Components and Demographic Characteristics of Low-Skilled Adults From the U.S. Prison and Household Samples

In the most recent assessment by the Programme for the International Assessment of Adult Competencies (PIAAC), approximately 19% of adults in the United States scored at or below Level 1 in literacy (National Center for Education Statistics [NCES], 2019a). Adults who performed at Level 1 were only able to identify one key piece of information from short real-world texts, and adults who scored below Level 1 struggled with this basic task. Because the PIAAC is based on a nationally representative sample, this grim finding suggests that almost one in five adults have difficulty understanding everyday texts, which include key documents like workplace memos, medical forms, and notices from children's schools. Thus, these adults' low reading skills impede their functionality in today's information-driven society.

In addition to gathering data on the U.S. household population, the PIAAC Survey of Incarcerated Adults was conducted during the 2014 National Supplement phase of data collection to provide information on this particularly vulnerable segment of adults (Rampey et al., 2016). Consistent with previous research on the reading abilities of incarcerated adults (e.g., Shippen et al., 2010), Rampey et al. found significantly lower average PIAAC literacy scores among the U.S. prison sample ($M = 249$) in comparison to the household sample ($M = 270$), with a significantly higher proportion of incarcerated (29%) than non-incarcerated (19%) adults scoring below Level 2.

PIAAC provides a measure of overall literacy skills for all U.S. adults who took either the computer-based or paper-based assessment. However, foundational reading skills assessed as part of the Reading Components Supplement were administered to, and therefore are only

available for, adults who took the paper-based assessment (due to having no prior computer experiences, failing a basic computer test, refusing the computer-based assessment) or adults who failed a test of basic literacy and numeracy skills. This study focuses on the low-skilled adult population who completed the paper-based PIAAC assessment. Specifically, we examined their performance on the Reading Components Supplement (i.e., print vocabulary knowledge, sentence processing, passage comprehension), the relationships of those subtests to their overall literacy performance, and the extent to which these relationships vary between the low-skilled U.S. household and prison samples.

The expressed intent of the PIAAC prison survey was to inform the development of education and training programs for incarcerated adults (see Rampey et al., 2016, p. 1). Gaining further insights about foundational reading skills and their relationship to overall literacy performance could better tailor these education and training programs. Previous studies have documented a link between correctional education outcomes and adults' successful transition back to their communities (Bozick et al., 2018; Davis, 2019; Spycher et al., 2012).

Educational programs in prisons can be provided in four areas: a. adult basic education (ABE) to build novice reading abilities; b. adult secondary education (ASE) to achieve functional academic skills or high school equivalency; c. career and technical education to become certified in skilled trades and; d. postsecondary education for credits toward associate or bachelor's degrees (Reed, 2015). ABE and ASE programs would be most relevant to building the literacy abilities of adults identified as having low skills, which is the focus of the present study. Non-incarcerated adults in similar programs have exhibited a wide range of abilities and skill needs (Tighe & Schatschneider, 2016a).

Yet, little is known about how various foundational reading component skills (e.g., vocabulary knowledge, sentence comprehension) contribute to the overall literacy abilities of incarcerated adults or whether these relations differ from non-incarcerated adults or by other individual characteristics (e.g., age, race, educational attainment, language background, disability, health, and maternal and paternal education levels). Given what we know about the development of reading ability and the heterogeneity of struggling adult readers, as reviewed in the sections that follow, such information would better inform the design of instruction for incarcerated adults. That is, knowing the specific component skill strengths and weaknesses of these adults can help to better target the instruction delivered in ABE and ASE programs and improve literacy outcomes (Johnson et al., 2017; Si et al., 2016).

Theoretical Models of Reading Comprehension

In order to establish effective, evidence-based interventions for struggling adult readers, it is important to identify accurate models of skills that underlie reading comprehension. The Simple View of Reading (SVR; Hoover & Gough, 1990) is a well-recognized model that points to word reading and language abilities as fundamentally important to reading comprehension. Previous research has investigated the SVR amongst both adult (Sabatini et al., 2010; Talwar et al., 2021) and young adult struggling readers (Braze et al., 2007). Sabatini and colleagues (2010) conducted a confirmatory factor analysis that examined the relations of latent factors of word recognition and language comprehension to reading comprehension. Word recognition and language comprehension were significant predictors and accounted for 62.5% of the variance in reading comprehension. In addition, the authors examined the related component skills of vocabulary and fluency. Although these latter skills did not uniquely predict reading comprehension, they demonstrated a close association with word reading.

Studies with struggling adult readers not explicitly testing the SVR also have suggested that language comprehension (e.g., Mellard & Fall, 2012) and decoding (Tighe et al., 2019a; To et al., 2016) are important to reading comprehension amid other types of component skills (Tighe & Schatschneider, 2016a). A 2016 meta-analysis of 16 studies with struggling adult readers found that six component skills emerged as strong predictors of reading comprehension: language comprehension, decoding, morphological awareness, fluency, oral vocabulary knowledge, and working memory (see Tighe & Schatschneider, 2016a). In a recent study, Tighe et al. (2019a) found that metalinguistic skills (orthographic awareness [letter and spelling patterns], phonological awareness [sound units], and morphological awareness [smallest units of meaning, prefixes/suffixes]) predicted reading comprehension both directly and indirectly through oral vocabulary and decoding. The component skills accounted for 91% of the overall variance in reading comprehension. Broadly, the results from these studies point to a model of reading comprehension for struggling adult readers that draws upon a wide array of component skills. Thus, better identifying the underlying skill areas of need could assist in planning more targeted instruction for improving adults' reading comprehension outcomes.

Little is known about the contribution of different types of components skills to a more general measure of struggling adult readers' and incarcerated adults' literacy abilities. Moreover, a growing body of literature suggests that child-based measures may not be valid for adults (Nanda et al., 2014; Pae et al., 2012), and few assessments are presently available to evaluate the range of literacy abilities within the adult population. Historically, four large-scale comparative literacy assessments designed specifically for adults (the National Adult Literacy Survey [NALS], the International Adult Literacy Survey [IALS], the National Assessment of Adult Literacy [NAAL], and the Adult Literacy and Life-skills Survey [ALL]) were administered

during the 1990s and 2000s to assess text-based skills commonly used in daily living (e.g., understanding news stories, locating information in graphs, calculating a tip). The NALS and the NAAL collected data from the general population as well as incarcerated adults. However, these assessments only provide information related to a broad range of literacy competencies, not indicators of particular component skills.

Unlike previous large-scale literacy assessments, PIAAC (administered to adults in the general population and incarcerated adults) is unique in that the dataset contains information related to adults' broader literacy performance as well as a Reading Components Supplement. The supplement was designed to assess foundational component skills underlying higher literacy abilities, including print vocabulary, sentence processing, and passage comprehension. A deeper understanding of the unique contributions of these skills to written and print materials in daily living could guide interventions aimed to improve these activities amongst both struggling adult readers and incarcerated adults. Therefore, the PIAAC serves as an appropriate extant dataset for investigating the relations between specific component skills and general literacy abilities in these two groups (i.e., incarcerated and non-incarcerated adults with low literacy skills).

Individual Differences in Adult Literacy Performance

General population. Adults who struggle with reading are heterogeneous with respect to age, gender, race, language background, learning disability (LD) status, and health status (Comings & Soricone, 2007; Lesgold & Welch-Ross, 2012). Prior research suggests that some of these demographic characteristics are associated with different skill levels or profiles. Relatively lower-skilled individuals in this population are more likely to identify as African American, report an LD diagnosis, and rate their overall health as poor or fair (Mellard et al., 2013). In terms of language background, English learners include adults with profound literacy deficits as

well as adults who are weak in oral language abilities but not in decoding skills (MacArthur et al., 2012; Strucker & Davidson, 2003). Furthermore, emerging evidence indicates that older adults tend to perform better on language comprehension tasks and worse on tasks measuring word-level processing (Talwar et al., 2020).

Prison population. Compared to the general U.S. population, incarcerated adults are more likely to be male and individuals of color, have been born in the U.S., report having an LD, have dropped out of school, and have experienced difficulty with employability (Bureau of Justice Statistics, 2018; Newton et al., 2018; Rampey et al., 2016; Spycher et al., 2012; Tewskbury & Stengel, 2006). Little is known about how these characteristics are associated with the literacy performance of incarcerated adults, but one study found that age, LD status, educational attainment, job prior to incarceration, and prison library use moderated the relations between PIAAC sentence processing and literacy or passage comprehension (Tighe et al., 2019b). That is, across age intervals, incarcerated adults with low sentence processing performance and who self-reported having a LD or being unemployed prior to incarceration had significantly lower literacy performance. In addition, those who had low sentence processing performance and were ages 16-24, rarely or never used the prison library, or did not complete any additional education while incarcerated had significantly lower passage comprehension performance.

However, Tighe et al. (2019b) did not examine whether there were different relationships among individual characteristics and PIAAC performance in the U.S. household sample compared to the prison sample. This comparison of the two samples was explored in earlier analyses, which indicated that incarcerated adults with some (e.g., all age intervals, those born in the U.S.) but not all (e.g., those with self-reported race/ethnicity of Black or Hispanic, all

analyzed educational attainment levels) characteristics had significantly lower literacy scores than non-incarcerated test-takers of similar demographics (Rampey et al., 2016). Therefore, the present study sought to expand on the work of both Rampey et al. and Tighe et al. by focusing on the performance of the subpopulation of low-skilled adults (at or below Level 2 in literacy) and including the PIAAC Reading Components Supplement measures to compare incarcerated with non-incarcerated test-takers.

Purpose and Research Questions

The purpose of the present study was to examine potential differences between low-skilled incarcerated adults and their counterparts in the general U.S. household sample who completed the Reading Components Supplement based on individual characteristics reported by PIAAC test-takers on the background questionnaire. Thus, our primary research questions were: Are demographic characteristics (i.e., age, race/ethnicity, educational attainment, self-reported LD status, native language status, overall health, and parental education levels) related to the literacy performance of low-skilled adults (U.S. household and prison sample)? Do the relationships of demographics to literacy performance vary based on sample type (U.S. household vs. prison sample)? Given the exploratory and novel nature of directly comparing these two samples, we did not make specific hypotheses about each demographic category in relation to literacy performance, but instead selected these demographics based on the heterogeneity of the samples included.

In addition, we sought to examine the relations of the PIAAC Reading Components Supplement to literacy performance for the low-skilled adult prison sample and U.S. household sample. Specifically, we asked: What are the relationships of the component skills (print vocabulary, sentence processing, passage comprehension) and the component skill timers to

literacy for the a low-skilled prison and general household samples (at or below Level 2 in literacy)? To address this, we considered a combined low-skilled group (from the prison and household samples) as well as examining whether sample type (prison vs. household) moderates the component skill-literacy relations. Based on previous models of reading (e.g., SVR) with samples of struggling adult readers, we anticipated that stronger reading component skills and speed (specifically less time spent) would be predictive of better literacy performance in both samples.

Method

The analytic sample used in the present study was composed of low-skilled readers who completed the Reading Components Supplement of the PIAAC. As pointed out in the introduction, far more research has been conducted with low-skilled readers who are not incarcerated than with those who are in prison, so this study included the sample of low-skilled incarcerated adults and compared their demographics and performance with that of the low-skilled household sample.

Participants

Data are drawn from the 2012 and 2014 U.S. household PIAAC sample as well as the 2014 U.S. prison PIAAC sample. Broadly, PIAAC is an international survey that was developed to assess the cognitive and workplace competencies of adults (ages 16-74). The 2012 and 2014 household sample included a nationally representative sample of 8,670 U.S. adults. The PIAAC Prison Study mirrored the cognitive domains assessed in the household sample and was collected on 1,270 incarcerated adults (ages 18-74) across 98 federal, state, and private prisons. For the purposes of our study, participants must meet the criteria of low-skilled (i.e., at or below Level 2 on PIAAC literacy) and must have completed the Reading Components Supplement ($Ns = 1,319$;

15.21% for the household sample and 338; 25.63% from the prison sample). For reference, 18.44% of the household sample and 34.30% of the prison sample completed the Reading Components Supplement (across all literacy proficiency levels). Approximately, 53.80% of the household sample and 71.52% of the prison sample fell at or below Level 2 (taking either the paper-based Reading Components Supplement or computer-based portion). Although the majority of those that completed the paper-based Reading Components Supplement are low-skilled, there are a variety of reasons why a participant may complete the supplement (e.g., no prior computer experience, opted out of the computer-based assessment; see Table 1).

Measures – Cognitive Assessments and Background Questionnaire

Our analyses included the literacy domain and Reading Components Supplement (print vocabulary, sentence processing, and passage comprehension) from the cognitive domains. The same literacy and Reading Components Supplement items were administered to the prison and household samples. In addition, we used several common questions from the household and prison background questionnaires (age, race/ethnicity, native language status, self-reported LD, overall health, educational attainment, father's education, and mother's education). All measures and questions are described in further detail below.

Literacy Domain

The literacy domain aimed to tap underlying cognitive skills as well as applied literacy skills that were deemed necessary to meet the demands of adults living and working during the 21st century (PIAAC Literacy Expert Group, 2009). This domain included multiple texts and formats (e.g., electronic texts, narrative texts, and interactive texts across an array of media). The assessment was given in paper format (24 items) and computer-adaptive (possible 52 items). Scale scores on this domain range from 0-500 (also classified as literacy proficiency levels). For

the purposes of our analyses we considered adults performing at or below Level 2 (cutoff score of below 276; see <https://nces.ed.gov/surveys/piaac/litproficiencylevel.asp> for descriptions of each literacy proficiency level).

Reading Components Supplement

The Reading Components Supplement was administered to better understand the foundational skills that compose low-skilled adults' literacy abilities (Sabatini, 2015; Sabatini & Bruce, 2009). This supplement was either completed after the respondents completed the other cognitive domains (e.g., literacy, numeracy) or completed if respondents failed the literacy/numeracy screenings in paper-and-pencil or computer format. The supplement was only administered in paper-based format to a subsection of the total household and prison samples (primarily low-skilled). The three components assessed included print vocabulary, sentence processing, and passage comprehension. These components were always administered in the same order. Although test-takers had unlimited time to complete the components, the proctor recorded how long each component took. For the purposes of the current study, we included only low-skilled adults (at or below Level 2 in literacy) who took the Reading Components Supplement from the household and prison samples.

Print Vocabulary

This 34-item task examined the ability to recognize words utilizing frequent and familiar vocabulary items (as opposed to technical or academic terms). Concrete, receptive vocabulary items were chosen to make the assessment cross-culturally relevant. The test-taker was shown four pictures and asked to select the correct vocabulary term from a list of four answer choices. The alternative answer choices were designed to be semantically or orthographically similar to

the correct choice. For example, the test-taker may be shown a picture of an ear with the following answer choices: “ear,” “egg,” “lip,” and “jar” (Sabatini, 2015).

Sentence Processing

This 22-item task required processing semantic and syntactic structure, decoding words, and properly relating words to understand the entire sentence meaning. The test-taker was presented with sentences of varied length and complexity and asked to make a judgment (yes/no) as to the sensibility of the sentence (either in relation to common knowledge or in relation to the internal logic of the presented sentence). For example, “A comfortable pillow is soft and rocky” (Sabatini, 2015). Sentence length and complexity varied in order to increase or decrease the processing demands of the task.

Passage Comprehension

This 44-item task assessed silent reading efficiency and comprehension of multi-paragraph prose texts. The test-taker was presented with four passages containing embedded items. The passages included narrative, persuasive, and expository texts. The items followed a forced-choice cloze procedure in which the test-taker was asked to select the correct answer choice (between two options). The incorrect answer choice was always grammatically or semantically wrong. For example, “The price will go up by twenty percent starting next wife/month” (excerpt from a longer passage; Sabatini, 2015).

Background Questionnaire

The background questionnaire was developed to encompass a comprehensive set of participant demographics and relevant correlates of interest to the main PIAAC domains (literacy, numeracy, and problem-solving in technology rich environments) that also would be cross-culturally valid (OECD, 2011, 2013). For the household sample, the questions fall into five

broad categories: basic demographics, educational attainment and participation, labor-force status and employment, social outcomes, and literacy and numeracy practices and use. The prison sample included the same questions as the household, where applicable, as well as prison-specific questions (e.g., use of prison library services, whether the test-taker had a prison job). We used several of the background items, with the caveat that the questions must be the same between the prison and household samples (see Table 2 for specific variables and our coding of each variable for our analyses).

Results

Descriptive and Correlational Analyses of the Sample

Our final merged sample of low-skilled U.S. prison and low-skilled U.S. household test-takers (2012/2014 cohorts) that completed the Reading Components (at or below Level 2 in literacy) includes 1,657 adults (1,319 from the household sample and 338 from the prison sample). Table 3 reports frequency data on gender as well as our demographic characteristics of interest (age, race/ethnicity, native speaker status, LD status, overall health, educational attainment, father's education, and mother's education) for the combined sample. Table 4 reports means and standard deviations of cognitive skill performance (literacy, print vocabulary, sentence processing, passage comprehension) and amount of time spent on each reading component skill task for the combined sample as well as separately by the prison and household samples.

We present correlations among cognitive skills (literacy, print vocabulary, sentence processing, passage comprehension) and component reading skill timers for the combined sample (Table 5) and separately by the prison and household samples (Table 6). Population-weighted estimates of correlations were computed using the `repest` command in STATA version 16. As expected, there were significant, positive relationships among the cognitive skills for both

groups ($p < .05$). In particular, print vocabulary and sentence processing ($r = .70$ for prison; $r = .77$ for household), sentence processing and passage comprehension ($r = .69$ for prison; $r = .80$ for household), and the sentence processing timer and the passage comprehension timer ($r = .70$ for prison; $r = .67$ for household) exhibited the strongest relationships for both samples. Of interest, the component skill timers showed different patterns of observed correlations between the prison and household samples. For the household sample, the print vocabulary timer exhibited significant, negative relationships with all other cognitive skills whereas the sentence processing and passage comprehension timers only had significant, negative relationships with literacy. For the prison sample, all component skill timers exhibited significant, negative relationships with other cognitive skills (with the exception of non-significant, negative correlations between print vocabulary performance and sentence processing and passage comprehension timers [$r_s = -.15, -.16$, respectively] and a non-significant, positive relation between the passage comprehension timer with passage comprehension performance [$r = .11$; see Table 6]).

Research Question 1

To address our first research question, we computed a series of frequencies in STATA Version 16 to examine percentages on our demographic characteristics of interest (age, race/ethnicity, native speaker status, LD status, overall health, educational attainment, father's education, and mother's education) for each sample. We report the unweighted sample sizes and population-weighted percentages separately by low-skilled prison and household samples who completed the Reading Components Supplement in Table 7. Of note, the prison sample reported higher rates of LD (29.1%; 13.2%, respectively), higher rates of not knowing mother's or father's educational level (14.3% mother's and 24.9% father's; 5.9% mother's and 9.9% father's,

respectively), and higher rates of having less than a high school diploma (49.9%; 36.5%, respectively). In addition, the prison sample had lower rates of older adults (55+; 16.3%), higher rates of Black adults (45.3%), and lower rates of White adults (23.8%) compared to the household sample (48.1% age 55+, 19.5% Black, and 48.0% White; see Table 7 for additional percentages).

To further address this question, we ran independent samples *t*-tests between literacy performance (across and within each literacy proficiency level) and sample type (prison and household; Figure 1). We also ran a series of multiple regression analyses to investigate whether demographic characteristics were predictive of literacy performance (Table 8) and whether any of the demographic-literacy relations were moderated by sample type (household vs. prison; Table 9). We report detailed results below. For all analyses, we considered an alpha level of below .05 as our criterion for significant effects.

Literacy Proficiency Level

We ran independent samples *t*-tests between literacy performance (across and within each proficiency level: below Level 1, Level 1, Level 2) and sample type (prison, household). On average, the low-skilled prison sample had significantly higher literacy performance ($M = 222.95$) compared to our low-skilled household sample ($M = 214.22$; $t = 2.35$, $p < .05$). However, there were no significant differences between the prison and household samples in literacy performance within any of the proficiency levels (below Level 1, Level 1, Level 2; see Figure 1 for all mean comparisons by sample, $p > .05$). Given the low unweighted sample sizes within some of the literacy levels, in particular for the prison sample (e.g., only 38 participants below Level 1), we were not able to consider demographic differences by sample type and literacy

proficiency level. We instead only considered interactions between sample type and demographic characteristics in our regression analyses.

Relations of Demographics and Sample Type to Literacy Performance

First, we ran a multiple regression analysis in STATA Version 16 (repest command) with sample type (prison/household) and all demographics of interest (age, race/ethnicity, native speaker status, LD status, overall health, educational attainment, father's education, and mother's education) as predictors of literacy performance (Table 8). The repest command allowed us to compute population estimates and proper standard errors and use all 10 literacy plausible values in our analyses. Prior to entering them into the regression model, all demographics with more than three categories (see Table 2) were dummy coded to account for multiple categories. Specifically, age had 3 dummy codes (D1: 35-44, D2: 45-55, D3: 55+ with younger <24-34 as the reference group), race/ethnicity had 2 dummy codes (D1: Black, D2: Hispanic, with White as the reference group), health status had 2 dummy codes (D1: Excellent/Very Good, D2: Good, with Fair/Poor as the reference group), and father's and mother's educational attainment each had the same three dummy codes (D1: College Degree or Higher, D2: H.S. Diploma or Some College, D3: Don't Know, with Less than H.S. Diploma as the reference groups). All predictors accounted for 28% of the variance in literacy performance. Race/ethnicity (D1 and D2), native speaker status, LD status, health status (D1 and D2), educational attainment, and sample type were all significant predictors of literacy performance.

In particular when compared to Whites, identifying as Black or Hispanic, being a non-native English speaker, self-reporting as having a LD, having fair/poor health (compared to either good or excellent/very good), and having lower educational attainment were predictive of lower literacy performance ($p < .05$; see Table 8 for estimates). In addition, being in the prison

sample (compared to the household sample) was predictive of higher literacy performance, controlling for all demographics ($p < .05$; see Table 8). Age (D1-D3), father's educational attainment (D1-D3), and mother's educational attainment (D1-D3) were not significant predictors of literacy performance.

Our first regression model established which demographics were uniquely predictive (race/ethnicity, native speaker status, LD status, health status, and educational attainment) of literacy performance. Our second regression analysis was to test whether sample type (prison/household) moderated any of the significant demographic-literacy relations (Table 9). Thus, we computed interaction terms for only significant predictors identified in our first model (Sample*D1_Black, Sample*D2_Hispanic, Sample*Native Speaker, Sample*LD status, Sample*D1_Excellent Health, Sample*D2_Good Health, and Sample*Educational Attainment). We included all main effects (demographics, sample type), interactions, and demographics not included in interactions (age and parental education) in our second regression model. Similar to the previous model, all predictors accounted for 28% of the variance in literacy performance. Findings suggest there were no significant interactions ($p > .05$) which indicates that the relations of race/ethnicity, native speaker status, LD status, health status, and educational attainment to literacy performance did not vary by sample type (prison/household). Significant main effects were similar to our first regression model, specifically, identifying as Black or Hispanic (compared to White), being a non-native English speaker, self-reporting as having a LD, having fair/poor health (compared to either good or excellent/very good), and having lower educational attainment were predictive of lower literacy performance ($p < .05$; see Table 9 for estimates). The only difference with this model was that the main effect of sample type was no longer predictive of literacy performance ($p > .05$; Table 9).

Research Question 2

To address our second research question, we ran a series of multiple regression analyses to explore the relationships of the Reading Components Supplement skills (print vocabulary, sentence processing, passage comprehension) and the three component skill timers to literacy performance. First, we ran the multiple regression analysis on the low-skilled combined sample (prison and household) using STATA Version 16 (repest command). The six predictors accounted for 34% of the variance in literacy performance. Sentence processing, passage comprehension, and the print vocabulary and passage comprehension timers emerged as significant predictors of literacy performance ($p < .05$; see Table 10 for estimates). In particular, higher accuracy on the sentence processing and passage comprehension items and faster response times on the print vocabulary and passage comprehension items were predictive of higher literacy performance.

Next, we ran the same multiple regression model in STATA Version 16 but controlled for sample type (SAMPFLAG) as well. The seven predictors still accounted for 34% of the variance in literacy performance. Similarly, sentence processing, passage comprehension, and the print vocabulary and passage comprehension timers were unique predictors of literacy performance ($p < .05$; see Table 11 for estimates). Sample type was not a significant predictor ($p > .05$), indicating that controlling for other skills in the model, there was no difference in literacy performance by sample type (prison vs. household).

We also considered whether sample type moderated the relationships between the unique significant predictors (sentence processing, passage comprehension, and the print vocabulary and passage comprehension timers) and literacy performance. Adding an interaction term would allow us to explore whether there was a different pattern of relations between the reading

component skills and timers and literacy performance for the prison versus household samples. We ran a series of four regression models, each model included the original 7 predictors (three component skills, three component skill timers, and sample type) and one additional interaction term. Interactions were only added for previously significant effects (Sentence Processing x Sample Type, Passage Comprehension x Sample Type, Print Vocabulary Timer x Sample Type, and Passage Comprehension Timer x Sample Type). Sample type was considered the moderator. Across all four models, the predictors jointly accounted for 34% of the variance in literacy performance and there were no significant interaction effects in any of the models ($p > .05$). There were no differences in the magnitude of the relationships of the component skills and timers to literacy performance by sample type.

Discussion

The purpose of the current study was twofold. First, the study investigated potential differences between adults who took the Reading Components Supplement (i.e., those who took the paper-based assessment) and low-skilled readers (those who performed at or below Level 2 in literacy) from the PIAAC household and prison samples on demographic characteristics (age, race/ethnicity, native speaker status, LD status, overall health, educational attainment, parental education) in relation to literacy performance. Second, the study examined potential differences between the subpopulation of low-skilled adults in the relations of their component skills (print vocabulary, sentence processing, passage comprehension) and component skill timers to literacy performance. Generally, although a larger percentage of the prison sample who completed the Reading Components Supplement was considered low-skilled (25.63% for the prison sample vs. 15.21% for the household sample), low-skilled incarcerated adults tended to outperform low-skilled adults from the household sample on literacy performance. Our results seem different from what was reported by Rampey et al. (2016), but the studies are reporting on different

samples. Rampey et al. studied all adults, regardless of literacy ability level and regardless of the assessment mode (whether one took the Reading Components Supplement or not), and found that incarcerated adults ($M = 249$) performed significantly lower on literacy than adults in the household sample ($M = 270$). However, our more restricted prison and household samples (i.e., those who were considered low-skilled [at or below Level 2 in literacy] and who took the Reading Components Supplement, which was only available in the paper-based assessment) actually reports the opposite: the prison sample ($M = 222.95$) outperformed the household sample ($M = 214.14$).

To further illustrate, Table 12 summarizes the literacy skill differences for various PIAAC subpopulations. The Rampey et al. (2016) sample of all adults from the prison and household samples is presented in the first row. Our sample of interest, low-skilled readers who took the Reading Components Supplement (only available as a paper-based assessment) and scored at or below Level 2 in literacy, is presented in the third row. As a comparison, we also present the general low-skilled reader sample (at or below Level 2 in literacy) in the second row (with the difference being that these adults are not distinguished by assessment mode [paper-based and computer-based]).

There are a few possible explanations for these seemingly discrepant findings. First, there is presumably a difference in technology use (e.g., computer use or experience) to be able to complete the computer-based PIAAC literacy domain. It may be that, in general, the prison sample had less overall experience with computers or access to the necessary technology relative to the low-skilled household sample (Lockwood et al., 2013), and therefore, a greater percentage took the paper-based task (either failing the core computer task or more likely opted to take the paper-based task). Table 1 shows the average literacy performance by the reasons for not taking

the computer-based assessment. As expected, a much larger percentage of the prison compared to the household sample took the paper-based assessment and, therefore, completed the Reading Components Supplement. Those with a lack of computer experience or who refused the computer-based version had higher average literacy scores. However, the scores of adults who took the paper-based assessment because they either failed the basic computer test or literacy core items did not differ significantly. The make-up of the prison sample completing the Reading Components Supplement suggests they need to gain experience and confidence with performing tasks on the computer.

This may be coupled with the fact that the household sample that took the Reading Components Supplement was older (48.1% were 55+) than the prison sample (16.3% were 55+ see Table 7). Older adults tend to have greater challenges reading material on a screen compared to paper (Hou et al., 2017). These differences may be a result of cognitive decline factors as well as psychological factors (e.g., anxiety, lack of perceived confidence, negative attitude [all under the term “technophobia”]; Hou et al., 2017). Thus, the average higher literacy scores reported by Rampey et al. (2016) and from the IDE (2021) for the low-skilled household sample may be inflated by the larger number of relatively low-skilled (still within Level 2) adults that completed the computer-based literacy domain and also that tended to be younger.

It does not appear that differences in literacy scores were driven by other demographic characteristics because these were similar across samples: adults with lower educational attainment (less than HS diploma), self-reported LD, non-native speakers of English, fair/poor self-reported health, and Black and Hispanic race/ethnicity tended to have predicted lower literacy performance. These results are consistent with previous research that suggests such characteristics are associated with lower literacy achievement among children (Esmaeeli et al.,

2019; NCES, 2019b) and struggling adult readers (Mellard et al., 2013). Future research may want to consider the timers on the reading component skills as many studies have reported differences in response times for older compared to younger adults in general decision-making and information processing skills, with older adults spending greater amounts of time (e.g., Peters, et al., 2008). Little is known about response times between older and younger low-skilled adults specific to reading tasks, but it may provide greater insight into their underlying reading processes.

For both samples, higher sentence processing and passage comprehension scores were predictive of better literacy performance. Orchestrating semantic and syntactic knowledge for the sentence-level reading tasks required for the two component skills previously has been found to support adults' reading comprehension (Guo et al., 2011; Tighe & Schatschneider, 2016a,b). Nevertheless, it would have been expected that performance on a vocabulary measure also would be a significant predictor of test-takers' literacy performance (Tunmer & Chapman, 2012); however, there were strong relations among the component skills in both samples (e.g., $r_s = .77, .70$ between print vocabulary and sentence processing for the household and prison samples, respectively), suggesting possible multicollinearity issues. Alternatively, past research on the relation of vocabulary knowledge to reading comprehension with struggling adult readers has focused on oral vocabulary knowledge (expressive and/or receptive; Braze et al., 2007; Tighe & Schatschneider, 2016a,b). Thus, it is possible that a reading vocabulary task such as print vocabulary would be less likely to be related to reading comprehension. Similarly, the use of concrete, familiar words in the print vocabulary task may not assess the depth of vocabulary knowledge necessary to support reading comprehension among adults performing at lower levels (see Tran et al., 2020, on relations between vocabulary depth and comprehension for struggling

adult readers; see Binder et al., 2017, on vocabulary depth and reading comprehension related to skilled adult readers). Ongoing work investigating the items on the PIAAC print vocabulary task for low-skilled adults has found that the items are incredibly easy (28/34 items with 95% or higher accuracy) and are not able to discriminate well among low-skilled adult test-takers (Tighe et al., 2020). Mirroring this finding, Tighe et al. (2019b) reported that print vocabulary was significantly predictive of literacy and passage comprehension independent of sentence processing for incarcerated adults; however, this accounted for less than 1% unique variance. It is likely that print vocabulary may be an important contributor, but the restricted variability from the ceiling effects on items limits the ability to detect significant effects.

We did not observe any significant interactions between component skills (sentence processing, passage comprehension) nor timers (print vocabulary, passage comprehension) by sample type on literacy performance. This is not surprising because both samples are considered low-skilled, but it is novel because there has never been a direct comparison of component skills and speed on these types of tasks from two seemingly different populations. For both samples, being faster responders on print vocabulary and passage comprehension was predictive of better literacy performance. This finding is not surprising because maze comprehension measures, such as the PIAAC passage comprehension, are often considered a hybrid of fluency and comprehension (Hale et al., 2012; Muijselaar et al., 2017). Text reading fluency is vital to more skilled comprehension and may serve as a “bridge” or mediator between decoding and comprehension (e.g., Kim et al., 2014; Kim & Wagner, 2015). Thus, faster response times on the passage comprehension may be indicative of overall more fluent and skilled reading of connected text for prison and household respondents. Despite the prediction of literacy performance demonstrated by the print vocabulary and passage comprehension timers, the

sentence processing timer did not show a similar relationship. It could be that the simpler sentences with yes/no responses, which characterize the sentence processing items, are more prone to compensatory behaviors (e.g., guessing) among low-skilled adult readers (Strucker et al., 2005). Therefore, speed on these items may not be an accurate reflection of ability levels whereas accuracy on these items was a strong predictor of literacy performance.

Limitations and Directions for Future Research

There are a few limitations to note. First, prominent models of reading comprehension (e.g., SVR, Direct and Inferential Mediation Model [DIME]; Cromley & Azevedo, 2007; Hoover & Gough, 1990), include several additional component skills (e.g., background knowledge, inference generation, listening comprehension, oral vocabulary knowledge, decoding) that are not directly measured in the PIAAC Reading Components Supplement. Thus, it is challenging to compare results from previous investigations with struggling adult readers (e.g., Nanda et al., 2010; Sabatini et al., 2010; Tighe & Schatschneider, 2016a). However, most of the past literature with these component skills has relied on assessments normed on typically-developing children and skilled adults, which may not be as reliable for struggling adult readers (see Nanda et al., 2014; Pae et al., 2012). Thus, using the Reading Components Supplement from the PIAAC has an advantage because this test was rigorously evaluated and specifically developed for adults across all ability levels. As the second cycle of PIAAC is collected (2022-2023) with new Reading Components Supplement items, it will be important to assess whether the refined items are more challenging and provide additional information in predicting low-skilled adults' literacy performance. Furthermore, the second cycle of PIAAC will include numeracy components, which may also relate to literacy and should be explored (e.g., Durand et al., 2005; Truckenmiller et al., 2016).

Second, many of the demographic characteristics considered are self-reported and, therefore, may be biased or lack specificity (e.g., self-reported LD). It would be helpful to understand the prevalence of diagnosed LD in these low-skilled samples and how they may or may not contribute to component skill and literacy performance.

Finally, we only considered literacy performance as an outcome. It would be interesting to assess whether any demographic differences emerged if we consider the Reading Components Supplement (in particular sentence processing and passage comprehension) as outcomes. Tighe et al. (2019b) investigated a different set of demographics and prison-specific activities as moderators of the sentence processing-literacy and sentence processing-passage comprehension relations with the prison sample that completed the Reading Components Supplement (all ability levels). Interestingly, some variables (e.g., self-reported LD, educational attainment, prison library use, prison educational attainment) were significant moderators for one outcome but not the other. Only age and job status prior to incarceration significantly moderated the sentence processing-literacy and sentence processing-passage comprehension relations. Thus, with our current study, it would be interesting to see if the results remain the same between samples with different outcomes.

Implications for Research and Policy

These results have important implications for research and policy. It is interesting to note that despite the percentage distributions, our regression analyses revealed no significant interactions of demographic characteristics by sample type on literacy performance. This underscores the need to adopt similar approaches with struggling adult readers enrolled in adult basic and secondary education (ABE/ASE) programs with struggling incarcerated adult readers in correctional education programs as well. Although there is a limited number of intervention

studies in the extant literature, the findings of a synthesis suggested that ABE can be effective at improving academic outcomes for incarcerated adults (Hedges g effect size = 0.52 to 1.66) when delivered with computer-assisted instruction as well as by peer tutors or trained instructors (Reed, 2015). More recent work with ABE/ASE programs has highlighted researcher-developed educational technology (e.g., AutoTutor, iSTART-ALL) as a means to introduce more individualized, interactive, computerized learning environments that struggling adult readers can engage with in and out of the classroom (Johnson et al., 2017; Si et al., 2016). However, the issues plaguing ABE/ASE programs are exacerbated in correctional settings as prisons may not have access to highly skilled instructors nor computer access (Kamrath & Gregg, 2018; Lewis, 2006; Tewksbury & Stengel, 2006). Moreover, although a majority of state and federal prisons (estimated 87%) have some type of educational program(s), only a small fraction of incarcerated adults enroll in further education (Patterson, 2019). Thus, our work highlights the need to increase awareness and enrollment in correctional educational programming in order to increase reading component and literacy skills.

Conclusion

This study presents a snapshot of the similarities of the demographic profiles and component skill performance of the lowest-skilled adults (at or below Level 2 and completed the Reading Components Supplement) from the extant U.S. PIAAC prison and household studies. Low-skilled adults with lower educational attainment (less than HS diploma), self-reported LD, non-native speakers of English, fair/poor self-reported health, and Black and Hispanic race/ethnicity have the lowest literacy performance. In addition, sentence processing and passage comprehension were the strongest predictors of literacy performance for both samples. Faster response times on the passage comprehension and print vocabulary tasks were also predictive of

higher literacy performance, suggesting that building fluency may be important in both samples. Collectively, there is a strong need to increase funding and attention to improving instruction in ABE/ASE and correctional education programs to enhance the component reading and literacy skills of low-skilled adults in the U.S. Our results highlight specific demographics that are common across both low-skilled samples that may be the important groups to target in educational programs.

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[42~6%C3%83Level+4+%C3%843~7%C3%83Level+5+%C3%844~1~2~3~4%C3%83L2+or+below+\(collapsed\)+%C3%81USH%C3%80USP%C3%81MN%C3%82MN%C3%81Y%C3%82J%C3%810%C3%810%C3%8137%C3%81N&Lang=1033](#)

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Table 1

Reason for Taking the Assessment on Paper and Completing the Reading Components Supplement and the Corresponding Literacy Scores for Each Sample

	Household Sample		Prison Sample	
	%	Average Literacy Score	%	Average Literacy Score
Completed Reading Components Supplement & are low-skilled ¹	15	214	26	223
Reason for taking the assessment on paper and completing the Reading Components Supplement				
No prior computer experiences	6	198	11	221
Failed basic computer test ²	4	223	5	(reporting standards not met)
Refused the computer-based assesment ³	8	244	22	255

¹The data reported in this row were from the analytic sample. The remaining rows are from data reported by NCES (<https://nces.ed.gov/surveys/piaac/ideuspiaac/report.aspx?p=1%C3%81LNP%C3%811%C3%8120133%C3%81PV LIT%C3%81PBROUTE%C3%81USH%C3%80USP%C3%81MN%C3%82MN%C3%80RP%C3%82RP%C3%81Y%C3%82J%C3%810%C3%810%C3%8137%C3%81N&Lang=1033>)

²Successfully completing the basic computer test involved completing four of six simple tasks, such as using a mouse and highlighting text on the screen.

³Participants could opt out of taking the assessment on the computer for any reason; the specific reason for refusal was not recorded.

Table 2*Specific PIAAC Variable Names Used in Analyses and Re-Coding Decisions*

Measure Considerations	Variable Name	Variable Value	Re-Coding
Age	AGEG10LFSEXT	6 categories	Combine <24/25-34 Combine 55-65/66+
Race/Ethnicity	RACETHN_4CAT	4 categories	Eliminate Other
Learning Disability	I_Q08USX3	2 categories	None
Overall Health	I_Q08	5 categories	Combine Excellent/ Very Good Combine Fair/Poor
Educational Attainment	B_Q01_AUS_C	3 categories	Combine H.S. Diploma & Some College/College+
Father's Education	J_Q07BUS	3 categories	Add Don't Know
Mother's Education	J_Q06BUS	3 categories	Add Don't Know
Native Language	NATIVESPEAKER	2 Categories	None
Literacy	PVLIT1-10	0-500	None (<= Level 2)
Print Vocabulary	PRC_PV_SCR	0-34	None
Sentence Processing	PRC_SP_SCR	0-22	None
Passage Comprehension	PRC_PC_SCR	0-44	None
Print Vocab Timer	PRC_PV_Q1	In Seconds	None
Sentence Processing Timer	PRC_SP_Q1	In Seconds	None
Passage Comp Timer	PRC_PF_Q1-Q3	In Seconds	Combine timers for 4 passages
Sample Split (HH or Prison)	SAMPFLAG	2 categories	None

Note. We examined “valid skips”, “don’t know”, and “not stated or inferred” responses separately for each measure/demographic characteristic to determine whether removing these eliminated/restricted the sample size in any of our groups. Other than adding in “don’t know” responses for Mother’s and Father’s education we decided to drop cases of “valid skips”, “don’t know”, and “not stated or inferred” from our demographic characteristics.

Table 3*Combined Demographics of the Low-Skilled Prison Sample and Household Sample*

Demographic Variable	Unweighted <i>N</i>	Weighted Percent (<i>SE</i>)
<u>Gender</u>		
Male	963	52.8 (1.66)
Female	693	47.2 (1.66)
<u>Race</u>		
Hispanic	354	25.8 (1.87)
White	697	47.7 (2.32)
Black	477	19.7 (1.57)
Other	119	6.8 (0.97)
<u>Age</u>		
≤34	472	16.9 (1.20)
35-44	251	13.4 (1.23)
45-54	343	21.9 (1.41)
55+	591	47.8 (1.75)
<u>Native English Speaker</u>		
Yes	1,244	70.3 (2.05)
No	408	29.7 (2.05)
<u>Self-Reported Learning Disability</u>		
Yes	325	13.3 (1.14)
No	1,317	86.7 (1.14)
<u>Overall Health</u>		
Poor/Fair	606	38.6 (1.74)
Good	484	29.6 (1.44)
Very Good/Excellent	552	31.8 (1.40)
<u>Educational Attainment</u>		
Less than High School Diploma	662	36.6 (1.24)
High School Diploma and Higher	985	63.4 (1.24)
<u>Father's Education</u>		
Less than High School Diploma	757	53.3 (1.90)
High School Diploma/Some College	523	27.7 (1.34)
College Degree or Higher	147	8.9 (1.35)
Don't Know	223	10.1 (1.25)
<u>Mother's Education</u>		
Less than High School Diploma	805	55.7 (1.71)
High School Diploma/Some College	550	31.0 (1.56)
College Degree or Higher	169	7.4 (1.05)
Don't Know	126	5.9 (0.81)

Table 4

Skill Performance of the Combined Prison Sample and Household Sample that Completed the Reading Components Supplement (At or Below Level 2 in Literacy)

Skill Measures	Unweighted <i>N</i>	Weighted <i>Mean (SE)</i>	Range
Literacy (Combined)	1,657	214.22 (2.03)	38.16-275.90
Prison	338	222.95 (3.14)	38.16-275.74
Household	1,319	214.14 (2.05)	72.32-275.90
Print Vocabulary (Combined)	1,657	31.00 (0.26)	0-34
Prison	338	32.54 (0.23)	0-34
Household	1,319	30.99 (0.26)	0-34
Sentence Processing	1,657	17.45 (0.23)	0-22
Prison	338	19.06 (0.30)	0-22
Household	1,319	17.43 (0.23)	0-22
Passage Comprehension	1,657	35.00 (0.55)	0-44
Prison	338	38.57 (0.81)	0-44
Household	1,319	34.97 (0.56)	0-44
Print Vocabulary Timer (sec)	1,641	1,763.38 (49.38)	18-21,970
Prison	337	1,696.70 (96.66)	28-15,152
Household	1,304	1,764.05 (49.91)	18-21,970
Sentence Processing Timer (sec)	1,638	1,869.50 (51.95)	18-10,784
Prison	336	1,925.32 (69.96)	24-6,754
Household	1,302	1,868.94 (52.34)	18-10,784
Passage Comprehension Timer (sec)	1,632	4,006.17 (113.31)	56-18,002
Prison	336	4,236.89 (149.48)	84-12,882
Household	1,296	4,003.82 (118.47)	56-18,002

Note. sec = seconds.

Table 5*Correlations of Reading Components, Literacy, and Reading Component Timers for the Combined Sample*

Measure	1	2	3	4	5	6	7
1. Literacy	--	.31 (.04)	.46 (.04)	.46 (.04)	-.36 (.05)	-.21 (.04)	-.16 (.05)
2. Print Vocabulary	--	--	.77 (.02)	.67 (.02)	-.15 (.05)	.18 (.03)	.23 (.03)
3. Sentence Processing	--	--	--	.80 (.02)	-.27 (.05)	.14 (.05)	.23 (.04)
4. Passage Comprehension	--	--	--	--	-.31 (.05)	.07 (.06) ^a	.31 (.03)
5. Print Vocabulary Timer	--	--	--	--	--	.44 (.05)	.24 (.05)
6. Sentence Processing Timer	--	--	--	--	--	--	.67 (.05)
7. Passage Comp Timer	--	--	--	--	--	--	--

Note. All significant at $p < .05$ unless noted by ^a. These are the population-weighted estimates.

Standard Errors (*SEs*) are reported in parentheses.

Sample sizes range from 1,632 to 1,657 (unweighted *N* size).

Table 6

Correlations of Reading Components, Literacy, and Reading Component Timers Separately by Low-Skilled Prison Sample (Below Diagonal) and Low-Skilled Household Sample (Above Diagonal)

Measure	1	2	3	4	5	6	7
1. Literacy	--	.31 (.04)	.46 (.04)	.46 (.04)	-.36 (.05)	-.21 (.04)	-.16 (.05)
2. Print Vocabulary	.37 (.06)	--	.77 (.02)	.67 (.02)	-.14 (.05)	.18 (.03)	.24 (.03)
3. Sentence Processing	.47 (.06)	.70 (.05)	--	.80 (.02)	-.27 (.05)	.14 (.05)	.23 (.04)
4. Passage Comprehension	.37 (.07)	.55 (.06)	.69 (.07)	--	-.31 (.05)	.07 (.06) ^a	.31 (.03)
5. Print Vocabulary Timer	-.32 (.12)	-.39 (.11)	-.44 (.08)	-.34 (.09)	--	.44 (.05)	.24 (.05)
6. Sentence Processing Timer	-.34 (.06)	-.15 (.11) ^a	-.22 (.08)	-.20 (.08)	.59 (.08)	--	.67 (.05)
7. Passage Comp Timer	-.36 (.07)	-.16 (.12) ^a	-.19 (.10)	.11 (.08) ^a	.51 (.08)	.70 (.06)	--

Note. All significant at $p < .05$ unless noted by ^a. These are population-weighted estimates.

Standard Errors (*Ses*) are reported in parentheses.

Unweighted *Ns* for household sample range from 1,296-1,319.

Unweighted *Ns* for prison sample range from 336-338.

Table 7*Demographic Percentages by Low-Skilled Prison and Low-Skilled Household Samples*

Demographic Variable	Household <i>N</i>	Weighted Percent (<i>SE</i>)	Prison <i>N</i>	Weighted Percent (<i>SE</i>)
<u>Race</u>				
Hispanic	274	25.7 (1.88)	80	25.5 (2.45)
White	605	48.0 (2.34)	92	23.8 (2.09)
Black	331	19.5 (1.59)	146	45.3 (2.17)
Other	99	6.8 (0.98)	20	5.4 (1.25)
<u>Age</u>				
≤34	366	16.8 (1.21)	105	32.3 (2.95)
35-44	166	13.3 (1.24)	85	23.9 (2.23)
45-54	253	21.8 (1.43)	90	27.5 (2.80)
55+	535	48.1 (1.77)	57	16.3 (2.14)
<u>Native English Speaker</u>				
Yes	977	70.2 (2.06)	267	77.1 (2.88)
No	337	29.8 (2.06)	71	22.9 (2.88)
<u>Self-Reported Learning Disability</u>				
Yes	223	13.2 (1.15)	102	29.1 (3.26)
No	1,090	86.8 (1.15)	227	70.9 (3.26)
<u>Overall Health</u>				
Poor/Fair	491	38.7 (1.76)	115	33.1 (2.82)
Good	396	29.6 (1.45)	88	26.8 (2.82)
Very Good/Excellent	427	31.7 (1.42)	125	40.0 (2.90)
<u>Educational Attainment</u>				
Less than H.S. Diploma	487	36.5 (1.26)	175	49.9 (3.11)
H.S. Diploma and Higher	824	63.5 (1.26)	161	50.1 (3.11)
<u>Father's Education</u>				
Less than H.S. Diploma	649	53.6 (1.91)	107	31.7 (2.67)
H.S. Diploma/Some College	409	27.6 (1.35)	114	34.5 (2.76)
College Degree or Higher	116	8.9 (1.36)	31	8.9 (1.70)
Don't Know	138	9.9 (1.27)	86	24.9 (2.53)
<u>Mother's Education</u>				
Less than H.S. Diploma	685	55.9 (1.73)	120	35.1 (2.14)
H.S. Diploma/Some College	422	30.9 (1.58)	128	38.3 (2.93)
College Degree or Higher	129	7.3 (1.06)	40	12.3 (2.05)
Don't Know	76	5.9 (0.82)	50	14.3 (2.07)

Table 8

Multiple Regression of Demographics to Literacy for the Combined Low-Skilled Prison and Household Sample

Predictor	b	SE	z	p-value
<u>Age</u>				
D1: 35-44	3.82	5.09	0.75	.453
D2: 45-54	-7.34	4.62	1.59	.112
D3: 55+	-6.67	3.78	1.76	.078
<u>Race/Ethnicity</u>				
D1: Black	-17.11	3.14	5.45	<.001
D2: Hispanic	-21.06	5.31	3.97	<.001
Native English Speaker Status	15.93	5.22	3.05	.002
Learning Disability Status	-14.13	4.02	3.52	<.001
<u>Health Status</u>				
D1: Excellent/Very Good	11.79	3.62	3.26	.001
D2 Good	8.42	2.78	3.03	.002
Educational Attainment	18.75	3.21	5.85	<.001
<u>Father's Educational Attainment</u>				
D1: College or Higher	9.10	4.92	1.85	.064
D2: H.S. Diploma/Some College	3.11	3.24	0.96	.337
D3: Don't Know	-5.05	4.88	1.04	.300
<u>Mother's Educational Attainment</u>				
D1: College or Higher	5.70	5.69	1.00	.316
D2: H.S. Diploma/Some College	2.44	3.24	0.75	.451
D3: Don't Know	0.41	7.44	0.05	.956
Sample Type	14.48	3.61	4.01	<.001

Note. Total $R^2 = .28$. These are population-weighted estimates.

Sample type was coded 0 = Household and 1 = Prison.

Native English speaker status was coded 0 = Non-Native and 1 = Native

Learning disability status was coded 0 = Non-LD and 1 = LD

Educational attainment was coded 0 = less than H.S. Diploma and 1 = H.S. Diploma and Higher

Reference groups for variables with more than 3 levels: age (<24-35), race/ethnicity (White), health status (poor/fair), mother's and father's educational attainment (less than H.S.).

Table 9*Demographic Predictors of Literacy and Interactions by Sample Type*

Predictor	b	SE	z	p-value
<u>Age</u>				
D1: 35-44	3.82	5.09	0.75	.452
D2: 45-54	-7.35	4.62	1.59	.112
D3: 55+	-6.69	3.78	1.77	.077
<u>Race/Ethnicity</u>				
D1: Black	-17.05	3.18	5.37	<.001
D2: Hispanic	-21.20	5.34	3.97	<.001
Native English Speaker Status	15.86	5.25	3.02	.003
Learning Disability Status	-14.23	4.10	3.47	.001
<u>Health Status</u>				
D1: Excellent/Very Good	11.87	3.66	3.24	.001
D2 Good	8.49	2.80	3.03	.002
Educational Attainment	18.77	3.24	5.79	<.001
<u>Father's Educational Attainment</u>				
D1: College or Higher	9.07	4.92	1.84	.065
D2: H.S. Diploma/Some College	3.10	3.24	0.96	.338
D3: Don't Know	-5.09	4.89	1.04	.298
<u>Mother's Educational Attainment</u>				
D1: College or Higher	5.72	5.69	1.01	.314
D2: H.S. Diploma/Some College	2.44	3.24	0.75	.451
D3: Don't Know	0.36	7.44	0.05	.961
Sample Type	12.19	15.04	0.81	.418
Sample*D1_race	-1.01	6.06	0.17	.868
Sample*D2_race	15.26	9.40	1.62	.104
Sample*Native Speaker	12.22	11.53	1.06	.289
Sample*LD	3.05	8.06	0.38	.705
Sample*D1_health	-8.56	7.92	1.08	.280
Sample*D2_health	-7.74	7.14	1.08	.279
Sample*Edu Attain	-4.04	5.99	0.67	.501

Note. Total $R^2 = .28$. These are population-weighted estimates.

Interpretations of dichotomous and reference groups remain the same as in Table 8.

Table 10

Multiple Regression of Reading Component Skills and Timers to Literacy for the Combined Low-Skilled Prison and Household Sample

Predictor	b	SE	z	p-value
Print Vocabulary	-.39	.37	1.06	.291
Sentence Processing	1.86	.40	4.67	<.001
Passage Comprehension	.85	.14	5.96	<.001
Print Vocabulary Timer	-.003	.001	2.26	.024
Sentence Processing Timer	-.001	.002	0.47	.635
Passage Comp Timer	-.004	.001	5.15	<.001

Note. Total $R^2 = .34$. These are population-weighted estimates.

The outcome is continuous scale scores using the 10 literacy plausible values.

All component skills are continuous scales.

All component skill timers are continuous scales.

Table 11

Multiple Regression of Reading Component Skills and Timers to Literacy Controlling for Sample Type

Predictor	b	SE	z	p-value
Print Vocabulary	-.39	.37	1.06	.290
Sentence Processing	1.86	.40	4.67	<.001
Passage Comprehension	.85	.14	5.96	<.001
Print Vocabulary Timer	-.003	.001	2.26	.024
Sentence Processing Timer	-.001	.002	0.47	.635
Passage Comp Timer	-.004	.001	5.15	<.001
Sample Type	4.28	2.79	1.54	.125

Note. Total $R^2 = .34$. These are population-weighted estimates.
Sample type was coded 0 = Household and 1 = Prison.

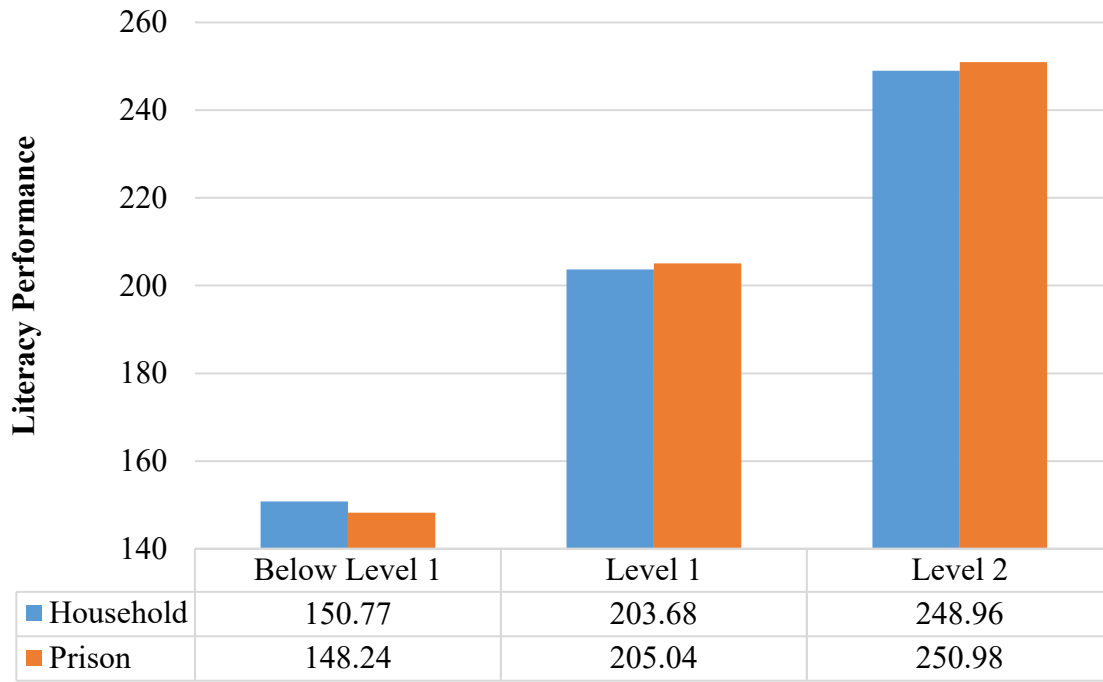
Table 12*Various Populations of Interest, Literacy Scores, and Differences*

Population of interest	Prison	HH	Difference Significant?	Source of data*
All adults	249	270	Yes	PIAAC Prison Study Highlights Report (Rampey et al. 2016)
Low-skilled readers regardless of assessment mode (L2 or below Mean)	228	231	No	Author calculation in International Data Explorer (IDE, 2021)
Low-skilled readers who took the paper-based assessment (L2 or below Mean)	223	214	Yes	Current Study

Note. HH = Household. L2 = PIAAC literacy proficiency Level 2.

Figure 1

Proficiency Levels of Low-Skilled Adults by Prison and Household Samples



Note. There are no significant differences within literacy levels between the samples (alpha level of .05). These are population-weighted estimates.