EXPERIENCE REPORT

# THE ENTANGLED NATURE OF FIRST LANGUAGE LEARNING, EDUCATION, AND LITERACY

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ABSTRACT

The entangled relationship between first language acquisition, education, and literacy challenges conventional linguistic paradigms. This paper explores recent findings revealing the intricate interplay of these factors, particularly emphasizing the impact of education and literacy on grammatical knowledge. Drawing on studies conducted in diverse linguistic contexts, this paper argues against the universal applicability of conventional metrics such as the High Academic Attainment/Low Academic Attainment (HAA/LAA) cut-off to investigate the role of reading, advocating for a more nuanced understanding of linguistic development that considers local educational dynamics. Additionally, the paper discusses methodological challenges in studying illiterate populations and proposes alternative measures to capture the cumulative effects of language experience. Ultimately, the paper underscores the importance of interdisciplinary collaboration in developing inclusive research methodologies and educational interventions that address the diverse needs of learners worldwide. By embracing the complexities of language learning, education, and literacy, linguists can advance our understanding of human language capabilities and promote more equitable opportunities for linguistic development.

RESUMO

A relação intrincada entre aquisição da primeira língua, educação e alfabetização desafia os paradigmas linguísticos convencionais. Este artigo explora descobertas recentes que revelam a intrincada interação desses fatores,



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enfatizando particularmente o impacto da educação e da alfabetização no conhecimento gramatical. Com base em estudos conduzidos em diversos contextos linguísticos, este artigo argumenta contra a aplicabilidade universal de métricas convencionais, como o limite de Alto Desempenho Acadêmico/Baixo Desempenho Acadêmico (HAA/LAA) para investigar o papel da leitura, defendendo uma compreensão mais matizada do desenvolvimento linguístico que considere a dinâmica educacional local. Além disso, o artigo discute os desafios metodológicos no estudo de populações analfabetas e propõe medidas alternativas para capturar os efeitos cumulativos da experiência linguística. Por fim, o artigo ressalta a importância da colaboração interdisciplinar no desenvolvimento de metodologias de pesquisa inclusivas e intervenções educacionais que abordem as diversas necessidades dos alunos em todo o mundo. Ao abraçar as complexidades do aprendizado de línguas, educação e alfabetização, os linguistas podem avançar nossa compreensão das capacidades da linguagem humana e promover oportunidades mais equitativas para o desenvolvimento linguístico.

KEYWORDS
First Language Learning; Education; Literacy; Print Exposure.

PALAVRAS-CHAVE
Aprendizagem de Primeira Língua; Educação; Alfabetização; Exposição Impressa.

# INTRODUCTION

Over the last few decades, linguistics has assumed that native speakers of a language converge on the same grammatical knowledge uniformly and successfully (*e.g.*, Chomsky, 1965). However, recent studies show that individual differences in grammatical knowledge in L1 speakers is much more pervasive than it was postulated before (*e.g.*, Dabrowska, 2012). These studies show the impact of quality of input, which is modulated by education, literacy, and reading. Much of linguistics – for good or bad – has been influenced by what some call Chomsky's hidden legacy (Christiansen & Chater, 2016), and ignored effects that influence input quality.

The idea that education may modulate linguistic knowledge is not surprising for several reasons – although it was and has been heavily ignored by many linguists, therefore unsurprising does not necessitate unimportant. Education is an amalgamation of opportunities for reading and writing (becoming literate), and improving cognition. Formal education provides a stepping stone into becoming literate, and then sustaining these literacy practices (*i.e.*, reading). It is now established that reading has a reciprocal effect on language and cognition, known as the Matthew Effect (*e.g.*, Cunningham & Stanovich, 1998) the more one reads, the better their cognition becomes, and the better their language skills become, which improve reading, which in turn improve cognition. This is a simplified way of putting it, the real entanglement may be more bidirectional than unidirectional. Secondly, a recent meta-analysis shows that each year of schooling improves nonverbal IQ skills about 3 to 5 points on average (Ritchie & Elliot, 2018).

Speakers with fewer years of spent in formal education appear to demonstrate more individual differences in L1 grammatical knowledge and they appear to extract slightly different representations of constructions (both within and across groups). For instance, Dabrowska (1997) found that increasing number of years in formal education refine the use of syntactic cues in comprehending complex noun phrases in English. However, even highly educated speakers appear to differ in the way they extract generalizations from input (*e.g.,* Gedik, 2024, in prep).

Several studies (*e.g.,* Street & Dabrowska 2010; Street 2020) have used a high and low academic attainment cut (HAA and LAA, respectively) to investigate the relationship between native speakers' performance on language tasks and education. These studies consider L1 speakers with an undergraduate degree or beyond to belong to the HAA group, and on average they have an average of 14-22 years of time spent in formal education. In contrast, LAA group consists of speakers with around 10 years of formal education. This is a considerable gap. In addition to this cut, emerging studies have also used illiterates, ex-literates, and literates as one continuum to investigate if education-related factors that were explained previously would interact with performance on language tasks. Emerging research shows that literacy may be an important predictor in predicting speakers' performance on language tasks (Dabrowska *et al*. 2022, 2023; Gedik in prep).

One question is the generalizability of these "cuts" to other countries: does every country have the HAA/LAA cut? Does this cut work in other countries? Similarly, there are countries with very low rates of illiteracy – and in Western, Educated, Industrialized, Rich, Democratic (WEIRD, Heinrich et al. 2010) countries illiteracy is usually observed in individuals with mental disorders, rather than lack of opportunities of schooling. Many countries differ in the way they formalize education. In this paper, I will focus on Turkey as an example and argue why the HAA/LAA cut does not work for Turkey, then discuss its implications for other countries that may bear similarities. I will also argue that what we traditionally consider HAA (from a WEIRD perspective) in non-WEIRD or not-so-WEIRD countries (such as Turkey) may show as many individual differences as LAA speakers might in a traditionally WEIRD society. In doing so, I aim to invite linguists (and others in cognitive sciences) to carefully consider when using education-related measures and to take into account the local trends in education-related differences.

## 1. SETTING THE SCENE: HIGHER EDUCATION IN TURKEY

In Turkey, the education system is structured to provide a comprehensive framework for students from primary school through higher education. At the pinnacle of this system lies the university entrance exam, a crucial milestone that significantly impacts students' educational trajectories and future career prospects. The university entrance exam, commonly known as the "Yükseköğretim Kurumları Sınavı" (YKS), is a standardized test administered annually to assess students' academic readiness for higher education. It is divided into two main components: the TYT (Turkish Proficiency Test) and the AYT (Academic Proficiency Test). The TYT evaluates students' proficiency in Turkish language, mathematics, social sciences, and natural sciences, while the AYT focuses on more specialized subjects related to the student's chosen field of study.

One distinctive aspect of the Turkish education system is the tier system implemented within the university entrance exam. This tier system offers students the flexibility to choose between different exam tracks based on their academic strengths and career aspirations. The two main tiers are the standard track and the vocational track. In the standard track, students take the TYT and AYT exams, which cover a broad range of subjects and are designed for those seeking admission to traditional academic programs in universities. On the other hand, the vocational track caters to students interested in pursuing technical or vocational education. It includes additional exams tailored to specific fields such as health sciences, fine arts, or sports.

Within Turkey's tiered university entrance exam system, test takers not only face the challenge of achieving high scores but also navigating a complex ranking and admission process. After completing the exams, students are scored and ranked based on their performance relative to other

test takers. However, admission to specific universities and majors is not solely determined by individual scores. Instead, each university and major sets its own minimum base score requirement.

This minimum base score serves as a threshold that applicants must meet to be considered for admission to a particular university program. However, meeting this threshold does not guarantee admission. Since universities typically receive more applications than they have available spots, admission also depends on the ranking of the applicant relative to others who have applied to the same program. For instance, if two students apply to the same major at a university and one student has a higher score and ranking while listing that major as their preference, they will likely secure admission over the student with a lower score, even if they meet the minimum base score requirement, as every major also has maximum quotas.

Furthermore, it is important to note that universities in Turkey vary significantly in terms of education quality and reputation. With over 200 universities across the country, there is a wide spectrum of academic offerings and institutional standards. Some universities are renowned for their research excellence, faculty expertise, and state-of-the-art facilities, while others may face challenges related to funding, infrastructure, or academic rigor. In short, where one studies significantly predicts the quality of education they will receive. This is not to say that WEIRD countries may not experience this, but it might take place to a smaller extent. Thus, while Turkey has around 8 million actively enrolled university students, of those 8 million, only very few may actually constitute a HAA group in the traditional sense.

## 2. WHY THE HAA/LAA CUT MAY NOT WORK IN TURKEY (AND ALIKE COUNTRIES)

First, I begin with evidence from a recent study conducted by Winckel & Dabrowska (2024) with L1 English speakers. These speakers were highly educated (15.5 years spent in formal education on average). When faced with very complex English sentences, print exposure – as measured by an author recognition task – over education (*i.e.*, the number of years spent in formal education) was a more reliable variable predicting individual differences and accuracy in complex syntax comprehension (complex noun phrases, reduced relatives, X-is-difficult-answer, ditransitives). The author recognition task measures how much speakers read by presenting real and foil author names and asking participants to decide if participants know them or do not. This shows that clearly even in a highly educated population education on its own does not necessarily translate to more reading. Some HAA speakers may read more than others, and some HAA speakers may not read at all. One potential criticism is that some of the constructions that Winckel and Dabrowska tested are too complex or do not constitute everyday speech. However, relative clauses and ditransitives are used

in spoken English frequently enough that they cannot be deemed peripheral. Therefore, measuring HAA speakers' performance on more central or easier constructions would be interesting.

One central grammatical construction is the Turkish aorist. It poses difficulties to children during acquisition since the aorist can be realized with multiple form-meaning pairings in various phonological environments. For instance, -Ar can occur with monosyllabic verbs, but -Ir can appear with monosyllabic sonorant ending verbs and multisyllabic verbs. In a recent study conducted by Gedik (2024) among a highly educated population (BA, MA, PhD holders from various universities in Ankara), print exposure accounted for more individual differences (over and above education operationalized as degree attained) in morphological productivity in nonce-verb conjugation with the Turkish aorist. Print exposure was measured using a self-reported reading questionnaire. This is quite interesting since the Turkish aorist is quite an integral part of Turkish grammar. That is, the aorist is used very frequently in spoken language as well as written language. Ideally HAA speakers of Gedik's study should have performed at ceiling, providing the generalization of the aorist, and homogeneously on such a simple task that tested a central part of Turkish grammar. Instead, again, it was the print exposure questionnaire that predicted their performance over education (operationalized as the number of years spent in formal schooling), and explained roughly 12% of the answers given in the study whereas education was not significant at all. This shows that print exposure can influence the representation of certain constructions even among a highly educated population.

In a separate study, Gedik (in press) studies another central grammatical component of Turkish grammar: optional plural agreement. In Turkish, animate plural nouns may optionally be marked with the plural marker while speakers strongly disprefer marking the verb plural if the subject is plural inanimate. Gedik tested this construction using a timed force binary choice task in combination with print exposure and vocabulary size among 45 BA students from a high tier university, all of whom had roughly 16-17 years of formal schooling on average. This time, print exposure was measured using an author recognition task, which is used widely in other linguistic studies investigating similar phenomena over questionnaires. The participants greatly differed in their use of the construction and print exposure as well as vocabulary size significantly predicted their preferences of using plural agreement. Once again, this shows that even among a highly educated sample at a good university in Turkey, reading may capture more differences than education. If the number of years spent in formal schooling was just as important, the statistical analyses would have proven this; but instead, it was print exposure that was statistically significant.

So the interim summary is that while in some countries, the HAA/LAA cut might work with certain constructions, in different parts of the world and in different languages (as well as constructions), measuring print exposure might be a more viable option. This is because in such countries the number of years spent in formal education may not translate to a cumulative sustained experience with written materials, simply because individuals in such countries may not be expected to read

outside of class. Importantly, author recognition tasks are not readily available for every language. In such circumstances, it might be useful to operationalize measuring print exposure with a self-reported reading questionnaire, although such questionnaires are known to be influenced by social desirability (e.g., Acheson *et al*. 2008, Gedik in press).

There are instances where it is impossible to measure cumulative effects of experience with written language. After all, not every speaker is literate, or practices reading frequently, as it appears to be the case even among highly educated speakers. Among illiterate and ex-literate populations, print exposure measures cannot be utilized for obvious reasons. In such cases, there are several options that researchers have tried to approximate the cumulative effects of print exposure. These are group membership (literate, semi-literate, illiterate), 1-minute word reading (*e.g.*, Simos *et al*. 2013), how long the person has received literacy instruction, and the number of years spent in formal education. Now, we discuss these measures in turn and how well they work.

Recently, several studies have investigated the relationship between acquiring literacy and its effects on morphosyntactic knowledge among L1 speakers. These studies (Dabrowska et al. 2022, 2023, Gedik in prep) revealed that group membership is a more reliable predictor of performance in tasks tapping into grammatical comprehension, even when compared to a continuous variable such words read correctly under 1 minute. This is interesting since this is potentially due to the fact that the 1-minute word reading tasks measure two different constructs in different groups: in illiterate or semi-literate speakers, it potentially measures the speed at which orthographic decoding occurs whereas in literate speakers, it potentially measures the current reading fluency – which does not necessarily reflect the cumulative reading experience of a person. After all, Gedik (in prep) shows that some illiterate speakers who were learning to read overlapped in their performance of reading words with literate speakers. However, because performance in the 1-minute word reading task and group are very highly correlated (*i.e.*, literate speakers could read more words on average than illiterate speakers), when group and the 1-minute word reading task are replaced in regression analyses, the results are highly comparable (Gedik, in prep), explaining roughly 45% of the variance in a simple grammar task. A counter argument, however, is that it is highly plausible that illiterate speakers who know more vocabulary items (through spoken language) learn reading faster, and this translates to better performance in tasks tapping into grammar. After all, children with more vocabulary knowledge learn to read and write faster (Lee, 2011), and there is no reason why this should not apply to adult learners.

One important note with regard to group membership among illiterate speakers is that it is very difficult to detangle the effects of literacy, education, and cognition on grammatical performance. In other words, group probably captures not only the cumulative reading experience, but also cumulative effects of education, and the effects of these on language and cognition. As Gedik (in prep) and Dabrowska and colleagues (2022) discuss, formal schooling encourages native speakers to think about their own native language by using language tasks that help to reflect on

metalinguistic skills or teachers may correct grammatical inconsistencies, which improves cognition and language skills, which improve cognition, which improve language skills in turn and so on. Thus, specifying the cumulative effects of reading among illiterate speakers becomes extra difficult. Be that as it may, when working with illiterate speakers, group membership appears to capture more of the cumulative effects of exposure to written language, since it takes many years for grammar to be influenced by written language (cf. Dabrowska 2021).

In this vein, it would make sense to include the other measures mentioned above (*i.e.*, how long the person has received literacy instruction, and the number of years spent in formal education). However, there are also several issues with these measures when working with illiterate or ex-literate populations. First, many illiterate speakers cannot attend school for various patriarchal or other reasons around the world. This renders using number of years in formal education useless since most participants would answer close to zero, or at least that has been the case in Gedik (in prep). Second, based on personal experience working with illiterate speakers and discussions with those who work with them, illiterate speakers may provide inaccurate or incomplete responses for how long they have received literacy instruction. This is because some speakers received on and off literacy instruction from friends and family, and some attend literacy classes on and off. Therefore, their answers are at best an approximation and hence do not provide to be reliable measures. Another issue with this measure is literate speakers from a certain age cohort will provide the same answer (*i.e.*, age 7 for those above the age of 25 in Turkey because of the way the education system worked back then).

## 3. LIMITATIONS OF TRADITIONAL MEASURES IN CAPTURING LINGUISTIC PROFILES

Traditional measures, such as the HAA/LAA cut-off or standardized tests of linguistic competence, have long been used to investigate the relationship between education and language skills. However, these measures often fail to fully capture the nuances of linguistic profiles, particularly in individuals from WEIRD (Western, Educated, Industrialized, Rich, and Democratic) populations. In WEIRD contexts, where access to education is nearly universal and illiteracy is rare, traditional metrics conflate formal education with linguistic competence, overlooking other critical factors such as print exposure or socio-cultural variability.

A deeper issue with traditional measures lies in their inherent WEIRD bias. These metrics were often developed within and for societies with standardized, high-quality education systems. However, applying these measures uncritically to diverse linguistic and cultural contexts risks misrepresenting linguistic realities. For instance, in non-WEIRD countries such as Turkey, significant disparities exist in education quality and access, leading to substantial variability in linguistic

outcomes even among individuals categorized as HAA or LAA. This renders the binary HAA/LAA framework ineffective in capturing the full range of linguistic competencies.

Moreover, illiteracy in WEIRD populations is often attributed to factors such as cognitive impairments or socio-economic disadvantage, whereas in non-WEIRD contexts, illiteracy frequently results from systemic barriers to education, such as patriarchal norms or geographic isolation. These divergent causes mean that traditional metrics, developed for WEIRD populations, fail to address the unique challenges faced by speakers in non-WEIRD contexts. As such, the application of WEIRD-centric metrics to non-WEIRD populations without contextual adaptation is methodologically unsound and ethically questionable.

## 4. WHERE DO WE GO FROM HERE?

The exploration of the entangled nature of first language learning, education, and literacy unveils complexities that challenge traditional notions within linguistics. As evidenced by the studies discussed here, the relationship between education, literacy, and grammatical knowledge is nuanced and multifaceted, with implications extending beyond theoretical frameworks to practical considerations in research methodology and pedagogy. Linguists need to be careful in selecting which measures to use in their studies and always consider both the population and the country specific conditions.

The findings discussed above underscore the importance of reevaluating established paradigms within linguistics, particularly regarding the influence of education on linguistic competence. While conventional wisdom (looking at previous studies) may suggest that higher levels of formal education equate to greater grammatical proficiency, emerging research suggests that this relationship is not straightforward, especially in not-so-WEIRD countries. Instead, factors such as print exposure and literacy (group membership) play significant roles in shaping linguistic abilities, often surpassing the predictive power of education alone in tasks tapping into grammatical knowledge.

Moreover, the context-specific nature of language acquisition and education becomes apparent when considering diverse linguistic communities and educational systems. The case of Turkey serves as a good example, highlighting the inadequacy of applying a universal HAA/LAA cut to measure linguistic proficiency. In non-WEIRD countries like Turkey, where educational trajectories are influenced by a myriad of socio-cultural factors and where the quality of education varies significantly among institutions, traditional metrics may fail to capture the complexities of linguistic development.

Therefore, researchers must adopt a more nuanced approach to studying language and education, taking into account the unique socio-cultural contexts in which language acquisition occurs. This includes considering alternative measures of linguistic competence, such as print exposure (such as author recognition tasks or questionnaires when such tasks are not available) and

group membership based on literacy levels, which may better reflect the cumulative effects of language experience. Collecting data for both measures will capture the individual differences of the participants in that context and establish a bottom-up measure rather than using a top-down approach of "group" which may overlook the fuzzy boundaries of, for instance, being an illiterate speaker who may have received some literacy education from others in their family.

Furthermore, the challenges posed by illiteracy highlight the need for innovative methodologies that accommodate diverse populations. Conventional measures such as years of formal education or duration of literacy instruction may prove inadequate for illiterate individuals, necessitating alternative approaches such as using 1 minute word reading tasks or potentially verbally administered questionnaires that account for their unique linguistic backgrounds and linguistics experiences.

Moving forward, interdisciplinary collaboration between linguists, educators, and policymakers is crucial for developing inclusive research methodologies and educational interventions that address the diverse needs of learners worldwide. By embracing the entangled nature of language learning, education, and literacy, we can foster a deeper understanding of human language capabilities and promote more equitable opportunities for linguistic development.

In conclusion, the entangled nature of first language learning, education, and literacy challenges conventional notions within linguistics and underscores the importance of considering diverse contexts and populations in research and practice. By embracing this complexity and adopting innovative approaches, we can advance our understanding of language acquisition and promote more inclusive educational practices globally.

## ADDITIONAL INFORMATION

### CONFLICT OF INTEREST

The author declares no competing interests.

### STATEMENT OF DATA AVAILABILITY

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

### REVIEW AND AUTHORS' REPLY

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