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Abstract

This dissertation investigates the evolving landscape of reading habits in the context of increasing digital saturation, with a focus on metacognitive and psychological outcomes relevant to a future labour market and cultural environment shaped by artificial intelligence and rapid change. Drawing on data from the 2018 Programme for International Student Assessment (PISA), the study examines whether students' home literacy environments—measured through books at home and daily reading time—are associated with outcomes such as cognitive flexibility, perspective-taking, and source credibility assessment. Regression analyses across a large international cohort of 15- to 16-year-olds reveal statistically significant positive relationships between reading behaviours and these higher-order cognitive traits, after adjusting for socioeconomic and demographic covariates.

In addition to these findings, the dissertation presents a descriptive analysis of global reading trends, drawing on PISA data from 2000-2022, highlighting a potential bifurcation: while a growing proportion of students report low engagement with reading, a subset continues to read extensively. This divergence is contextualised historically, tracing how access to books and reading has long reflected broader inequalities. The study suggests that digital environments may not only displace reading behaviourally but may interfere with the neurocognitive and attentional conditions that support deep literacy. These arguments are explored through an interdisciplinary lens, incorporating insights from neuroscience, philosophy, and media theory. The findings underscore the need for further research into the differential impacts of reading practices across socioeconomic groups and the implications of digital reading on cognition and education.

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1. Introduction

Why does reading matter in the twenty-first century, and how is it changing? This dissertation addresses a central question: how do students' home literacy environments and daily reading practices relate to higher-order cognitive and psychosocial outcomes, and how have these relationships evolved across two decades of global change?

Despite long-standing assumptions about the value of reading, recent surveys suggest that reading engagement is shifting. In many countries, fewer young people read daily, access to books at home is declining, and digital media increasingly occupies time once devoted to print. These patterns raise urgent questions about whether the skills traditionally supported by sustained reading—critical evaluation of information, adaptability, perspective-taking—are themselves at risk.

To investigate this, the dissertation combines descriptive and inferential analyses of harmonised PISA data from 2000 to 2022. The descriptive analysis traces long-term trends in books-at-home, daily reading time, and reading attitudes, disaggregated by OECD status to capture global disparities. An ancillary regression shows that book access remains strongly associated with socioeconomic background, underscoring persistent inequalities. The core regression models, using 2018 PISA data, demonstrate that both books-at-home and reading time are significant positive predictors of metacognitive understanding, summarising, source credibility assessment, and cognitive flexibility. Reading time also predicts perspective-taking, while books-at-home does not. These findings suggest that structural home literacy factors remain relevant, but that regular practice of reading has a more direct link to certain socio-cognitive skills.

The significance of these results is twofold. Empirically, they extend the literature by leveraging large-scale, cross-national data to show robust associations between reading and higher-order skills, moving beyond small cohort studies or narrow measures of achievement. Theoretically, they point to deeper implications: if reading supports evaluative and reflective capacities, then its decline has consequences not only for education but for how individuals think, interact, and participate in society. To explore these broader stakes, the dissertation situates its findings within perspectives from neuroscience, philosophy and media theory.

Chapter 2 reviews the literature on contemporary reading trends and their cognitive, socio-emotional and socioeconomic outcomes. Chapter 3 outlines the dataset, variables, and regression framework. Chapter 4 presents descriptive and regression results. Chapter 5 discusses the findings within an historical context and proceeds to contextualise them through neuroscientific, philosophical, and cultural lenses. Chapter 6 reflects on limitations and future directions.

2. Literature Review

2.1 Modern Reading Rate Trends

2.1.1 Conflicting Trends

Digital Displacement and General Declines

Longitudinal data show that adolescent reading habits have markedly declined over recent decades. Drawing on 40 years of nationally representative U.S. survey data, Twenge et al. (2019) report a drop in daily print reading among 12th graders – from 60% in the late 1970s to 16% by 2016. Similar declines among 8th and 10th graders indicate a broad generational shift. This decline has occurred in tandem with a sharp rise in digital media use, particularly time spent on smartphones, video games, and internet-based leisure (Pew Research Center, 2024). This is supported by Baron and Mangen (2021), who found that long-form reading among students in Norway and the United States has increasingly been displaced by digital technologies.

An earlier report by the NEA found a similar trend in adults. The 2017 Survey of Public Participation in the Arts found that only 53% of U.S. adults had read books or literary texts in the preceding year – a fall from earlier decades (National Endowment for the Arts, 2019). In 2021, 23% of adults reported reading no books at all (Pew Research Center, 2021). This mirrors broader concerns about literacy: according to the OECD's 2023 Survey of Adult Skills (PIAAC), 28% of US adults aged 16–65 scored at Level 1 or below in literacy, indicating that they can only understand very basic, clearly labeled texts, lists, or short sentences (OECD, 2023).

The 2025 National Literacy Trust Annual Literacy Survey, based on responses from 114,970 children and young people aged 5 to 18 in the UK, found 32.7% of 8- to 18-year-olds reported enjoying reading "very much" or "quite a lot" – the lowest level recorded in two decades, and a 36% decline since 2005 (National Literacy Trust, 2025). Reading frequency mirrored this decline: only 18.7% of 8- to 18-year-olds said they read daily in their free time, 20 percentage points lower than in 2005 (National Literacy Trust, 2025). The drop was particularly acute among boys and pupils in lower socioeconomic groups,

with the gender gap in daily reading widening to 6.2 percentage points – the largest since 2023. Among younger children aged 5 to 8, daily reading rates declined to 44.5%, a 3.4-point drop from the previous year (National Literacy Trust, 2025).

Digital Extension

Other studies suggest that reading rates have not necessarily declined; rather, digital platforms have engendered an expansion of reading habits (Schwabe et al., 2023). In a survey of 779 adult leisure readers in Austria, Schwabe and colleagues found that 90.8% of participants still read printed books, either exclusively (47.5%) or alongside digital formats (43.3%), while only 9.2% read solely in digital formats. The study revealed that multi-format users read significantly more books per year than print-only readers and also spent more minutes reading per week. Although participants did not report that adopting digital reading increased their total reading volume, they did indicate it allowed them to read in different contexts, with digital reading especially prevalent on public transport, in outdoor public spaces and when time was limited. Notably, print was still strongly preferred for genres such as classic literature, non-fiction, and children's literature, while digital was more accepted for reading genres such as erotic fiction (Schwabe et al., 2023). This seems to suggest that digital reading has not replaced print but instead facilitates a broader and more flexible set of reading practices, particularly for already frequent and motivated readers.

In the United States, while the rise of digital formats such as e-books has expanded reading access – one-third of Americans now read e-books, with 9% reading exclusively digital (Pew Research Center, 2022) – this shift has not necessarily translated into a decrease in print reading: U.S. national data reveal that the average number of books read per year has remained stable since 2011 (Pew Research Center, 2022). The Pew Research Center also revealed that approximately 30% of American adults read e-books as of 2021, up from around 17% in 2011 (Pew Research Center, 2022). This growth has not displaced print reading; rather, it reflects a diversification in reading habits. Most e-book users still read in multiple formats, and as already mentioned, only a small proportion (9%) rely exclusively on digital texts (Pew Research Center, 2022). E-book readers tend to consume more books overall compared to non-digital readers, suggesting that digital access may enhance rather than diminish total reading volume (Pew Research Center, 2012). Compounding this, despite the availability of digital media, print remains the preferred medium for most readers, including younger adults aged 18–29, who continue to favour print at 65% (of the 75% of U.S. adults who read at least one book per year in 2021) (Pew Research Center, 2022). The so-called *"decline"* of print may thus reflect a shift in how and where people read, rather than if they read.

2.1.2 Group Differences in Reading Rates

Socioeconomic Disparities in Reading Participation

Reading habits appear to be stratified by wealth, an observation that will be discussed in greater detail in chapter 5 of this dissertation. Non-reading was more common among those with lower income and education levels; 39% of adults with a high school diploma or less reported no reading, compared to 11% of those with a college degree (Pew Research Center, 2021). This rate of non-reading has remained relatively stable since 2014, suggesting no recent improvement in U.S. national reading engagement (Pew Research Center, 2021). In the UK, a report found 40% of respondents reported they had not read a single book (YouGov, 2025).

Bookworms vs. Typical Readers

The mean number of books read per American adult in the previous 12 months was approximately 14 while the median number was five, indicating that while some individuals read many books, half of all adults read five or fewer (Pew Research Center, 2022). This difference between mean and median could imply that a small subset of highly avid readers significantly inflates the average, whereas the median offers a clearer picture of typical reading behaviour. A 2025 YouGov poll of 2,121 UK adults found that while the median number of books read in the past year was just three, a small group of "mega-readers" (4%) who read over 50 books annually significantly inflated the national average (YouGov, 2025).

2.2 Outcomes from Reading

2.2.1 Neurological and Cognitive Outcomes

Brain Restructuring

Reading acquisition appears to induce both structural and functional reorganisation within the brain, particularly in regions associated with visual recognition and language processing. Dehaene et al. (2015) demonstrate that learning to read activates the visual word form area (VWFA) in the left ventral occipitotemporal cortex, a region repurposed from object recognition to written symbol processing. This reorganisation enables readers to map orthographic input to phonological and semantic representations, strengthening connections between visual, auditory, and language networks. The transition from illiteracy to literacy is also associated with enhanced hemispheric specialisation, with word

recognition becoming increasingly left-lateralised and improvements in visual discrimination occurring more broadly (Dehaene et al., 2015).

Cognitive Aging and Protection

Wang et al. (2022) examined how leisure reading affects cognition in adults with varying education levels using data from the CANDOR (China Alzheimer's Disease and Neurodegenerative Disorder Research) cohort. They found that while higher education was associated with better cognitive performance and larger hippocampal volume, frequent reading significantly improved cognitive scores, especially among those with lower education levels. In contrast to the findings of Dahaene et al., reading appeared to have no effect on brain structure, suggesting its benefits are functional rather than anatomical (Wang et al., 2022). A similar study by Lee et al. (2018) found that engaging in daily intellectual activities, including reading, was associated with a reduced risk of cognitive decline and incident dementia among older Chinese adults.

Emerging longitudinal evidence suggests that regular reading contributes to long-term health and cognitive preservation. Bavishi et al. (2016) found that adults over 50 who read books for more than 30 minutes daily had a 20% lower mortality risk over 12 years, after adjusting for education, wealth, and health. This effect was unique to books, not periodicals, suggesting deeper cognitive engagement as the protective factor. Supporting this, Chang et al. (2021) analysed 14 years of data from older Taiwanese adults (N = 1962) and showed that consistent reading habits significantly slowed cognitive decline, independent of baseline cognition or socioeconomic status.

2.2.2 Socio-emotional and Developmental Outcomes

Adolescent Readings Enduring Outcomes

Longitudinal evidence suggests that adolescent reading habits may have enduring benefits extending into late adulthood. Kannan et al. (2023) analysed cohort data and found that individuals who engaged in regular reading during adolescence demonstrated higher levels of social engagement in older age, independent of educational attainment, cognitive status, or baseline sociability. The authors propose that early reading fosters both cognitive development and social-cognitive skills such as empathy, perspective-taking, and conversational competence, which in turn support richer interpersonal networks later in life. Sun et al. (2024), found early engagement in reading for pleasure was associated with superior cognitive performance, greater mental wellbeing, and increased brain volume in adolescence (Sun et al., 2024). Further evidence underscores the developmental benefits of reading, with reading exposure consistently linked to improved reading comprehension

and broader literacy outcomes. In their meta-analysis, Mol and Bus (2011) synthesised 99 studies spanning infancy to early adulthood (N = 7,669) and found moderate to strong correlations between voluntary print reading and literacy skills, including comprehension, spelling, and oral language. Notably, the association between print exposure and comprehension strengthened across developmental stages - explaining 12% of the variance in oral language skills in preschoolers and up to 34% in university students - supporting an upward spiral of causality consistent with the Matthew effect (Stanovich, 1986).

The Matthew Effect

The Matthew Effect posits that early success in reading leads to increased reading volume, which in turn enhances vocabulary, fluency, and comprehension, creating a self-reinforcing loop in which "the rich get richer", (Stanovich, 1986). Children who develop strong literacy skills early on tend to read more frequently and engage with more complex texts, thereby accelerating their cognitive and linguistic development. This is compounded by Guthrie and Wigfield (2000) who found motivated and engaged readers read more often, read more challenging texts, and use deeper comprehension strategies — leading to stronger literacy outcomes. Conversely, children who struggle with reading from an early age are less likely to read voluntarily, missing out on critical exposure to language and text structures, which further impedes their progress (Juel, 1988). This divergence, driven in part by differences in early print exposure, compounds over time, resulting in widening gaps in academic achievement and literacy competence (Mol and Bus, 2011; Cunningham and Stanovich, 1997). The process mirrors the concept of dynamic complementarities in economics, where early skill acquisition increases the productivity of future learning, amplifying the returns to subsequent educational investments (Cooper and Johri, 1997). In both contexts initial advantages or disadvantages are magnified over time, underscoring the importance of early interventions and consistent access to high-quality reading material to prevent long-term disparities in reading proficiency.

2.2.3 Socio-Cognitive Outcomes — Readings Relation to Empathy and Theory of Mind (ToM)

Empathy

Research suggests a link between reading fiction and enhanced empathy, though results vary and questions of causality remain. Djikic et al. (2013) found that reading literary fiction increased self-reported *cognitive empathy*—the ability to understand another person's perspective—particularly among individuals low in openness, but had no effect on *affective empathy*, which refers to sharing or mirroring another's emotional state.

Notably, they also found that frequent fiction readers scored higher on a behavioural empathy task, implying that the cumulative effects of sustained reading habits may differ from the immediate effects of a single, short-term reading intervention. Oatley (2002) suggested that literature can profoundly transform the emotional self, while Bal and Veltkamp (2013) draw more modest conclusions, emphasising the mediating role of emotional transportation, showing that fiction increased empathy only when readers were emotionally absorbed in the story. Longitudinal evidence from Mar et al. (2009) showed that fiction exposure predicted empathy and social support even after controlling for personality traits like openness, suggesting that the relationship is not reducible to pre-existing individual differences.

Theory of Mind (ToM)

Supporting a neurocognitive perspective, Tamir et al. (2016) found that reading fiction engages the brain's default mode network - associated with mentalising and simulation - indicating a plausible neural basis for fiction's social-cognitive benefits. Meanwhile, Jiménez et al. (2019) linked emotional intelligence and reading competence in adolescents, further supporting the interplay between reading and emotional skills. Kidd and Castano (2013) reported improved Theory of Mind (ToM) following brief exposure to literary fiction, though later replication attempts by Panero et al. (2016) failed to reproduce these findings, raising doubts about the robustness of short-term effects. However, Mar (2011) conducted a meta-analysis showing that brain regions involved in story comprehension - such as the medial Prefrontal Cortex (mPFC), the Temporal Parietal Junction (TPJ), and precuneus - overlap with those used in ToM (Saxe and Kanwisher, 2003; Frith and Frith, 2006). This suggests that reading fiction could engage the same neural systems used for understanding others' thoughts and feelings, providing a biological basis for fiction's potential to enhance empathy. While short-term experimental effects remain inconsistent, cumulative exposure to fiction may facilitate empathic and social cognition through both psychological and neural mechanisms.

2.2.4 Reading, Human Capital, and Economic Mobility

University Level Reading and Income

Research also reveals the socioeconomic benefits of sustained reading habits, linking them to long-term income outcomes. Kato and Nagira (2021), using data from a longitudinal survey of Japanese business and economics graduates (N=677) across 1996-2016, found that frequent extracurricular reading during university was positively associated with higher post-graduation income, after controlling for subject-specific competencies, GPA, and cognitive ability. Students who read regularly exhibited stronger subject-specific

competencies that likely translated into greater employability and income resilience in dynamic labour markets. Their reading habits at graduate level led to greater reading after graduation. This further reading allowed for a continuous update of the students subject knowledge, explaining some of these income effects (Kato and Nagira, 2021).

Broader Skills and Workplace Productivity

Increases in income could also be a result of reading enhancing domain-general competencies such as self-regulated learning (OECD, 2010), communication (Mol and Bus, 2011), and problem-solving (OECD, 2013; Cain and Oakhill, 2010) - skills increasingly valued in the knowledge economy (Powell and Snellman, 2004; OECD, 2018; World Economic Forum, 2025). Reading also fosters the accumulation of knowledge, which Foray (2006), in his book, *The Economics of Knowledge*, identifies as a fundamental economic resource, contributing to both capital and income. Sullivan and Brown (2015), in a longitudinal study (N = 10,000) found reading for pleasure in children was a predictor of progress in vocabulary and mathematics, while the OECD (2013) skills report observed a strong correlation between literacy and problem solving abilities. The report also showed a positive correlation between the use of reading skills at work and labour productivity across different countries, suggesting that the integration of reading into professional contexts may contribute to more efficient and knowledge-intensive economies. Around 30% of the variation in labour productivity across countries can be attributed to how often reading skills are used in the workplace (OECD, 2013). This association held after accounting for workers' literacy and numeracy levels.

Socioeconomic Reading Gaps

Recent survey data from Statista (2018) highlights a stratified pattern in reading frequency by income in the United States: individuals earning over $80,000 annually reported reading an average of 12 books per year, compared to just 6 books for those earning under $40,000. 16% of respondents in the $80,000 category said they read between 20-50 books a year compared to 10% for those in the $40,000 and under bracket. While the data is correlational, it suggests a reinforcing cycle wherein higher income affords greater time, access, and opportunity for reading, which in turn supports further skill accumulation and economic advantage - echoing the upward spiral described by Stanovich's (1986) Matthew effect. This is reflected in OECD data showing that, on average, 72% of socio-economically advantaged students reported reading for enjoyment daily, compared to 56% of disadvantaged students - with the gap exceeding 20 percentage points in countries such as Ireland, Germany, and France (OECD, 2010).

2.3 Gaps in the Literature

While extensive reporting by the OECD has documented broad declines in reading time, attitudes, and home literacy resources—particularly among youth—there is still value in deepening this analysis. This dissertation draws on harmonised PISA data across 2000-2022 to explore global trends in reading attitudes and behaviours, with distinctions between OECD member countries (predominantly high-income economies (World Bank, 2024)) and non-OECD partner economies also being highlighted. By disaggregating trends in books-at-home, reading time, and attitudinal responses, this study adds contextual nuance to existing accounts. In doing so, it helps situate the subsequent regression analyses within a clearer picture of how reading environments have evolved over the past two decades (2000–2022).

Importantly, while international reports (OECD, 2021) describe changes in literacy environments, they do not model how these trends could relate to cognitive and psychosocial outcomes. Existing studies linking reading to long-term gains—such as income (Kato and Nagira, 2021), empathy (Mar et al., 2009), or dementia risk (Lee et al., 2018)—tend to rely on small, country-specific cohorts or post hoc self-reports. Large-scale international assessments such as PIRLS (Mullis et al., 2017) provide valuable cross-national data, but their focus is on reading literacy outcomes (e.g., comprehension of literary and informational texts) rather than metacognitive competencies such as summarising, source credibility evaluation, or cognitive flexibility. Sullivan and Brown (2013) examine broader cognitive outcomes in a longitudinal UK cohort, though their findings are based on a nationally specific rather than a globally representative sample. Few studies attempt to quantify the relationship between reading inputs and these broader metacognitive traits in a globally representative adolescent sample.

Moreover, despite growing concern about digital displacement, most research compares digital versus print reading in terms of comprehension, without examining whether increased digital engagement coincides with broader declines in the reflective, attentional, and critical thinking skills that sustained reading may cultivate.

This project contributes to this area by incorporating insights from cognitive neuroscience (Dehaene and Cohen, 2007; Tamir et al., 2016), attentional control theory (Eysenck et al., 2007), modern philosophy (Han, 2021, 2023), and empirical studies linking reading to inductive reasoning, mindfulness, and imagination (Greenfield, 2009). These theoretical perspectives do not imply causality but instead offer an interpretive framework for understanding the wider implications of declining positive attitudes toward reading and reduced reading engagement—particularly for cognitive development, attentional capacities, and socio-emotional skills—in the context of increasing digital saturation.

Skills such as abstract reasoning, critical thinking, and reflective attention—which appear to be associated with extended reading—may be particularly relevant for adolescents now entering a labour market shaped by artificial intelligence and rapid technological change (Bakhshi et al., 2017; OECD, 2018; Mitchell, 2019). Furthermore, as economies become increasingly interconnected and globalised, individuals must be emotionally capable of seeing the views of others—an ability linked to perspective-taking, which has been shown to reduce intergroup conflict and foster social cohesion in diverse settings (Alan et al., 2023). While this dissertation does not claim to establish causal effects, it seeks to illuminate whether reading-related behaviours predict metacognitive and psychological outcomes that are likely to be central to human adaptability in the 21st century.

Separating home literacy conditions by OECD status also introduces necessary historical context, reminding us that reading has long been a stratified and privileged practice. As Chapter 5 will explore, any serious discussion of declining literacy must be grounded in a careful, context-sensitive understanding of its unequal distribution across time.

3. Data and Methodology

3.1 Data Source

3.1.1 Pisa Data Set

This study draws on publicly available data from the OECD's Programme for International Student Assessment (PISA). The analysis spans eight assessment cycles from 2000 to 2022, focusing on student reading attitudes, the home literacy environment (proxied by estimated books-at-home), and daily time spent reading.

While descriptive comparisons are made across all cycles to highlight global trends, the 2018 wave is used for in-depth regression modelling. This wave contains the richest set of psychological and cognitive outcome variables, alongside detailed indicators of reading time, preferences, and digital reading behaviours. It is important to note that variables measuring reading attitudes, preferences, and daily reading time were only included in 2000, 2009, and 2018, which limits longitudinal comparisons to those three years. In contrast, the books-at-home item was included in every cycle, allowing for consistent analysis of long-term trends. To contextualise digital vs. print habits, additional descriptive insights are drawn from a 2018 item measuring stated reading format preference.[1]

The descriptive analysis visualises changes in books-at-home distribution and average reading time across all available years, with separate breakdowns by OECD membership. PISA is conducted triennially, with a delay in 2021 due to the COVID-19 pandemic. Across the eight waves, participation averaged 446,451 students from 63 countries per cycle. The 2018 dataset is the largest, containing 612,004 student responses from 80 countries.

[1]See OECD documentation for each PISA cycle used in this study: (OECD, 2002a,b, 2000, 2005a,b, 2003, 2008, 2009a, 2006, 2011, 2012a, 2009b, 2014a,b, 2012b, 2017a,b, 2015, 2020, 2019, 2018, 2024c,d, 2022). Full datasets and materials are available at `https://www.oecd.org/pisa/data/`.

3.1.2 Survey Administration

In each PISA cycle, a nationally representative sample of 15 to 16-year-old students is selected through a two-stage stratified sampling design. Students complete both a cognitive assessment (covering reading, mathematics, and science) and a background questionnaire. The latter provides data on student demographics, attitudes, educational background, and socio-emotional constructs. Of particular relevance for this study are the student-reported items on daily reading time, books in the home, and reading preferences as well as the PISA constructed indexes covering metacognition and other psychological traits.

3.2 Dataset Construction

3.2.1 Data Processing

Data were processed using custom Python scripts developed for each wave (see tables A.8 and A.9). Earlier data cycles, spanning from 2000 to 2012, were provided as fixed-width text files and required parsing using SPSS syntax scripts. Cleaning procedures involved harmonising variable formats across years, removing invalid codes, and recoding Likert scales. All final data were exported as .csv files for statistical analysis.

3.2.2 Key Predictors

The two primary independent variables are `read_time_numeric` and `books_home`. Both were derived directly from the PISA 2018 student questionnaire and are treated as ordinal predictors coded from 1 to 5 and 1 to 6, respectively.

`read_time_numeric` captures students' self-reported daily reading time for enjoyment, based on the question: "About how much time do you spend reading for enjoyment on a typical day?" Response options were provided on a five-point ordinal scale: (1) None; (2) Up to 30 minutes; (3) Between 30 and 60 minutes; (4) Between 1 and 2 hours; and (5) More than 2 hours. Responses were recoded into a numeric variable ranging from 1 to 5, where higher values correspond to more reading time.

`books_home` reflects students' estimates of the number of books available in their home, drawn from the item: "About how many books are there in your home?" Students selected from six ordinal categories, recoded into integer values from 1 to 6 as follows: (1) 0–10 books; (2) 11–25 books; (3) 26–100 books; (4) 101–200 books; (5) 201–500 books; and (6) more than 500 books. While the measure is ordinal, it serves as a proxy for the home literacy environment and is treated as a continuous predictor in the regression models under the assumption of a monotonic relationship with the outcomes.[2]

[2]A recognised limitation of this approach is that it implicitly assumes equal spacing between cate-

3.2.3 Outcome Variables

Five outcome variables are examined in the regression models, capturing both metacognitive and psychological dimensions of student performance.

Metacognitive Outcomes

The first three, `metacog_understanding`, `metacog_summarising`, and `metacog_credibility`, are continuous indices developed by the OECD. These variables are scaled approximately between -1.7 and $+1.5$, with higher values indicating stronger metacognitive skills. `metacog_understanding` reflects students' ability to comprehend and retain text-based information and is derived from a weighted composite of responses in the PISA reading assessment. Similarly, `metacog_summarising` captures students' capacity to extract and condense essential ideas from texts, derived from questions such as "I summarise the text in my own words".

`metacog_credibility` evaluates students' capacity to assess the reliability of online information sources. The `metacog_credibility` index combines both cognitive responses and self-reported questionnaire data. For instance, students were presented with a hypothetical scenario involving a suspicious promotional email and asked to rate the appropriateness of various reactions (e.g., "check the sender's email address", "click on the link", "delete the email") using a six-point Likert scale. These were combined with embedded reading assessment items designed to test source evaluation skills, producing a psychometrically validated index of digital credibility assessment.

Psychological Constructs

The remaining two outcome variables, `cognitive_flexibility` and `perspective_taking`, represent psychological competencies related to adaptability and social cognition. Both are continuous variables derived by the OECD using weighted likelihood estimation (WLE), a psychometric technique that estimates latent trait levels based on multiple questionnaire items (Warm, 1989). Scores range from approximately -3.3 to $+2.1$, with higher values indicating greater cognitive flexibility or perspective-taking ability.

`cognitive_flexibility` captures students' capacity to adapt to new or stressful situations, persist through challenge, and demonstrate a growth-oriented mindset. The index aggregates responses to items reflecting beliefs about the malleability of intelligence and

gories, which is unlikely to reflect actual differences in book counts or their cognitive impact. Alternative specifications—such as modelling categories as dummies (UCLA Institute for Digital Research and Education, 2024) or assigning midpoint values (von Hippel et al., 2016)—can be implemented as robustness checks to relax this assumption. Therefore, as a robustness check, models were re-estimated using midpoint coding of the six books-at-home bands ($[5, 18, 63, 150, 350, 600]$) and reported coefficients per 100 books. Results remained significant and robust: the books-at-home coefficients appeared positive and statistically significant across all outcomes. See Table A.4 for details on results and Chapter 6 for greater detail of this limitation.

willingness to persevere through difficulty (e.g., "Your intelligence is something about you that you can't change very much"; "If I am not good at something, I would rather keep struggling to master it than move on"). These items are complemented by self-assessments of adaptability e.g., "I can adapt to different situations even when under stress or pressure".

`perspective_taking` reflects socio-cognitive empathy—the capacity to understand and consider others' viewpoints, especially in intercultural or interpersonal settings. The index is constructed from items measuring both interpersonal understanding and cultural openness. Example items include: "I try to look at everybody's side of a disagreement before I make a decision," "Before criticizing somebody, I try to imagine how I would feel if I were in their place," and "I want to learn how people live in different countries." Responses are provided on five-point Likert scales ranging from "not at all like me" to "very much like me." Higher scores indicate a greater self-perceived tendency to adopt multiple perspectives.

3.3 Descriptive Framework

3.3.1 Descriptive Analysis

The initial stage of analysis focuses on global descriptive trends. This includes the evolution of books-at-home from 2003 to 2022, the distribution of daily reading time in 2000, 2009, and 2018, and differences in home literacy environments between OECD and non-OECD countries. The 2018 item on reading format preference is used to illustrate students general reading medium preference (i.e print or digital). Book distribution is also further split between OECD and non-OECD countries (OECD, 2024b) to examine wealth differences, which informs later discussions on the historical context of reading.

Socioeconomic Correlations with Books at Home

As a brief ancillary validation (2018 only), students' reported number of books at home was regressed on their ESCS scores to confirm the expected socioeconomic gradient in book access and to further inform wealth differences in reading resources and the historical discussion of reading. Full model details and estimates are reported in Appendix A.6.

3.4 Regression Framework

3.4.1 The Meta-Model

The regression framework employed in this study, henceforth referred to as the *Meta Model*, investigates whether the home reading environment—captured through student-reported books-at-home and daily reading time—predicts metacognitive and psychological outcomes. This model is estimated using data from the 2018 wave of PISA, which provides a set of constructs capturing both cognitive processing and psychosocial development.

The dependent variables Y_i vary across models and include three metacognitive competencies: understanding and remembering, summarising, and assessing the credibility of information sources; as well as two psychological traits: cognitive flexibility and perspective taking. These five outcomes are each modelled separately to provide a clear view of how reading-related inputs relate to different facets of cognition and self-regulation.

A staggered modelling strategy is employed. The baseline specification includes only the two key predictors: $\texttt{read\_time}_i$, the ordinal variable indicating time student i spends reading daily (coded from 1 to 5), and $\texttt{books\_home}_i$, the ordinal estimate of books-at-home (coded from 1 to 6, corresponding to ranges from 0–10 books to 500+ books). This initial model is specified as:

$$Y_i = \beta_0 + \beta_1 \cdot \texttt{read\_time}_i + \beta_2 \cdot \texttt{books\_home}_i + \varepsilon_i \tag{3.1}$$

The second model expands this by adding a comprehensive vector of control variables encompassing demographic characteristics (e.g., gender, age, and language background), socioeconomic indicators (family wealth index and parental education levels), and a range of attitudinal and cognitive constructs relevant to student learning and engagement. This yields the following specification:

$$Y_i = \beta_0 + \beta_1 \cdot \texttt{read\_time}_i + \beta_2 \cdot \texttt{books\_home}_i + \sum_{k=3}^{K} \beta_k X_{ki} + \varepsilon_i \tag{3.2}$$

The third model includes country fixed effects γ_c to adjust for national-level heterogeneity, and standard errors are clustered at the country level to account for intra-country correlation in sampling and response structure. This full specification is shown below:

$$Y_i = \beta_0 + \beta_1 \cdot \texttt{read\_time}_i + \beta_2 \cdot \texttt{books\_home}_i + \sum_{k=3}^{K} \beta_k X_{ki} + \gamma_c + \varepsilon_i \tag{3.3}$$

In this specification, Y_i denotes the outcome variable for student i, which varies across models and includes metacognitive and psychological constructs (e.g., summarising abil-

ity, cognitive flexibility). The summation term $\sum_{k=3}^{K} \beta_k X_{ki}$ captures the vector of $K-2$ control variables, where X_{ki} represents student i's value on control variable k. The term γ_c represents country fixed effects for country c, which control for unobserved national-level heterogeneity. Finally, ε_i is the individual-level error term.

The staggered regression design provides a clear view of how the inclusion of controls changes the estimated effect sizes of books-at-home and reading time. This helps isolate their unique contributions to the outcomes of interest, while mitigating confounding influences. Full regression tables and coefficient plots are reported in Chapter 4, with detailed specifications of variables presented in Appendix Table A.1. Sample sizes vary slightly across models due to item-level nonresponse.

3.4.2 Robustness Checks

Variance Inflation Factor (VIF)

A Variance Inflation Factor (VIF) analysis was conducted to assess multicollinearity between predictors (O'Brien, 2007). Results indicate no evidence of multicollinearity across any of the five outcome models, with all VIF values close to 1. See Table A.2 in the Appendix for full results.

Reading Attitudes as a Mediator

Reading attitude variables are intentionally excluded from the primary regression specification due to their likely role as mediators rather than confounders. A richer home reading environment—proxied by books-at-home and daily reading time—may foster more positive attitudes toward reading, which in turn contribute to the development of cognitive and psychosocial skills. Including such mediators in OLS regressions risks obscuring the total effect of the primary predictors by inducing overcontrol bias or collider bias (Elwert and Winship, 2014)—where conditioning on an intermediate variable can block part of the causal pathway or introduce spurious associations (Hayes, 2013; Rohrer, 2018). In econometric terms, such post-treatment variables can act as "bad controls", potentially obscuring part of the total effect of the main predictors (Cinelli et al., 2022; Angrist and Pischke, 2009). From a mediation framework perspective, excluding attitudinal variables allows for clearer estimation of the total effect of the reading environment. The supplementary table A.3 demonstrates that including reading attitude controls leads to substantially attenuated coefficients for both books-at-home and reading time, consistent with partial mediation (see MacKinnon et al., 2007).

Non-linearity Checks

Although both `read_time_numeric` and `books_home` are ordinal predictors, a non-linearity check was conducted for reading time by including a squared term (`read_time_sq`) in the model. This was justified on the grounds that reading time, though binned, reflects an underlying continuous behaviour where diminishing returns may occur. By contrast, `books_home` is a symbolic home literacy proxy with broad, non-equidistant bins, and non-linear transformations are less meaningful. Model estimates with the squared term suggest a concave relationship between reading time and metacognitive outcomes (positive linear term, negative quadratic term), indicating diminishing marginal effects beyond moderate durations (see Table A.6). Nevertheless, the inclusion of this term does not substantially alter the direction or significance of the main effects, supporting the validity of the linear OLS specification (see Chapter 6).

4. Results

4.1 Descriptive Analysis

4.1.1 Book Ownership Trends

Between 2003 and 2022, there has been a clear and steady decline in the proportion of students reporting high numbers of books at home, accompanied by a consistent rise in those with minimal access to books. In 2003, 13.6% of students reported having 0–10 books at home, but this figure increased progressively across cycles, reaching 22.2% by 2022—an absolute rise of 8.6 percentage points. Similarly, the 11–25 book category saw a moderate increase from 17.4% to 19.7%. By contrast, the proportion of students reporting 26–100 books—the most commonly reported category—declined slightly over time, from 29.6% in 2003 to 25.8% in 2022. Pronounced decreases occurred in the upper categories: students reporting 101–200 books declined from 17.5% to 12.0%, while those with 201–500 books dropped from 13.5% to 8.2%. The highest category (500+ books) fell by nearly half, from 8.3% in 2003 to 4.3% in 2022.[1]

The 2024 OECD report sheds additional light on these trends. The report found access to books strongly influences reading attitudes: only 25% of children with fewer than 10 books at home considered themselves 'very confident' readers, compared to 66% of those with more than 200 books; similarly, 46% of children with limited book access reported disliking reading, compared to just 11% among those with extensive home libraries (OECD, 2024a). The OECD report concluded that overall, since 2015, the number of books available in the home has decreased and that "the rise of digital technology has meant books, traditionally the leading pedagogical resource – are increasingly competing with digital devices and internet access." (OECD, 2024a).

[1]The 2000 PISA survey (Q37) used a seven-category response scale for books at home, beginning with *"None"* and then *"1–10"*. From 2003 onwards (ST013), the lowest category was recoded to *"0–10"*, with only six categories in total. This creates a discontinuity: respondents who would have chosen *"None"* in 2000 were grouped with the *"1–10"* category in subsequent waves. As a result, including 2000 data would artificially inflate the lowest category in later years, making direct trend comparisons misleading. For consistency, 2000 is therefore excluded from the cross-cycle analysis.

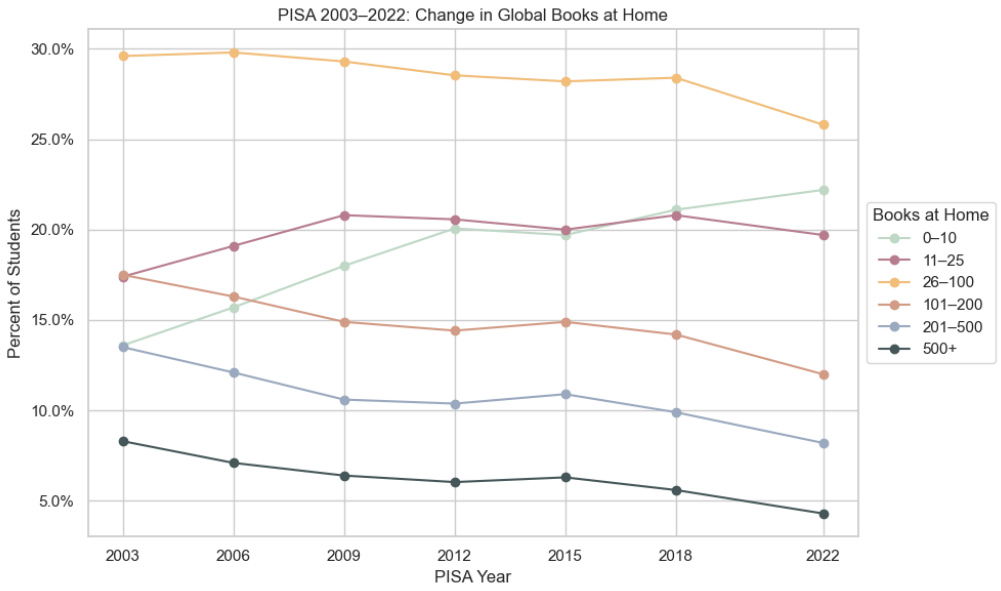

Figure 4.1: Distribution of student-reported books at home across PISA cycles (2003–2022).

Table 4.1: Percentage of Students by Books-at-Home Category (2003–2022)

Books at Home	**2003**	**2006**	**2009**	**2012**	**2015**	**2018**	**2022**
0–10	13.6%	15.7%	18.0%	20.1%	19.7%	21.1%	22.2%
11–25	17.4%	19.1%	20.8%	20.6%	20.0%	20.8%	19.7%
26–100	29.6%	29.8%	29.3%	28.5%	28.2%	28.4%	25.8%
101–200	17.5%	16.3%	14.9%	14.4%	14.9%	14.2%	12.0%
201–500	13.5%	12.1%	10.6%	10.4%	10.9%	9.9%	8.2%
500+	8.3%	7.1%	6.4%	6.0%	6.3%	5.6%	4.3%

Source: Author's calculations using PISA data (2003–2022). Percentages may not total 100% due to rounding.

4.1.2 Student Reported Reading Time

Daily reading time has declined slightly in terms of regularity and intensity, but with an interesting uptick in long-duration readers by 2018. The proportion of students who reported not reading at all on a typical day increased steadily across cycles, from 28.7% in 2000 to 32.7% in 2018. Meanwhile, the share of students reading for less than 30 minutes remained relatively stable (30.0% in 2000; 24.9% in 2018), while the 30–60 minute category declined from 22.9% to 19.6%.

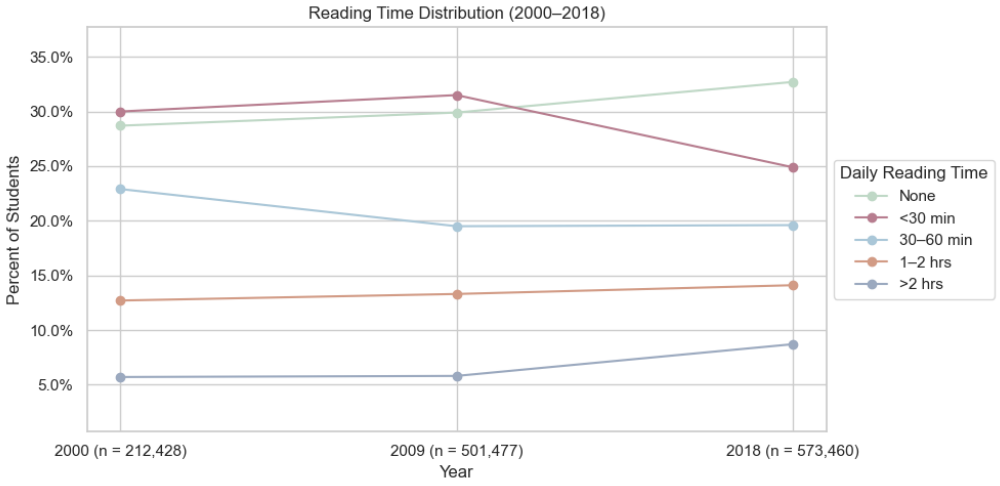

Figure 4.2: Trends in Daily Reading Time across PISA cycles 2000, 2009 and 2018

There was a slight increase in the percentage of students reading for 1–2 hours daily, rising from 12.7% in 2000 to 14.1% in 2018. The proportion of students reading for more than 2 hours also increased—from 5.7% to 8.7%—suggesting a small but meaningful rise in highly engaged readers.

Table 4.2: Percentage of Students by Daily Reading Time Category (2000–2018)

Reading Time	**2000 (n = 212,428)**	**2009 (n = 501,477)**	**2018 (n = 573,460)**
None	28.7%	29.9%	32.7%
<30 min	30.0%	31.5%	24.9%
30–60 min	22.9%	19.5%	19.6%
1–2 hrs	12.7%	13.3%	14.1%
>2 hrs	5.7%	5.8%	8.7%

Source: Author's analysis using PISA 2000, 2009, and 2018 datasets. Percentages may not sum to 100% due to rounding.

4.1.3 Reading Attitudes Over Time

For the statement "I read only if I have to", both levels of agreement increased between 2000 and 2018 (Agree: 24.51% to 30.24%; Strongly Agree: 12.30% to 14.60%), while both levels of disagreement declined (Strongly Disagree: 27.64% to 22.62%; Disagree: 35.55% to 32.54%). This indicates a shift toward greater endorsement of the view that reading is undertaken only when necessary, rather than for intrinsic enjoyment.

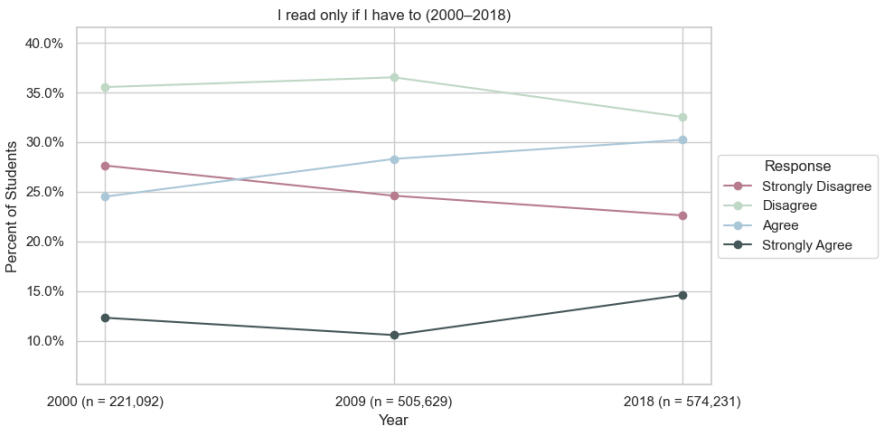

Figure 4.3: Percentage of students agreeing or disagreeing with the statement "I read only if I have to", across PISA cycles 2000, 2009 and 2018.

More encouraging patterns emerge for "Reading is one of my favourite hobbies", where strong agreement increased from 11.3% to 14.3%, and strong disagreement fell from 24.5% to 21.8%. Together with a stable share of moderate agreement, these results suggest a modest rise in intrinsic motivation for reading over time. However, this pattern could partly reflect social desirability bias—where respondents overreport socially valued behaviours such as reading, particularly when it is perceived as an indicator of cultural capital (Krumpal, 2013). The statement "I like talking about books with other people", reflects a similar improvement: the proportion of students expressing strong agreement increased from 8.1% in 2000 to 12.1% in 2018, while strong disagreement declined from 24.3% to 22.0%.

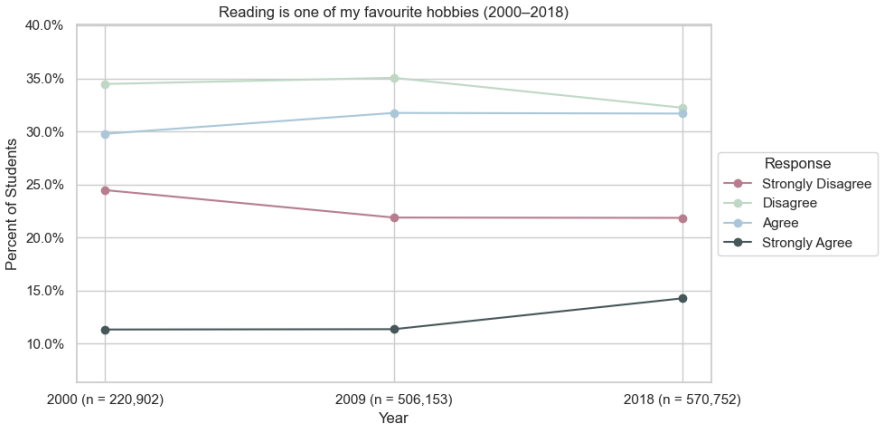

Figure 4.4: Percentage of students agreeing or disagreeing with the statement "Reading is one of my favourite hobbies", across PISA cycles 2000, 2009 and 2018.

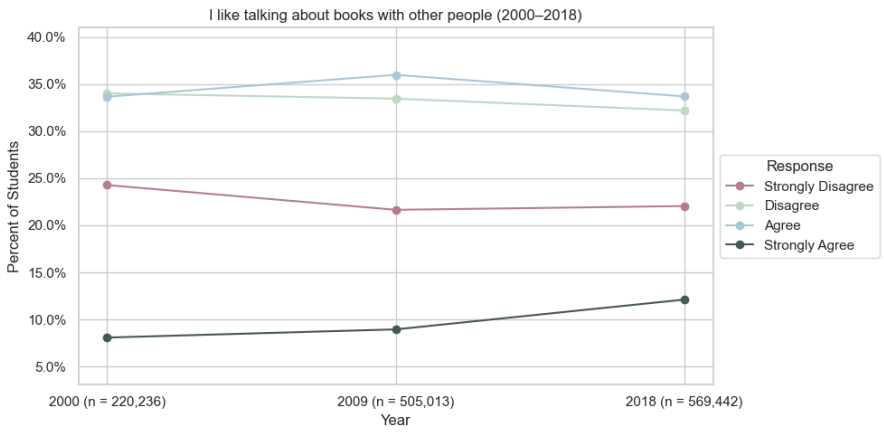

Figure 4.5: Percentage of students agreeing or disagreeing with the statement "I like talking about books with other people", across PISA cycles 2000, 2009 and 2018.

Attitudes toward reading as a "waste of time" have remained relatively stable across cycles, with strong disagreement slightly declining from 37.6% to 37.0%. However, there was a small increase in strong agreement—from 7.6% to 8.1%—suggesting that a subset of students has become more openly dismissive of reading's value. Finally, the pragmatic view that "I read only to get the information I need", continued to receive substantial agreement across all years. Strong agreement rose from 13.2% in 2000 to 15.2% in 2018, while disagreement—particularly moderate—fell by several percentage points, indicating a slight shift toward less utilitarian reading motivations.

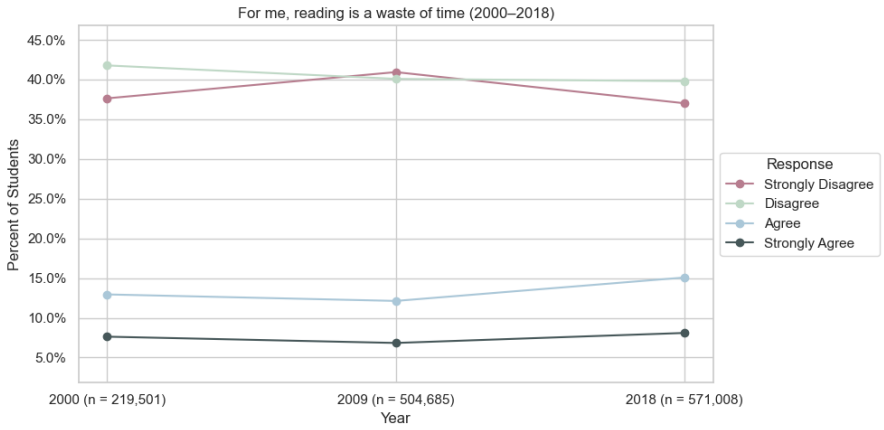

Figure 4.6: Percentage of students agreeing or disagreeing with the statement "Reading is a waste of time", across PISA cycles 2000, 2009 and 2018.

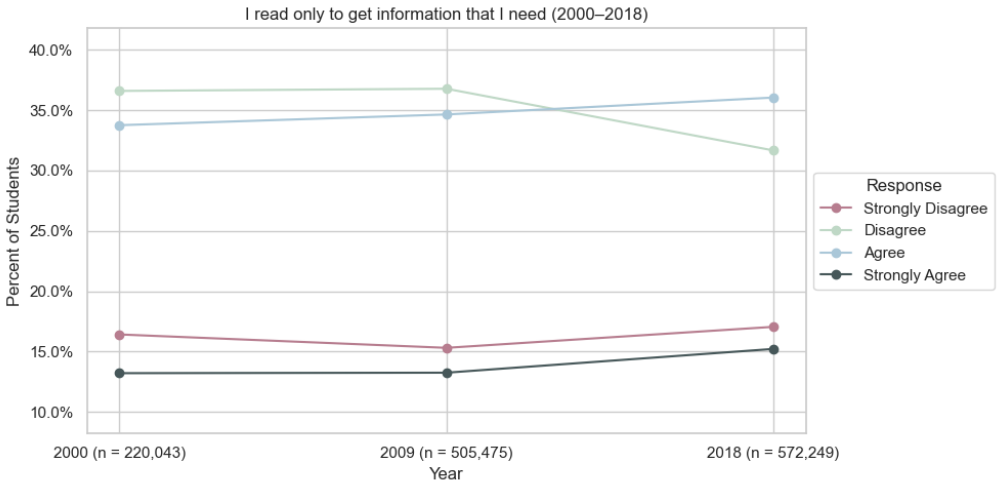

Figure 4.7: Percentage of students agreeing or disagreeing with the statement "I read only to get the information I need", across PISA cycles 2000, 2009 and 2018.

Table 4.3: Student Attitudes Toward Reading: Percent Responding by Agreement Level (2000–2018)

Item	**Response**	**2000**	**2009**	**2018**
I read only if I have to	Strongly Disagree	27.64%	24.60%	22.62%
	Disagree	35.55%	36.53%	32.54%
	Agree	24.51%	28.31%	30.24%
	Strongly Agree	12.30%	10.56%	14.60%
Reading is one of my favourite hobbies	Strongly Disagree	24.46%	21.87%	21.84%
	Disagree	34.47%	35.05%	32.23%
	Agree	29.77%	31.74%	31.68%
	Strongly Agree	11.31%	11.34%	14.25%
I like talking about books with other people	Strongly Disagree	24.27%	21.64%	22.04%
	Disagree	34.00%	33.44%	32.18%
	Agree	33.65%	35.97%	33.68%
	Strongly Agree	8.08%	8.95%	12.11%
For me, reading is a waste of time	Strongly Disagree	37.64%	40.94%	37.02%
	Disagree	41.78%	40.09%	39.80%
	Agree	12.95%	12.13%	15.08%
	Strongly Agree	7.63%	6.84%	8.10%
I read only to get information that I need	Strongly Disagree	16.42%	15.31%	17.05%
	Disagree	36.60%	36.78%	31.67%
	Agree	33.76%	34.65%	36.05%
	Strongly Agree	13.21%	13.25%	15.22%

Source: PISA 2000, 2009, 2018 student questionnaires. Values represent percentage of students choosing each response on a 4-point Likert scale.
Note: Based on cleaned datasets with invalid values excluded. Minor rounding differences may occur.

4.1.4 Descriptive Insights from 2018: Format Preferences and Book Access

Book Format Preference

In 2018, 30% of students stated that they read books more often in paper format, compared to 19.8% who reported reading more often on digital devices, and 17.8% who indicated reading equally in both formats (Figure 4.8). A further 25.4% reported rarely or never reading books. These are self-reported format preferences, based on the PISA item "Which of the following statements best describes how you read books (on any topic)?" (OECD, 2018), and therefore reflect perceived rather than directly observed behaviour. Nevertheless, they align with prior research on reading behaviour and access to print resources, as discussed in Section 2.1.1, where print appears to remain the preferred format for most readers (Pew Research Center, 2022), particularly for focused or literary reading (Schwabe et al., 2023), despite increasing access to digital media.

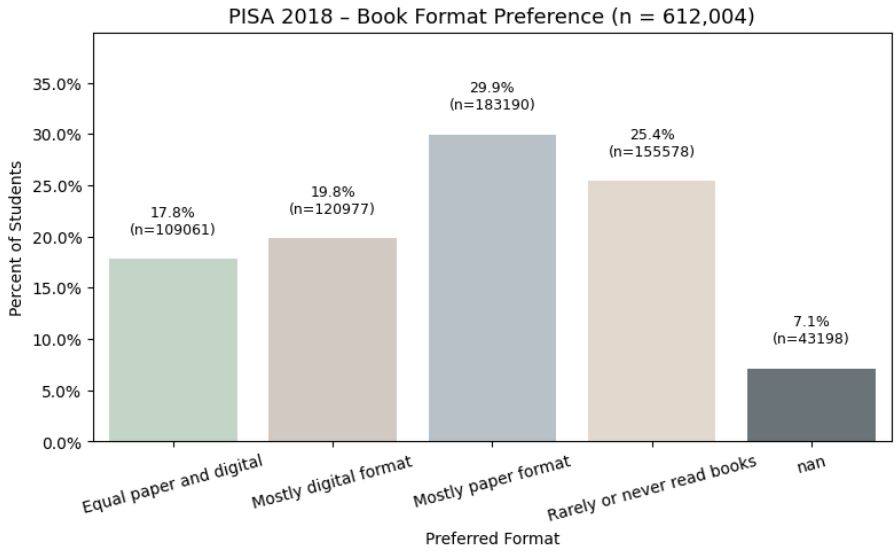

Figure 4.8: Stated reading format preferences in 2018, (all countries).

Book Access by OECD Split

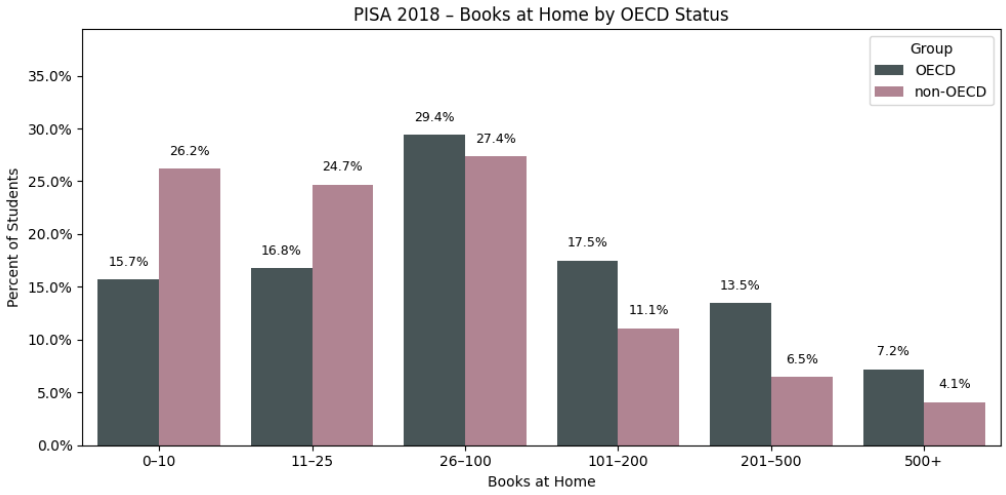

Figure 4.9: Student reportage of books at home by OECD status.

Figure 4.9 shows the distribution of reported books-at-home by OECD status. In OECD countries, 29.4% of students reported having 26–100 books, and 15.7% reported having 0–10 books. In contrast, among non-OECD students, limited reported ownership in households was more common: 26.2% reported 0–10 books and 24.7% reported 11–25. The highest ownership category (500+ books) was twice as common in OECD countries (7.2%) as in non-OECD settings (4.1%) — a 43% relative difference.

These patterns align with existing evidence that both wealth and education predict home book access (Heppt et al., 2022; Eriksson et al., 2021), and with historical analyses showing that leisure reading emerged unevenly across social strata as a function of material and cultural capital (Jajdelska, 2007; Bannet, 2017).

4.1.5 Socioeconomic Regression Findings

The ancillary regression analysis (2018) confirms a strong socioeconomic gradient in book access. In the pooled OLS specification, the *coefficient* on ESCS is $\beta = 0.6662$ (SE $= 0.0010$, $p < 0.001$; $N = 593{,}387$), indicating that each one standard-deviation increase in socioeconomic status is associated with an increase of about two-thirds of a category on the books-at-home scale. The within-country model, which includes country fixed effects and clustered SEs, yields a slightly smaller but still precise *coefficient* of $\beta = 0.6442$ (SE $= 0.0240$, $p < 0.001$; $N = 593{,}387$). These results indicate a positive correlative relationship between socioeconomic status and books at home. Full model results are provided in Appendix A.6.

4.2 Regression Findings

4.2.1 Meta-Model 1 Findings

Meta Model 1 estimates the direct relationship between students' daily reading time (`read_time_numeric`) and home literacy resources (`books_home`) on a set of cognitive and psychosocial outcomes, using ordinary least squares (OLS) regression without any control variables or fixed effects. This baseline specification captures the gross associations of interest across the full international sample. The dependent variables are standardised (mean = 0, SD = 1), such that the coefficients can be interpreted as the expected change in the outcome, in standard deviation units, for a one-category increase in the predictor. For example, a coefficient of 0.068 for reading time indicates that moving up one category in daily reading time (e.g., from 31–60 minutes to 1–2 hours) is associated with a 0.068 SD increase in the outcome, all else equal.[2]

Across all five outcome variables, both predictors are positively and significantly associated with the dependent measures. For instance, the coefficient for `books_home` on *metacognitive understanding* is $\beta = 0.094$ (SE = 0.001, $p < 0.001$), while `read_time_numeric` yields $\beta = 0.068$ (SE = 0.001, $p < 0.001$). For *metacognitive credibility*, `books_home` shows an even stronger association ($\beta = 0.130$, SE = 0.001, $p < 0.001$), while *perspective taking* is most strongly associated with reading time ($\beta = 0.099$, SE = 0.001, $p < 0.001$).

Although modest in terms of explained variance (R^2 ranging from 0.013 to 0.041), the overall model fit is statistically significant in all cases. The F-statistics—ranging from 2,717 to 11,100—confirm the joint significance of the included predictors ($p < .001$ for all models). The F-statistic tests the null hypothesis that all slope coefficients are simultaneously zero, and under standard OLS assumptions, provides a valid inference of model fit (Wooldridge, 2016).

Additionally, each model reports the log-likelihood value (e.g., –740,290 for *metacognitive understanding*), which provides a likelihood-based measure of model fit. While the absolute magnitude of the log-likelihood offers limited interpretive value on its own, it becomes informative when comparing across nested specifications or model extensions (Greene, 2012). These baseline values serve as a benchmark for evaluating improvements in subsequent models that incorporate additional covariates and fixed effects.

[2]This interpretation applies to all models (Models 1–3), as all dependent variables are standardised and predictors are coded as ordered categories.

Table 4.4: Model 1 Regression Results of Reading Time and Books at Home on Cognitive and Psychological Outcomes

	Understanding (n = 527,989)	**Summarising** (n = 528,486)	**Credibility** (n = 520,765)	**Flexibility** (n = 424,432)	**Perspective Taking** (n = 425,915)
Main Predictors					
Reading Time (β)	0.068***	0.056***	0.038***	0.038***	0.099***
(SE)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Books at Home (β)	0.094***	0.116***	0.130***	0.068***	0.038***
(SE)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Model Statistics					
R-squared	0.030	0.037	0.041	0.013	0.021
Adj. R-squared	0.030	0.037	0.041	0.013	0.021
F-statistic	8062	10070	11100	2717	4557
Log-Likelihood	−740290	−739580	−720220	−609260	−607860
AIC	1.481e+06	1.479e+06	1.440e+06	1.219e+06	1.216e+06

Levels of statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.
Standard errors in parentheses.
Notes: Model estimated using OLS with no control variables or country fixed effects. Dependent variables are standardised cognitive and psychological indices derived from PISA 2018.

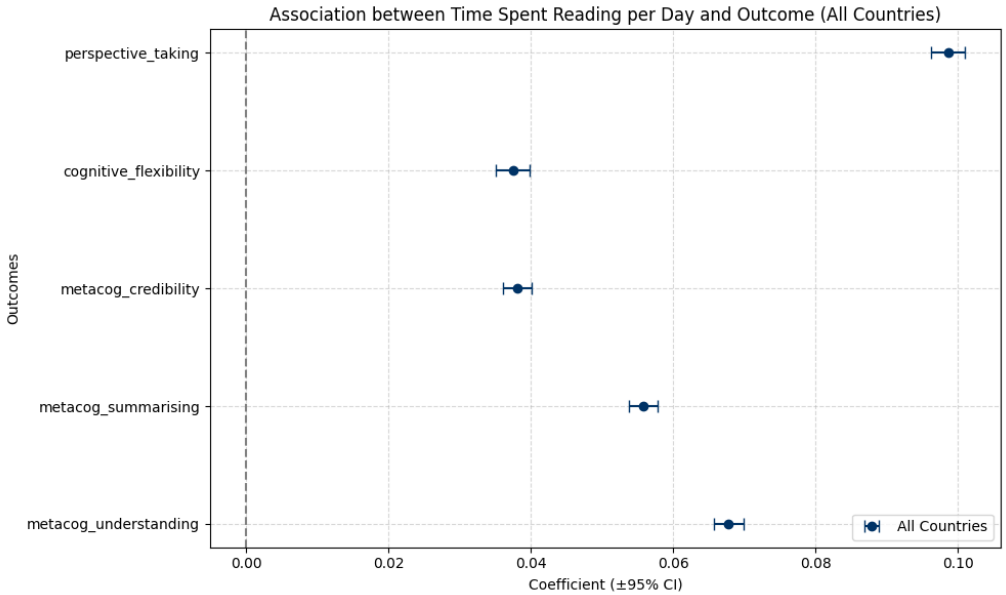

Figure 4.10: Regression coefficients for Meta-Model 1 (Reading Time)

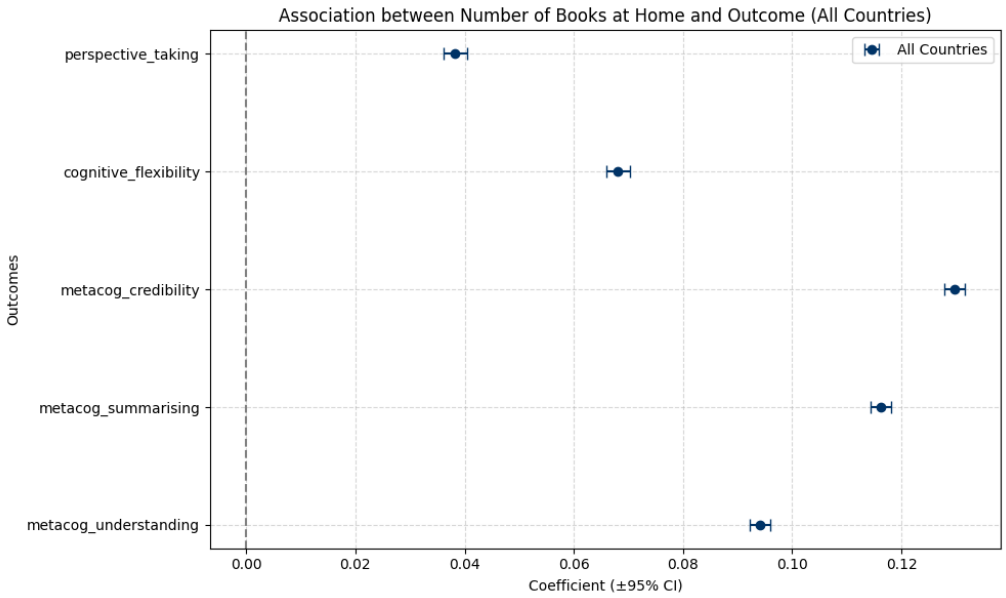

Figure 4.11: Regression coefficients for Meta-Model 1 (Books at Home)

4.2.2 Meta-Model 2 Findings

Model 2 extends the baseline specification by including a full set of control variables—demographic, cognitive and socioeconomic covariates—while still excluding country fixed effects and clustered standard errors. This allows for a cleaner examination of whether the predictive power of `read_time_numeric` and `books_home` persists once key background characteristics are accounted for. Across all five outcome variables, both predictors remain statistically significant in most models, though the strength of association is attenuated relative to Model 1. For instance, the coefficient for `read_time_numeric` on *metacognitive understanding* drops from $\beta = 0.068$ in Model 1 to $\beta = 0.048$ (SE = 0.002, $p < 0.001$), suggesting that part of the association in the baseline model was explained by confounding covariates. A similar pattern is observed for `books_home`, which now yields $\beta = 0.019$ (SE = 0.003, $p < 0.001$) on the same outcome.

The most robust effects are seen for `read_time_numeric` in predicting both *perspective taking* ($\beta = 0.047$, SE = 0.002, $p < 0.001$) and *metacognitive credibility* ($\beta = 0.046$, SE = 0.002, $p < 0.001$), while `books_home` retains its strongest coefficient for *summarising* ($\beta = 0.036$, SE = 0.003, $p < 0.001$). However, the effect of books at home on *perspective taking* is rendered statistically insignificant ($\beta = 0.002$, SE = 0.003, $p = 0.48$), suggesting a more limited role once background variables are accounted for. This is intuitive, as perspective-taking skills are likely more dependent on active engagement with reading than on the mere availability of books in the home environment.

Model fit improves substantially compared to Model 1. R^2 values now range from 0.093 to 0.138 across outcomes, indicating a greater proportion of variance explained

after adjusting for individual characteristics. F-statistics remain highly significant, ranging from 355.6 to 568.1 ($p < 0.001$ in all cases). The log-likelihood and AIC values are similarly informative for model comparison: for example, the AIC for *metacognitive understanding* improves from 1,481,000 in Model 1 to 382,500 in Model 2, reflecting the narrower residual distribution induced by additional controls.

Table 4.5: Model 2 OLS Regression Results of Reading Time and Books at Home on Cognitive and Psychological Outcomes (Controls Included)

	Understanding (n = 141,959)	**Summarising** (n = 142,794)	**Credibility** (n = 141,770)	**Flexibility** (n = 145,914)	**Perspective Taking** (n = 145,775)
Main Predictors					
Reading Time (β)	0.048***	0.034***	0.046***	0.015***	0.047***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Books at Home (β)	0.019***	0.036***	0.027***	0.007**	0.002
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Model Statistics					
R-squared	0.093	0.131	0.117	0.138	0.126
Adj. R-squared	0.093	0.130	0.117	0.137	0.125
F-statistic	355.6	523.0	458.8	568.1	511.0
Log-Likelihood	–191210	–188190	–188170	–192020	–192630
AIC	382500	376500	376400	384100	385400

Levels of statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.
Standard errors in parentheses.
Notes: Model estimated using OLS with 41 covariates. Dependent variables are standardised cognitive and psychological indices derived from PISA 2018.

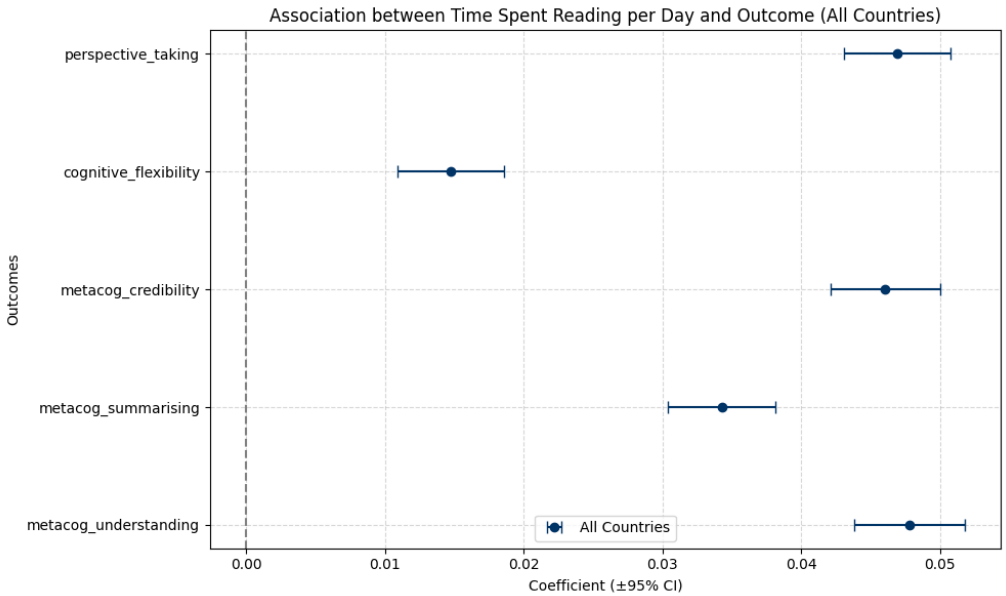

Figure 4.12: Regression coefficients for Meta-Model 2 (Reading Time)

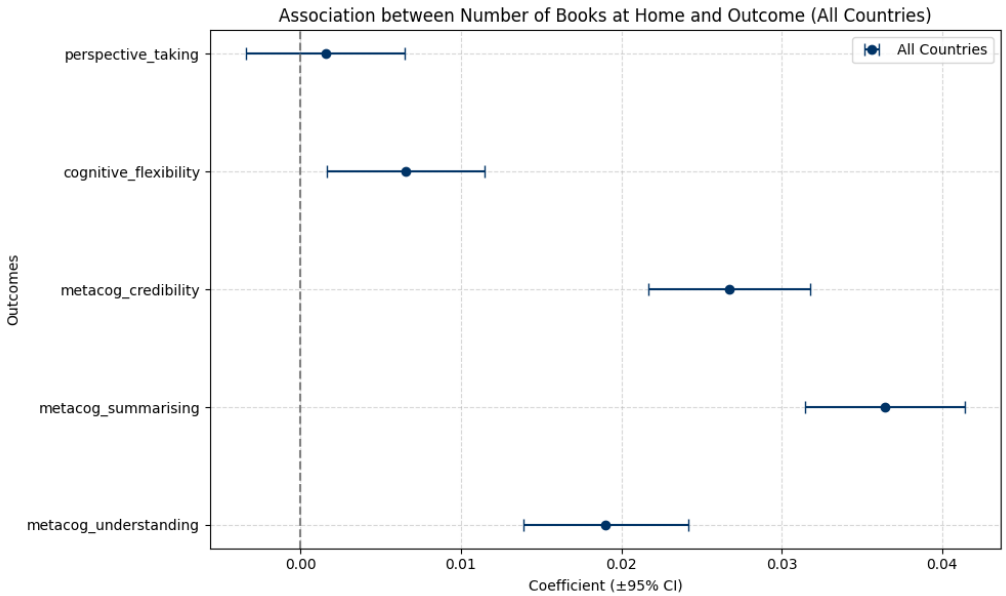

Figure 4.13: Regression coefficients for Meta-Model 2 (Books at Home)

4.2.3 Meta-Model 3 Findings

Controlling for a full vector of background variables, country fixed effects, and applying clustered standard errors, both `books_home` and `read_time_numeric` remain statistically significant predictors across most outcomes. Reading time is a particularly consistent positive predictor. It significantly predicts all five cognitive and psychosocial outcomes, with the strongest effect observed for metacognitive credibility assessment ($\beta = 0.060$, $p < 0.001$) and summarising ($\beta = 0.050$, $p < 0.001$). For perspective taking, reading time maintains its strength ($\beta = 0.047$, $p < 0.01$), while the effect of `books_home` becomes non-significant ($\beta = -0.001$, n.s.), suggesting that daily reading may be a more proximal driver of this particular psychological skill.

`books_home` continues to show modest but significant associations with *metacognitive understanding* ($\beta = 0.017$, $p < 0.001$), *summarising* ($\beta = 0.029$, $p < 0.001$), *credibility* ($\beta = 0.025$, $p < 0.001$), and *cognitive flexibility* ($\beta = 0.010$, $p < 0.005$). While these coefficients are smaller than in models without controls, they remain robust and meaningful in the context of large samples ($n \approx 140{,}000$–$145{,}000$) and comprehensive covariate adjustment.

Model explanatory power, while still modest, is highest for *summarising* ($R^2 = 0.166$), *cognitive flexibility* ($R^2 = 0.166$), and *credibility* ($R^2 = 0.148$), indicating these skills are more strongly shaped by the modelled predictors and controls. The inclusion of country fixed effects also accounts for some of the cross-national policy, cultural, and educational differences, improving internal validity.

Table 4.6: Model 3 OLS Regression Results of Reading Time and Books at Home on Cognitive and Psychological Outcomes (with Country Fixed Effects and Clustered SEs)

	Understanding (n = 141,959)	**Summarising** (n = 142,794)	**Credibility** (n = 141,770)	**Flexibility** (n = 145,914)	**Perspective Taking** (n = 145,775)
Main Predictors					
Reading Time (β)	0.053***	0.050***	0.060***	0.027***	0.047***
(SE)	(0.004)	(0.004)	(0.005)	(0.003)	(0.004)
Books at Home (β)	0.017***	0.029***	0.025***	0.010**	–0.001
(SE)	(0.003)	(0.004)	(0.005)	(0.003)	(0.004)
Model Statistics					
R-squared	0.114	0.166	0.148	0.166	0.143
Adj. R-squared	0.113	0.165	0.147	0.166	0.142
F-statistic	933.5	1594.0	1260.0	5977.0	2171.0
Log-Likelihood	–189570	–185250	–185690	–189560	–191210
AIC	379300	370700	371600	379300	382600

Levels of statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.
Standard errors in parentheses.
Notes: OLS estimates include country fixed effects and clustered standard errors by country. Model estimated using OLS with 41 covariates. Dependent variables are standardised cognitive and psychological indices derived from PISA 2018.

Although the F-statistics for each model remain high (e.g., $F = 5977.0$ for *cognitive flexibility*; $F = 1594.0$ for *summarising*), their interpretation is constrained by the presence of clustering and fixed effects. As highlighted by Angrist and Pischke (2009) and Cameron and Miller (2015), conventional F-tests assume independent and identically distributed errors, and these assumptions are violated when standard errors are clustered. Accordingly, the reported F-statistics in this specification should be regarded as descriptive summaries rather than strict inferential tests. Despite this limitation, the consistently high F-values reflect the model's overall explanatory strength, and clustered inference ensures that the statistical significance of coefficients is robust to intra-country correlation.[3]

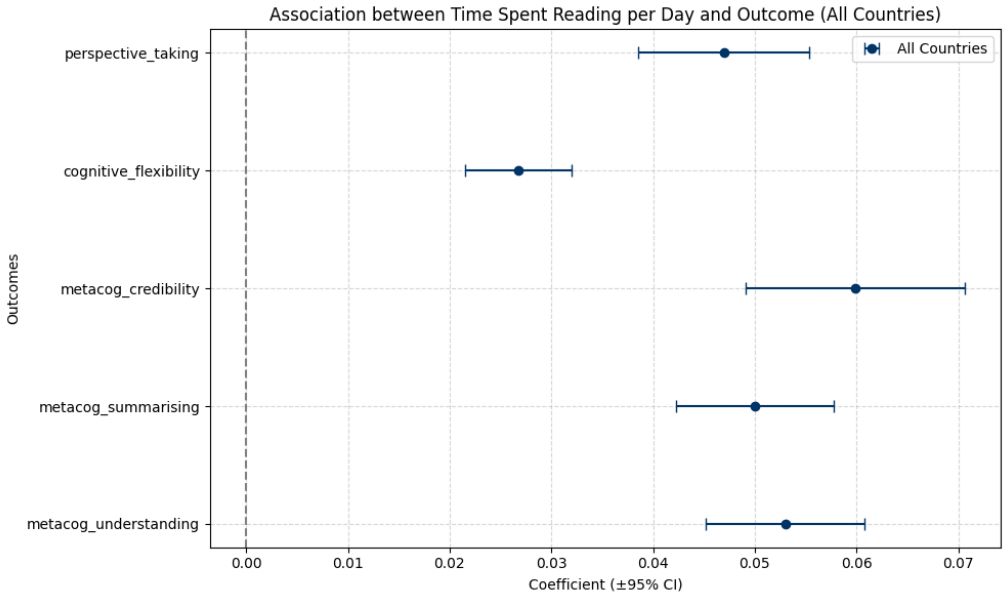

Figure 4.14: Regression coefficients for Meta-Model 3 (Reading Time)

[3]An alternative model including a squared term for daily reading time confirmed a concave relationship for metacognitive outcomes (see table A.6), consistent with diminishing returns. The evidence of diminishing returns in reading time aligns with cognitive load theories (Sweller, 2011; Mayer, 2009), suggesting that prolonged engagement may not yield proportionally greater benefits. This non-linearity, however, does not undermine the core finding that time spent reading and books at home are positive predictors of cognitive and psychosocial competencies and therefore these non-linear effects did not materially alter the interpretation of main results (see Cameron and Trivedi 2005).

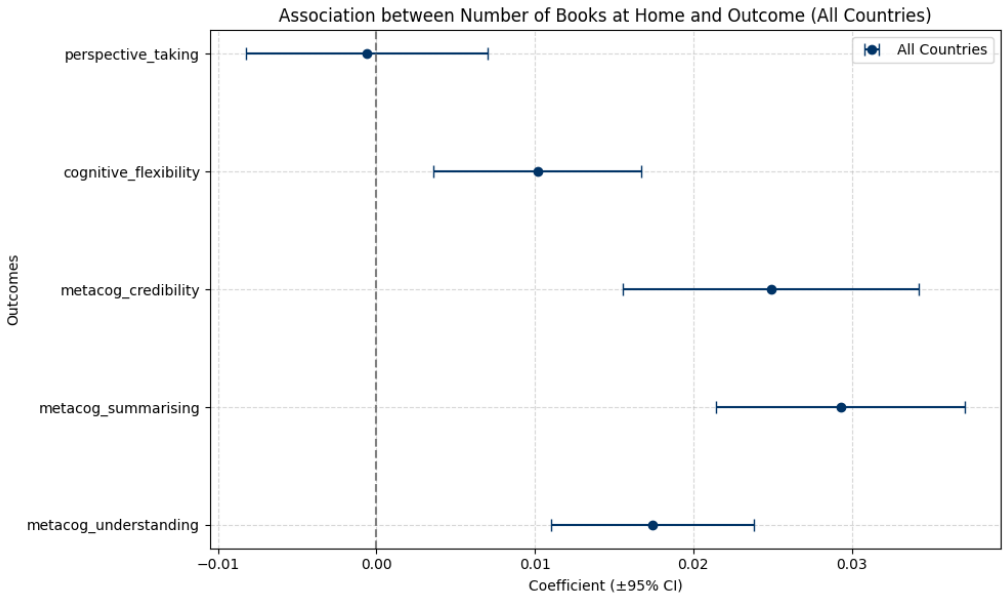

Figure 4.15: Regression coefficients for Meta-Model 3 (Books at Home)

These findings reinforce the role of the home literacy environment and reading practice as contributors to higher-order cognitive and psychosocial competencies, even after adjusting for potential confounds and structural country-level variation.

Across all the models, the statistical power is high given the large samples, and effect sizes in the range of 0.07–0.10 SD are meaningful in standardised educational metrics. In educational research, effects of this magnitude are often interpreted as substantive, having meaningful, cumalative consequences roughly equivalent to several months of additional learning progress (Hattie, 2009; Funder and Ozer, 2019). This same principle can apply to broader social science findings (Götz et al., 2022). Power calculations based on Cohen (1988) indicate that the sample size here is sufficient to detect effects well below this magnitude with over 95% power.

4.2.4 OECD vs. Non-OECD Split

To test the generalisability of findings, the final model was re-estimated separately for OECD and non-OECD countries. The results suggest that the predictive effects of both reading time and books-at-home are broadly consistent across groups, though somewhat attenuated in the non-OECD subsample. For instance, while reading time significantly predicts all five outcomes in both groups, its association with source credibility is strongest in OECD countries ($\beta = 0.070$, $SE = 0.005$, $p < 0.001$) compared to non-OECD ($\beta = 0.052$, $SE = 0.008$, $p < 0.001$). Similarly, the predictive power of books-at-home on summarising is larger in OECD settings ($\beta = 0.042$, $p < 0.001$) than in non-OECD ($\beta = 0.018, p < 0.001$), suggesting a steeper cognitive return on home literacy resources in

more developed contexts. One possible explanation for the attenuation in the non-OECD sample is linguistic: many students may take PISA in a language that differs from the one spoken at home, which is well-documented to suppress reading performance (Abedi, 2002, 2004; Jerrim, 2022). Books-at-home shows no significant relationship with perspective-taking in either group, further reinforcing earlier findings. Overall, the direction and significance of effects largely persist, supporting the robustness of the main model.

Table 4.7: Model 3 OLS Regression of Reading Time and Books at Home on Cognitive and Psychological Outcomes (Split by OECD Status)

	OECD					Non-OECD				
	Understanding (n = 64,602)	**Summarising** (n = 64,892)	**Credibility** (n = 64,400)	**Flexibility** (n = 66,197)	**Perspective Taking** (n = 66,149)	**Understanding** (n = 77,357)	**Summarising** (n = 77,902)	**Credibility** (n = 77,370)	**Flexibility** (n = 79,717)	**Perspective Taking** (n = 79,626)
Main Predictors										
Reading Time (β)	0.051***	0.060***	0.070***	0.032***	0.050***	0.054***	0.042***	0.052***	0.023***	0.044***
(SE)	(0.004)	(0.004)	(0.005)	(0.003)	(0.007)	(0.006)	(0.005)	(0.008)	(0.004)	(0.004)
Books at Home (β)	0.023***	0.042***	0.042***	0.006*	–0.009*	0.013***	0.018***	0.010*	0.013**	0.007**
(SE)	(0.004)	(0.005)	(0.004)	(0.004)	(0.006)	(0.005)	(0.005)	(0.006)	(0.005)	(0.004)
Model Statistics										
R-squared	0.114	0.171	0.144	0.174	0.147	0.104	0.126	0.128	0.159	0.140
Adj. R-squared	0.113	0.170	0.144	0.174	0.147	0.104	0.126	0.127	0.159	0.139
F-statistic	–1.06e+13	1.52e+14	–7.85e+13	292.0	57.86	273.4	685.5	1235.0	775.5	855.6
Log-Likelihood	–85,611	–82,623	–84,373	–85,141	–85,990	–103,810	–102,360	–101,110	–104,300	–105,130
AIC	171,300	165,400	168,900	170,400	172,100	207,800	204,900	202,400	208,700	210,400

Levels of statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.
Standard errors in parentheses.
Notes: OLS regressions with 41 control variables, including country fixed effects and clustered standard errors by country. Dependent variables are standardised cognitive and psychological outcomes from PISA 2018.

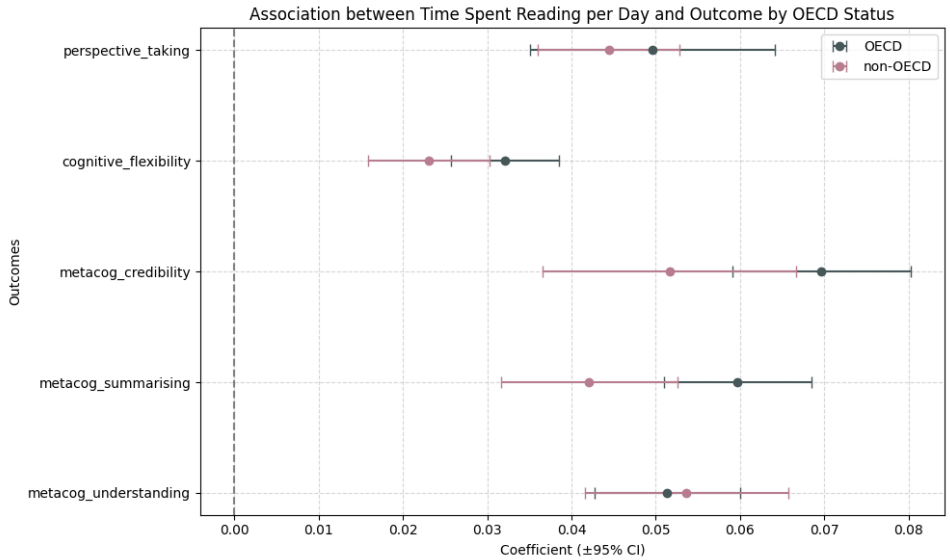

Figure 4.16: Regression coefficients for Meta-Model 3 (Reading Time), split by OECD and non-OECD

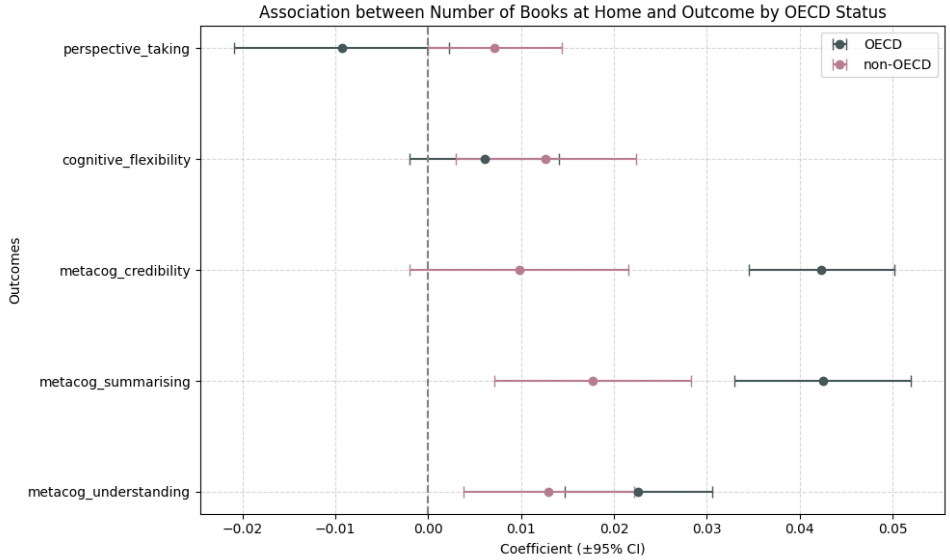

Figure 4.17: Regression coefficients for Meta-Model 3 (Books at Home), split by OECD and non-OECD

5. Discussion

5.1 Reading Decline or Reading Divide? A Historical and Empirical Reappraisal

5.1.1 Ambiguous Trends in Contemporary Reading Habits

Widely circulated narratives warn of an ongoing "reading crisis" (Stern Center for Language and Learning, 2024; Rhoads, 2025), citing declining engagement and deteriorating literacy skills—yet such claims can oversimplify a more complex picture. For instance, statistics such as the claim that 21% of American adults are illiterate[1] lack transparency about definitions and data sources. More appropriate is the OECD's report, mentioned in the literature review, who found 28% of US adults aged 16–65 scored at Level 1 or below in literacy, indicating that they can only understand basic sentences — this is alarming, but it is not complete illiteracy (see Vágvölgyi et al., 2016). As Snow, cochair of the Literacy and Languages concentration at Harvard, observes: "we haven't created a crisis. We've just created a very stable level of mediocrity" (Freeman, 2024). In reality, as just one country example, U.S. student reading scores have remained stable over the past 25 years, with a notable but temporary dip during the COVID-19 pandemic (Freeman, 2024). Statistical claims of crisis must therefore be accompanied by clear documentation of what is being measured, how, and among whom (Spiegelhalter, 2019). Without such clarity, these figures risk reinforcing narratives that obscure deeper structural causes and educational inequalities.

Findings from this dissertation highlight the need for further research into reading as a subject in general. Descriptive trends based on PISA data reveal mixed signals: while the proportion of students with very few books at home (0–10) has increased, and more students report not reading for enjoyment, the share of students reading for two or more hours per day has also grown (see figure 4.2). Notably, 29.9% of students reported a preference for print formats, yet a quarter selected the option "rarely or never read books." (see figure 4.8). Tellingly, as pointed out in the literature review, 39% of non-readers in

[1] `https://www.thenationalliteracyinstitute.com/2024-2025-literacy-statistics`

the Pew Research data are adults with a high school diploma or less (Pew Research Center, 2021). These figures—alongside broader market data showing continued growth in U.S. print book sales (Statista, 2024)—suggest a widening distribution of reading habits. Rather than a uniform decline, the evidence points to a potential bifurcation, where highly engaged readers coexist with a growing cohort of disengaged non-readers.

This divergence echoes broader research trends. Twenge et al. (2019) and the National Literacy Trust (2025) document generational drops in reading among youth, particularly in leisure contexts. Yet studies such as Schwabe et al. (2023) show that multi-format readers continue to engage deeply with reading, and Pew Research Center (2022) reports that the majority of U.S. adults still prefer print formats. These contradictions further emphasise that the narrative of universal decline obscures more than it reveals.

Regression results from this study reinforce the need for nuance. While effect sizes are modest, both books-at-home and daily reading time significantly predict metacognitive and psychological traits such as cognitive flexibility, perspective-taking, and source credibility assessment. These findings validate the importance of sustained reading behaviours—not only as indicators of engagement, but as potential contributors to higher-order cognitive development. Crucially, they point to potential structural inequalities in access and opportunity: students from book-rich homes consistently perform better on these outcomes, after controlling for wealth, education, and demographic covariates.[2]

5.1.2 Literacy and Inequality: Historical Roots of Contemporary Disparities

These patterns are historically rooted. Literacy was the domain of elites—clergy, aristocrats, and the educated bourgeoisie (Graff, 1979; Bourdieu, 1984; Chartier, 1995). Leisure reading did not become widespread until the 19th and early 20th centuries, when formal education and disposable time became more common (Lloyd, 2018; Lemire, 2012). Harrington Lueker (2019) describes how reading gradually became part of domestic middle-class life, and Bannet (2017) and Jajdelska (2007) document how elite identity and reading instruction shaped social status in 18th-century Britain.

Contemporary disparities reflect these historical patterns. Books-at-home remains a robust proxies for socioeconomic status and educational support (Heppt et al., 2022; Evans et al., 2010) and a study that used PISA data found parental status and books at home to be the strongest predictors of success in the PISA test (Eriksson et al., 2021). PIRLS (Progress in International Reading Literacy Study) data confirm that even modest

[2]Although not explored in the present analysis, prior cross-national PISA findings indicate a moderate positive correlation between average books-at-home and country-level PISA scores in reading, mathematics, and science (OECD, 2018, 2021). This relationship warrants further examination as part of future work.

home libraries are associated with improved academic outcomes (Mullis et al., 2007). This interpretation is supported by the ancillary ESCS analysis, which shows a robust positive association between books-at-home and SES within countries ($\beta = 0.6442$, SE $= 0.0240$, $p < 0.001$; see Appendix A.6).

Together, the descriptive trends, regression results, and historical context converge on a shared insight: reading participation is likely not declining uniformly, but diverging along socioeconomic lines. Mid-range book ownership is shrinking, while both non-readers and avid readers are becoming more distinct. The result is not a universal decline, but a socially stratified reading landscape—one that reflects inequalities in access, opportunity, and cultural capital.

5.1.3 Reiterating Readings Potential Outcomes

This study's regression findings point to potentially meaningful associations. After controlling for socioeconomic and demographic factors, both reading time and books-at-home showed statistically significant effects on metacognitive and psychological traits, including perspective-taking, cognitive flexibility, and the ability to assess source credibility. These capacities may hold increasing relevance for students entering a world shaped by artificial intelligence (Brynjolfsson and McAfee, 2014; Wooldridge, 2020), where the ability to evaluate information, adapt to new demands, and understand others is critical (OECD, 2018). Karl Popper argued in The Open Society and Its Enemies, that tolerance is a necessary condition for open, pluralistic societies (Popper, 2002) and perspective-taking may help foster this disposition (Todd et al., 2011; Galinsky and Moskowitz, 2000). Moreover, having an adaptive mindset has been linked to improved outcomes in contexts where skills must be continuously updated to meet evolving labour market needs (Autor, 2015; Dweck, 2006).

As Willingham (2017) explores in *The Reading Mind*, reading is a demanding cognitive task that involves three levels of mental representation: the surface structure of words, the propositional meaning of sentences, and the integration of ideas across the text. Critically, many readers fail at the second level—integrating and reasoning about meaning—leaving them unable to detect contradictions or evaluate claims. This has direct relevance for the regression findings of this study: students who spend more time reading and report greater access to books at home scored higher on metacognitive measures of understanding and assessing the credibility of sources. Such findings reinforce the claim that reading quantity and environment support the development of higher-order evaluative skills. These skills are essential in an information-rich society (Gleick, 2011; Lupton, 2016; Webster, 2006) increasingly characterised by misinformation (Frankfurt, 2005; World Economic Forum, 2024; West and Bergstrom, 2021).

The remainder of this discussion section situates these findings within a wider theoretical and neurocognitive perspective. The analysis presented here is inferential rather than causal, but it places the results in a broader light: connecting empirical associations with what is known about the brain's adaptation to literacy, the fragility of attentional systems, and the cultural conditions that scaffold deep reading. In doing so, this discussion aims to interpret the statistical results as part of a larger narrative about the changing cognitive ecology of reading.

5.2 Why Reading May Still Be in Decline: A Neurocognitive Explanation

While historical inequalities and shifting social structures explain some of the disparity in reading engagement, a third layer of explanation is emerging. It is apparent that some predictive trends in reading and book access are on the decline: the number of books at home has on average, declined (see figure 4.1) and the percentage of students reporting that they do not spend any time reading has increased (see Figure 4.2).

5.2.1 Reading as a Culturally Acquired Skill

These declining trends could be attributed to the cognitive conditions necessary for sustained reading being disrupted in our modern landscape. Reading is not a biologically pre-specified skill, but a culturally acquired one, requiring the functional reorganisation of neural systems originally evolved for other purposes—a claim central to the neuronal recycling hypothesis (Dehaene and Cohen, 2007). According to this theory, brain circuits originally developed for object and face recognition are repurposed through cultural learning to support literacy (Dehaene, 2009). Neuroimaging studies confirm that skilled reading activates a left-lateralised network—including the occipitotemporal, parietotemporal, and inferior frontal regions—each contributing to decoding, phonological mapping, and semantic integration (Price, 2012; Pugh et al., 2001). Central to this network is the Visual Word Form Area (VWFA), which becomes specialised only through extensive exposure to print (Dehaene, 2009; Glezer and Riesenhuber, 2013; Glezer et al., 2015).

5.2.2 The Role of Attention and Neuroplasticity

This capacity for neuroplasticity, while enabling literacy, also makes reading vulnerable to environmental influences (Dehaene, 2009; Wolf, 2007). Reading fluency and comprehension rely not only on visual and phonological processing (Dehaene et al., 2015) but on sustained attentional control (Arrington et al., 2014)—a cognitive function increasingly under strain in modern digital contexts (Newport, 2016, 2019; Citton, 2017). Attentional

control is itself a critical predictor of academic success (Duncan et al., 2007), and disruptions to this system impairs not only reading performance but motivation and perceived effort. Macdonald et al. (2021) found that in 4th–5th grade struggling readers, both behavioural ratings of attention (from parents and teachers) and objective, task-based measures of sustained attention each explained unique variance in reading comprehension, independent of decoding or fluency skills. This highlights that comprehension—unlike basic reading mechanics—relies heavily on top-down attentional control.

5.2.3 Digital Distraction and the Anxiety Feedback Loop

Evidence suggests that the rise in digital media may contribute to declining reading through these mechanisms. Salmerón et al. (2023) found that greater use of digital tools in language arts classrooms predicted lower reading comprehension among U.S. students, indicating that digital engagement may displace the attentional habits that reading depends on. This is consistent with findings from Attentional Control Theory (Eysenck et al., 2007), which holds that anxiety and distraction reduce goal-directed focus—conditions increasingly common in digital environments. Vahedi and Saiphoo (2018) found that smartphone use correlates with higher anxiety, and even the silent presence of a phone can impair performance on tasks requiring deep concentration (Skowronek et al., 2023).

These cognitive effects are especially salient in reading contexts. Calvo and Eysenck (1996) showed that anxious individuals read more slowly and with greater distraction, particularly under evaluative pressure. More recently, Barnes et al. (2023) found that different anxiety profiles influence children's reading comprehension through their impact on attentional control. Putchavayala et al. (2023) note that problematic digital engagement both results from and exacerbates anxiety, creating a feedback loop of attentional vulnerability. Haidt, in his book, The Anxious Generation, highlights this same dynamic, describing how digital media ecosystems, such as social media, exploit users' psychological vulnerabilities, with anxiety both a cause and a consequence of compulsive digital engagement (Haidt, 2024).

5.2.4 Print vs. Digital Reading: Divergent Cognitive Outcomes

While Schwabe et al. (2023) notes that reading activities have diversified in the digital age—often expanding to new genres, platforms, and devices—this shift may not equate to deeper engagement nor to the same outcomes highlighted in this dissertation. A growing literature suggests that digital reading involves different cognitive behaviours than print, including more skimming, scanning, and non-linear navigation (Baron, 2021; Wolf, 2018; Society for Neuroscience, 2020). These patterns reduce immersion and may undercut the slow, reflective processes that comprehension and metacognition require. Evidence from

Lauterman and Ackerman (2014) confirms that text learning is generally less effective on screens than on paper, with screen reading consistently linked to overconfidence and reduced performance. However, they found that screen inferiority could be overcome when readers engaged in in-depth processing strategies - such as practice and retrieval cues - which also reduced metacognitive miscalibration. Meta-analytic evidence suggests children and adolescents consistently perform worse on comprehension tasks when reading digitally rather than in print (Delgado et al., 2018; Furenes et al., 2021), with performance gaps widening over time. The rise in screen-based reading may attenuate—not amplify—the cognitive outcomes typically associated with sustained literacy practices.[3]

Therefore, whilst Schwabe et al. (2023) argued that digital formats do not replace print but diversify reading habits, the neuronal recycling perspective suggests that frequent fragmented reading may rewire attention patterns in ways that are maladaptive for literacy. This tension underlies the media displacement problem: digital media may not reduce reading quantity outright, but they may crowd out the kind of immersive reading most beneficial for cognition. As just another example, Pfost et al. (2013) demonstrated that frequency of email use is negatively related to vocabulary and reading comprehension, and online activities detrimentally affect comprehension.

A Cognitive Feedback Loop

Taken together, these findings support a broader hypothesis: that declining reading engagement may stem not only from changing preferences or access but from deeper neurocognitive interference. When reading occurs in fragmented, high-stimulation, or stress-inducing environments, it becomes more effortful and less rewarding. This undermines both the frequency and the fluency of reading, initiating a feedback loop: reduced engagement weakens the neural and attentional systems that support reading (Glezer et al., 2009), which in turn further diminishes motivation and comprehension.

In this view, reading is not only being displaced by digital media—it is being jeopardised by it. Environmental changes may be eroding the neural architecture required for reflective, immersive reading. If true, this could help explain why even households with high education or book access may see declines in sustained reading among youth: the cognitive context has changed.

[3]Despite evidence that print reading engages distinct neural pathways, there are no direct neuroimaging studies (e.g., fMRI, EEG) comparing print and digital reading under controlled conditions. As such, claims about the neurological superiority of print remain inferential, based on behavioural proxies like mind-wandering or reduced task adaptation (Delgado et al., 2020; Wolf, 2018).

5.3 Philosophical and Cultural Perspectives on Reading in Modernity

5.3.1 Reading and Reflective Traditions

Reading requires more than just decoding text; it depends on sustained attention within an environment of calm and focus (Csikszentmihalyi, 1990), a condition emphasised in classical philosophy. Plato, in his *Philebus*, championed a reflective mode of thought grounded in moderation (Plato, 2006). Aristotle, in his *Nicomachean Ethics*, describes the virtue of *sophrosyne* (temperance) and *bios theoretikos* (the contemplative life) as the highest form of human flourishing—one marked by undistracted intellectual activity (Aristotle, 2009). Later, the Roman Emperor Marcus Aurelius, in his *Meditations*, maintained the need for mental equanimity, or *ataraxia* (Aurelius, 2006). Scholars of the Medieval and Renaissance tradition extended this legacy[4], cultivating contemplative reading practices within monastic silence (Stock, 1983; Saenger, 1997) and enlightened, humanistic study (Grafton, 1991; Sharpe and Zwicker, 2003). These thinkers collectively warned against distractions and the fragmentation of the mind—what could loosely be interpreted as modern-day mind wandering (Trasmundi and Toro, 2023; Zhang et al., 2022).

Such conditions of stillness appear to be increasingly absent from contemporary life (Firth et al., 2019; Levy, 2016; Kaplan and Kaplan, 1989; Reeves et al., 2020). As Han (2023) argues in *Vita Contemplativa* (the Latin rendering of *bios theoretikos*), the tradition of reflective stillness has been eclipsed by a modern imperative to perform, produce, and remain digitally visible. Once central to philosophical life, contemplation is increasingly dismissed as unproductive idleness. Hadot (1995) argues that in antiquity, philosophy was not merely theoretical but a daily spiritual exercise grounded in interiority. Pieper (1952) similarly argued that leisure—understood not as rest from work, but as the condition for contemplation. Han frames this shift away from leisure as a civilizational loss—where the capacity for deep attention and inner stillness is replaced by compulsive activity and distraction (Han, 2023).

5.3.2 Digital Media and the Fragility of Reading

Today, we find ourselves in a culture that no longer cultivates the stillness required for such reflection. The modern digital landscape pulls us in the opposite direction: media feeds train us to flit from stimulus to stimulus (Firth et al., 2019; Wilmer et al., 2017;

[4]As one example, the 16$^{\text{th}}$ century philosopher Montaigne retired to his family estate in the Dordogne in 1571, where he converted a tower of his château into a private library and study. The tower became the birthplace of his famous *Essais* (Montaigne, 2004).

Levitin, 2014; Uncapher and Wagner, 2018), cultivating a state of persistent distraction. In this context, sustained and focused reading appears increasingly difficult to maintain, a point supported by Gazzaley and Rosen (2017), who discuss in *The Distracted Mind* that constant digital interruptions strain the brain's capacity for goal-directed attention.

There is much evidence to suggest that reading is, neurobiologically, both fragile and effortful. In the context of pervasive digital distraction, this fragility becomes particularly salient: the neuronal recycling hypothesis (Dehaene and Cohen, 2007) shows that reading is not innate but a culturally acquired skill that repurposes brain circuits originally evolved for object recognition (Dehaene, 2009). Unlike spoken language, which emerges naturally in almost all children exposed to speech (Chomsky, 1975; Pinker, 2007), reading must be explicitly taught and practiced to stabilise the neural circuitry that supports fluent comprehension. Since this circuitry depends on structured instruction, practice, and sustained attention (Wolf, 2007), it is especially vulnerable in environments saturated with digital interruption. Any reduction in focused reading, particularly in the formative years, risks not only behavioural changes but potential developmental neurocognitive deficits in comprehension, memory consolidation, and abstract reasoning (Terenzini et al., 1995; Greenfield, 1998, 2009).

5.3.3 Theories of Reading and Modern Shallow Reading

In *Reclaiming Conversation*, Sherry Turkle contends that digital technologies fragment human interaction, replacing rich, dialogic encounters with brief, performative exchanges (Turkle, 2015). Her critique of shallow communication resonates powerfully with the modern challenges facing reading. Like meaningful conversation, reading is a relational act—a slow, attentive exchange between reader and author. Louise Rosenblatt's transactional theory captures this well: reading is not a passive absorption of meaning but a "transaction" in which the reader actively constructs understanding in dialogue with the text (Rosenblatt, 1994). Mikhail Bakhtin's notion of dialogism reinforces this idea, framing literature as a polyphonic conversation in which every voice—reader and author alike—plays a role (Bakhtin, 1981). This dialogic process is particularly evident in literary fiction, which invites readers to engage with ambiguity, interiority, and perspective-taking. Empirical support for this comes from Mar and Rain (2015), who found that narrative fiction was a significantly stronger predictor of verbal ability than expository non-fiction. When reading is displaced by digital skimming, it is not merely content that is lost, but this deeper process of co-creation, verbal fluency, reflection, and meaning-making.

This erosion of reflective capacity is further explored by Citton (2017), who argues in *The Ecology of Attention* that attention has become the defining cognitive battleground of contemporary life. Cognitive models such as Kahneman (1973) capacity theory of at-

tention, Attention Restoration Theory (Berman et al., 2008), and more recent Resource Rational Analysis (Lieder and Griffiths, 2020), conceptualise attention as a limited, effortful resource. However, in the digital age, attention is not only scarce—it is commodified, captured, and manipulated (Zuboff, 2019; Wu, 2016). Platforms optimise for engagement, not reflection (Alter, 2017; Turel et al., 2014). As a result, the slow, deliberate attentional states that reading demands are increasingly rare (Carr, 2011). Reading, once scaffolded by cultural norms that protected silence and focus, now competes with a torrent of stimuli designed to fragment thought (Ophir et al., 2009; Wilmer et al., 2017).

Byung-Chul Han, in *Non-things*, deepens this diagnosis. He argues, through a Heideggerian lens, that digital culture is saturated with "non-things"—transient, immaterial fragments of information that overwhelm without anchoring meaning (Han, 2021). These non-things, lacking stability or depth, erode our ability to dwell in sustained reflection. Traditional reading, by contrast, invites presence and temporality—it anchors us in a linear, cumulative unfolding of thought. Its decline signals the loss of a reflective mode of being that sustains depth against the pull of digital superficiality (Han, 2021; Heidegger, 1962).

Hayles (2007) makes a similar argument in cognitive terms, distinguishing between "deep attention" and "hyper attention." The former is slow, sustained, and immersive; the latter is fast, fragmented, and restless. Digital environments, she argues, overwhelmingly favour hyper attention, particularly among the young. While hyper attention may enhance responsiveness to novelty, it undermines the cognitive endurance needed for reading. This echoes Hassan (2012) critique of digital acceleration: the faster and more information-rich our environments become, the harder it is to maintain the reflective space that reading—and deep thinking—require.

The perspectives explored in this discussion reveal that the decline in reading is not just a behavioural trend—it is a neurocognitive and cultural shift with wide-reaching consequences. The transition to digital reading formats does not simply substitute paper for screen. It reconfigures attention, rewires engagement, and reshapes what reading is. If reading fosters empathy, memory consolidation, critical thinking, and inner dialogue, as well as the outcomes explored in this study of meta-understanding, meta-summarising, meta-credibility, perspective taking, and cognitive flexibility, then its erosion is not neutral. It signals a loss of cognitive and cultural infrastructure—one, that underpins education, conflict resolution, self-reliance and the possibility for reflective selfhood (Emerson, 2000; Mol and Bus, 2011; Nussbaum, 2010; Wolf, 2018; Han, 2021; Turkle, 2015).

6. Limitations

6.1 Methodological Limitations

Despite the strengths of this study—including its large, cross-national sample, standardised instruments, and robust regression framework—several limitations must be acknowledged. These are divided below into descriptive and inferential (regression-based) constraints.

6.1.1 Descriptive Limitations

While the observed decline in reported home book ownership between 2003 and 2022 appears substantial, this trend must be interpreted cautiously. The composition of participating countries in PISA has shifted over time, particularly since 2015, when the assessment expanded to include a greater number of low- and middle-income countries. Many of these countries have lower average household wealth and reduced access to print materials. Consequently, part of the apparent decline in books-at-home may reflect structural changes in the dataset rather than a universal decline in literacy-related resources. Although subsequent descriptive analyses employ OECD versus non-OECD breakdowns (figure 4.9) to account for this heterogeneity, the overall trend remains partially confounded by evolving sample characteristics. Furthermore, while books-at-home data are available up to 2022 and are likely to reflect current trends, the reading time variable was last collected in 2018, limiting the temporal validity of findings based on this measure. Future analyses should incorporate data from later PISA cycles—if reading time is included—to capture more recent patterns.

In addition, key variables of interest—namely, daily reading time and reading attitudes—were only collected in 2000, 2009, and 2018. This restricts the potential for high-resolution longitudinal tracking of behavioural change. Moreover, even within those years, self-reported measures may not reflect actual reading practices, and interpretations of time and frequency categories may differ across cultures (Jerrim and Vignoles, 2013). Another limitation when interpreting these trends is that the PISA data capture only 15–16-year-old students; while the dataset is global in scope, it provides a narrow

demographic snapshot that may not reflect reading behaviours across other age groups.

Most importantly, given the points made in the discussion, while the number of books at home serves as a reasonable proxy for exposure to a print-rich environment, it does not directly capture actual reading behaviour or engagement with printed materials. Similarly, the self-reported reading time variable reflects overall time spent reading, without distinguishing between digital and print formats. As such, the descriptive trends presented should be interpreted with caution, as they may conflate different modes and qualities of reading.

6.1.2 Regression Limitations

The `books_home` variable is ordinal, coded from 1 to 6 based on categorical ranges. These intervals are not evenly spaced in real-world quantity, nor are they guaranteed to correspond to equal cognitive effects. The assumption that moving from category 1 to 2 (0–10 $\rightarrow$ 11–25 books) has the same impact as moving from 5 to 6 (201–500 $\rightarrow$ 500+ books) is a strong one. Treating this predictor as continuous imposes a linearity assumption that may oversimplify nonlinear cognitive benefits, particularly at the upper end of the distribution (see tables A.4 and A.6). This concern is magnified in non-OECD contexts where students tend to cluster in the lower categories. While this simplification facilitates interpretation, it should be considered when drawing inferences (Royston et al., 2006).

Regarding the `read_time_numeric` variable, though it captures self-reported daily reading time on an ordinal scale (1 = none, 5 = more than 2 hours), it does not distinguish between reading genres, complexity, or purpose. Prior research suggests that the cognitive and affective benefits of reading can depend on content type and engagement depth (Mar and Rain, 2015; Kidd and Castano, 2013). PISA lacks this granularity, potentially attenuating associations between reading time and the more nuanced outcomes examined here.

Key predictors and outcomes rely on self-reports by 15 or 16-year-old students. This raises concerns about response validity due to recall inaccuracy, social desirability bias, and item misinterpretation (Podsakoff et al., 2003; Fan et al., 2006). Although the `books_home` item has demonstrated convergent validity across countries, other outcome constructs—such as metacognitive skill or perspective-taking—lack objective benchmarks. The metacognitive indices (e.g., `metacog_understanding`) are psychometric composites and are limited by their dependence on latent factor estimation, which itself may vary in reliability across cultures and language groups (OECD, 2019).

Moreover, causal inference is constrained by potential unobserved confounders, including personality traits and intrinsic motivation. Furthermore, though controls were

put in place for what students learn regarding critical thinking, teacher quality within those learning bouts could not be controlled for. These factors could influence both reading behaviours and cognitive outcomes. Exploratory analyses suggest diminishing marginal returns to daily reading time beyond moderate levels (e.g., 2+ hours), particularly for social-emotional outcomes such as perspective taking. This concave pattern, identified through inclusion of a squared reading term, may reflect selection bias or endogeneity, complicating interpretation of coefficients at the upper end of the reading scale (see Table A.6).

Finally, cultural context may moderate both reading behaviours and the interpretation of survey items. Reading practices, expectations around reading time, and even the understanding of Likert scale points can differ substantially across education systems. As Sapolsky observes in his books *Behave* and *Determined*, cultural affordances shape not only behaviour but neurobiological development (Sapolsky, 2017, 2023). This could suggest that the cognitive impacts of reading differ in outcomes across groups in complex, subtle and unobserved ways which country fixed effects do not necessarily capture.[1]

This cultural limitation is highlighted in much of the secondary literature referenced in this dissertation. While the empirical analysis draws on a globally representative dataset (PISA), much of the secondary literature referenced is drawn from Western contexts. This reflects a broader limitation in the field, often referred to as the WEIRD problem (Western, Educated, Industrialised, Rich, Democratic), whereby psychological and educational research disproportionately reflects the values, experiences, and systems of a narrow subset of the global population (Henrich et al., 2010). As such, care must be taken in generalising certain interpretive claims across diverse cultural and educational contexts.

Future research should test for such heterogeneity more explicitly—ideally with country-level interaction terms or mixed-effects modelling—and, where possible, supplement PISA data with longitudinal or qualitative evidence. It could also examine how socioeconomic gradients in the home reading environment interact with broader cognitive skill development. For example, Brown et al. (2025) show that schooling can build cognitive endurance—the ability to sustain mental effort over time—and that this capacity differs sharply by socioeconomic status. Their findings suggest that students from less advantaged backgrounds may benefit differently from similar reading environments due to disparities in schooling quality and opportunities for sustained cognitive engagement.

[1]Sapolsky, in his books, discusses contrasts between collectivist and individualist cultures, particularly between East Asian societies and the U.S. In these comparisons, collectivist cultures emphasise interdependence and group harmony, while individualistic cultures prize autonomy and uniqueness. For example, when asked to describe an object, Westerners are more likely to focus on its inherent attributes, whereas Eastern participants tend to describe its relation to other elements in the scene. See *Behave* (Sapolsky, 2017) and *Determined* Sapolsky (2023).

Exploring such interactions within the PISA framework more deeply, using available measures of socioeconomic background, could help clarify how reading resources and cognitive skills jointly contribute to educational outcomes across diverse contexts.[2]

[2]Drawing on *Race and Education* (Bhopal, 2024), which documents persistent racial inequalities in access to quality education, it is plausible that similar disparities may exist in foundational literacy factors such as books-at-home, daily reading time, and reading attitudes. Though not examined here, such questions could be explored using variables such as PISA's immigration and ancestry items (e.g., question ST019 in the PISA 2018 data - see (OECD, 2018)), potentially through a critical race theory framework (Ladson-Billings, 1998).

7. Conclusion

This dissertation set out to investigate the relationship between students' home literacy environments, daily reading time, and higher-order cognitive and psychosocial outcomes, situating these relationships within long-term global trends in reading engagement. Using harmonised PISA data from 2000 to 2022, descriptive analyses revealed a steady decline in reported books-at-home, a modest rise in the proportion of students who do not read daily, and a small but notable increase in the share of students reading for extended periods. Patterns differed by OECD status, with students in wealthier countries more likely to report higher book access and ancillary regressions indicate that a greater number of books at home is associated with higher values on the socioeconomic index, underscoring the continued stratification of reading resources.

Regression modelling using 2018 PISA data found that both books-at-home and daily reading time were statistically significant positive predictors of metacognitive understanding, summarising, source credibility assessment, and cognitive flexibility, after adjusting for socioeconomic and demographic covariates, country fixed effects, and clustered standard errors. Reading time also consistently predicted perspective-taking, whereas books-at-home did not. These results suggest that while structural home literacy factors remain relevant, regular reading practice may have a more direct association with certain socio-cognitive skills.

The descriptive findings support a nuanced interpretation of contemporary reading trends: rather than a uniform decline, the data indicate a divergence between highly engaged readers and those with minimal engagement, often along socioeconomic lines. The persistence of these disparities reflects historical patterns in access to literacy and suggests that policy interventions should target not only reading promotion but also the broader material and cognitive conditions that support sustained engagement. Unlike much of the existing literature, which relies on small-scale, country-specific cohorts or focuses primarily on reading achievement, this study combined large-scale, cross-national trend analysis with regression models targeting metacognitive and psychosocial outcomes. By leveraging harmonised PISA data over two decades, it links structural and behavioural aspects of reading to skills that are increasingly valued in economies shaped by, or will

be shaped by, automation, AI, globalisation, and rapid technological change.

If these competencies—critical evaluation of information, adaptability, and perspective-taking—are fostered, even in part, through sustained reading, then declines or disparities in engagement may limit opportunities for skill development and exacerbate existing educational inequalities, particularly in contexts of rapid technological and informational change. The importance of these findings lies in showing that reading habits and home literacy environments are not marginal influences, but consistent and measurable predictors of higher-order cognitive and socio-cognitive skills that are crucial in modern societies. Future research could build on this work by integrating longitudinal designs, exploring genre- and format-specific effects, and testing how cultural context moderates these associations. Such evidence could inform both educational policy and broader cultural strategies aimed at preserving and strengthening the cognitive conditions that sustained reading supports.

References

Abedi, J. (2002). Standardized achievement tests and english language learners: Psychometrics issues. *Educational Assessment*, 8(3):231–257.

Abedi, J. (2004). The no child left behind act and english language learners: Assessment and accountability issues. *Educational Researcher*, 33(1):4–14.

Alan, S., Baysan, C., Gumren, M., and Kubilay, E. (2023). Building social cohesion in ethnically mixed schools: An intervention on perspective taking. *American Economic Review*, 113(4):1213–1245.

Alter, A. (2017). *Irresistible: The Rise of Addictive Technology and the Business of Keeping Us Hooked*. Penguin Press.

Angrist, J. D. and Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press, Princeton, NJ.

Aristotle (2009). *Nicomachean Ethics*. Oxford University Press. Translated by W. D. Ross and L. Brown.

Arrington, C. N., Kulesz, P. A., Francis, D. J., Fletcher, J. M., and Barnes, M. A. (2014). The contribution of attentional control and working memory to reading comprehension and decoding. *Scientific Studies of Reading*, 18(5):325–346.

Aurelius, M. (2006). *Meditations*. Penguin Classics. Translated by M. Hammond.

Autor, D. H. (2015). Why are there still so many jobs? the history and future of workplace automation. *Journal of Economic Perspectives*, 29(3):3–30.

Bakhshi, H., Downing, J. M., Osborne, M. A., and Schneider, P. (2017). The future of skills: Employment in 2030.

Bakhtin, M. M. (1981). *The Dialogic Imagination: Four Essays*. University of Texas Press. Translated by C. Emerson and M. Holquist, edited by Holquist and Michael,.

Bal, P. M. and Veltkamp, M. (2013). How does fiction reading influence empathy? an experimental investigation on the role of emotional transportation. *PLoS ONE*, 8(1):e55341.

Bannet, E. T., editor (2017). *Eighteenth Century Manners of Reading: Print Culture and Popular Instruction in the Anglophone Atlantic World*. Cambridge University Press, Cambridge.

Barnes, E. D., Grills, A. E., and Vaughn, S. R. (2023). Relationships between anxiety, attention, and reading comprehension in children. Preprint, Research Square.

Baron, N. S. (2021). *How We Read Now: Strategic Choices for Print, Screen, and Audio*. Oxford University Press, New York.

Baron, N. S. and Mangen, A. (2021). Doing the reading: The decline of long-form reading in higher education. *Poetics Today*, 42(2):253–279.

Bavishi, A., Slade, M. D., and Levy, B. R. (2016). A chapter a day: Association of book reading with longevity. *Social Science & Medicine*, 164:44–48.

Berman, M. G., Jonides, J., and Kaplan, S. (2008). The cognitive benefits of interacting with nature. *Psychological Science*, 19(12):1207–1212.

Bhopal, K. (2024). *Race and Education: Reproducing White Supremacy in Britain*. Penguin Pelican, London. Examines how race continues to shape educational outcomes in Britain and perpetuates systemic inequalities.

Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgement of Taste*. Harvard University Press, Cambridge, MA.

Brown, C., Kaur, S., Kingdon, G., and Schofield, H. (2025). Cognitive endurance as human capital. *The Quarterly Journal of Economics*, 140(2):943–1002.

Brynjolfsson, E. and McAfee, A. (2014). *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. W. W. Norton & Company, New York.

Cain, K. and Oakhill, J. (2010). Profiles of children with specific reading comprehension difficulties. *British Journal of Educational Psychology*, 76(4):683–696.

Calvo, M. G. and Eysenck, M. W. (1996). Phonological working memory and reading in test anxiety. *Memory*, 4(3):289–305.

Cameron, A. C. and Miller, D. L. (2015). A practitioner's guide to cluster-robust inference. *Journal of Human Resources*, 50(2):317–372.

Cameron, A. C. and Trivedi, P. K. (2005). *Microeconometrics: Methods and Applications*. Cambridge University Press, Cambridge.

Carr, N. (2011). *The Shallows: What the Internet is Doing to Our Brains*. W. W. Norton & Company.

Chang, Y.-H., Wu, I.-C., and Hsiung, C.-A. (2021). Reading activity prevents long term decline in cognitive function in older people: Evidence from a 14 year longitudinal study. *International Psychogeriatrics*, 33(1):63–74.

Chartier, R. (1995). *The Order of Books: Readers, Authors, and Libraries in Europe between the Fourteenth and Eighteenth Centuries*. Stanford University Press, Stanford, CA.

Chomsky, N. (1975). *The Logical Structure of Linguistic Theory*. Plenum Press, New York.

Cinelli, C., Forney, A., and Pearl, J. (2022). A crash course in good and bad controls. *Sociological Methods & Research*, 51(1):43–67.

Citton, Y. (2017). *The Ecology of Attention*. Polity Press.

Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Erlbaum, Hillsdale, NJ, 2nd edition.

Cooper, R. W. and Johri, A. (1997). Dynamic complementarities: A quantitative analysis. *Journal of Monetary Economics*, 40(1):97–119.

Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*. Harper & Row, New York.

Cunningham, A. E. and Stanovich, K. E. (1997). Early reading acquisition and its relation to reading experience and ability 10 years later. *Developmental Psychology*, 33(6):934–945.

Dehaene, S. (2009). *Reading in the Brain: The New Science of How We Read*. Penguin Viking, New York.

Dehaene, S. and Cohen, L. (2007). Cultural recycling of cortical maps. *Neuron*, 56(2):384–398.

Dehaene, S., Cohen, L., Morais, J., and Kolinsky, R. (2015). Illiterate to literate: Behavioural and cerebral changes induced by reading acquisition. *Nature Reviews Neuroscience*, 16(4):234–244.

Delgado, P., Salmerón, L., and Carreiras, M. (2020). Effects of time pressure on mind-wandering and comprehension: Paper vs. screen reading. *Journal of Experimental Psychology: Applied*, 26(4):690–705.

Delgado, P., Vargas, C., Ackerman, R., and Salmerón, L. (2018). Don't throw away your printed books: A meta-analysis on the effects of reading media on reading comprehension. *Educational Research Review*, 25:23–38.

Djikic, M., Oatley, K., and Moldoveanu, M. C. (2013). Reading other minds: Effects of literature on empathy. *Scientific Study of Literature*, 3(1):28–47.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., and Japel, C. (2007). School readiness and later achievement: Results from the early childhood longitudinal study – kindergarten cohort. *Developmental Psychology*, 43(6):1428–1446.

Dweck, C. S. (2006). *Mindset: The New Psychology of Success*. Random House.

Elwert, F. and Winship, C. (2014). Endogenous selection bias: The problem of conditioning on a collider variable. *Annual Review of Sociology*, 40:31–53.

Emerson, R. W. (2000). *Self-Reliance and Other Essays*. Dover Publications. Originally published 1841.

Eriksson, K., Lindvall, J., Helenius, O., and Ryve, A. (2021). Socioeconomic status as a multidimensional predictor of student achievement in 77 societies. *Frontiers in Education*, 6:731634.

Evans, M. D. R., Kelley, J., Sikora, J., and Treiman, D. J. (2010). Family scholarly culture and educational success: Books and schooling in 27 nations. *Research in Social Stratification and Mobility*, 28(2):171–197.

Eysenck, M. W., Derakshan, N., Santos, R., and Calvo, M. G. (2007). Anxiety and cognitive performance: Attentional control theory. *Emotion*, 7(2):336–353.

Fan, X., Miller, B. C., Park, K. E., Winward, B. W., Christensen, M., Grotevant, H. D., and Tai, R. H. (2006). An exploratory study about inaccuracy and invalidity in adolescent self-report surveys. *Field Methods*, 18(3):223–244.

Firth, J., Torous, J., Stubbs, B., Firth, J. A., Steiner, G. Z., Smith, L., and et al. (2019). The "online brain": How the internet may be changing our cognition. *World Psychiatry*, 18(2):119–129.

Foray, D. (2006). *The Economics of Knowledge*. MIT Press, Cambridge, MA.

Frankfurt, H. G. (2005). *On Bullshit*. Princeton University Press, Princeton, NJ. Originally published as an essay in Raritan Quarterly Review in 1986.

Freeman, C. (2024). The reading wars. Harvard Magazine.

Frith, C. D. and Frith, U. (2006). The neural basis of mentalizing. *Neuron*, 50(4):531–534.

Funder, D. C. and Ozer, D. J. (2019). Evaluating effect size in psychological research: Sense and nonsense. *Advances in Methods and Practices in Psychological Science*, 2(2):156–168.

Furenes, M. I., Kucirkova, N., and Bus, A. G. (2021). Digital reading for young children: A meta-analysis and review of mechanisms. *Journal of Computer Assisted Learning*, 37(1):156–167.

Galinsky, A. D. and Moskowitz, G. B. (2000). Perspective-taking: Decreasing stereotype expression, stereotype accessibility, and in-group favoritism. *Journal of Personality and Social Psychology*, 78(4):708–724.

Gazzaley, A. and Rosen, L. D. (2017). *The Distracted Mind: Ancient Brains in a High-Tech World*. MIT Press.

Gleick, J. (2011). *The Information: A History, a Theory, a Flood*. Pantheon Books, New York.

Glezer, L. S., Jiang, X., and Riesenhuber, M. (2009). Evidence for highly selective neuronal tuning to whole words in the visual word form area. *Neuron*, 62(2):199–204.

Glezer, L. S., Kim, J., Rule, J., Jiang, X., and Riesenhuber, M. (2015). Adding words to the brain's visual dictionary: Novel word learning selectively sharpens orthographic representations in the vwfa. *Journal of Neuroscience*, 35(12):4965–4972.

Glezer, L. S. and Riesenhuber, M. (2013). Individual variability in location impacts orthographic selectivity in the visual word form area. *Journal of Neuroscience*, 33(27):11221–11226.

Graff, H. J. (1979). *The Literacy Myth: Cultural Integration and Social Structure in the Nineteenth Century*. Academic Press, New York.

Grafton, A. (1991). *Defenders of the Text: The Traditions of Scholarship in an Age of Science, 1450–1800*. Harvard University Press.

Greene, W. H. (2012). *Econometric Analysis*. Prentice Hall, Upper Saddle River, NJ, 7 edition.

Greenfield, P. M. (1998). The cultural evolution of iq. In Neisser, U., editor, *The Rising Curve: Long-Term Gains in IQ and Related Measures*, pages 81–123. American Psychological Association, Washington, DC.

Greenfield, P. M. (2009). Technology and informal education: What is taught, what is learned. *Science*, 323(5910):69–71.

Guthrie, J. T. and Wigfield, A. (2000). Engagement and motivation in reading. In Kamil, M. L., Mosenthal, P. B., Pearson, P. D., and Barr, R., editors, *Handbook of Reading Research*, volume 3, pages 403–422. Lawrence Erlbaum Associates, Mahwah, NJ.

Götz, F. M., Gosling, S. D., and Rentfrow, P. J. (2022). Small effects: The indispensable foundation for a cumulative psychological science. *Perspectives on Psychological Science*, 17(1):205–215.

Hadot, P. (1995). *Philosophy as a Way of Life: Spiritual Exercises from Socrates to Foucault*. Blackwell.

Haidt, J. (2024). *The Anxious Generation: How the Great Rewiring of Childhood Is Causing an Epidemic of Mental Illness*. Penguin Press, New York.

Han, B.-C. (2021). *Non-things: Upheaval in the Lifeworld*. Polity Press.

Han, B.-C. (2023). *Vita Contemplativa: In Praise of Inactivity*. Polity Press.

Harrington Lueker, D. (2019). *Books for Idle Hours: Nineteenth-Century Publishing and the Rise of Summer Reading*. University of Massachusetts Press, Amherst, MA.

Hassan, R. (2012). *The Age of Distraction: Reading, Writing, and Politics in a High-Speed Networked Economy*. Continuum.

Hattie, J. (2009). *Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement*. Routledge, London, UK.

Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. Guilford Press.

Hayles, N. K. (2007). Hyper and deep attention: The generational divide in cognitive modes. *Profession*, 2007(1):187–199.

Heidegger, M. (1962). *Being and Time*. Harper & Row, New York. Original work published 1927.

Henrich, J., Heine, S. J., and Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, 33(2-3):61–83.

Heppt, B., Olczyk, M., and Volodina, A. (2022). Number of books at home as an indicator of socioeconomic status. *Learning and Instruction*, 77:101465.

Jajdelska, E. (2007). Reading instruction & social identity in elite eighteenth century england. *Book History*, 10:123–153.

Jerrim, J. (2022). The impact of test language on pisa scores: new evidence from wales. *British Educational Research Journal*.

Jerrim, J. and Vignoles, A. (2013). Social mobility, regression to the mean and the cognitive development of high ability children from disadvantaged homes. *Journal of the Royal Statistical Society: Series A*, 176(4):887–906.

Jiménez, E. P., Alarcón, R., and de Vicente-Yague, M. I. (2019). Reading intervention: Correlation between emotional intelligence and reading competence in high school students. *Psychology, Society, & Education*, 13(2):81–92.

Juel, C. (1988). Learning to read and write: A longitudinal study of 54 children from first through fourth grades. *Journal of Educational Psychology*, 80(4):437–447.

Kahneman, D. (1973). *Attention and Effort*. Prentice-Hall.

Kannan, V. D., Peters, K., and Chapman, B. P. (2023). The relationship between adolescent reading habits and older adult social engagement: A longitudinal cohort analysis. *Social Science & Medicine*, 334:116174.

Kaplan, R. and Kaplan, S. (1989). *The Experience of Nature: A Psychological Perspective*. Cambridge University Press.

Kato, M. and Nagira, A. (2021). The impact of subject-specific competencies and reading habits on the income of japanese business and economics graduates. *International Journal of Educational Development*, 77:102346.

Kidd, D. C. and Castano, E. (2013). Reading literary fiction improves theory of mind. *Science*, 342(6156):377–380.

Krumpal, I. (2013). Determinants of social desirability bias in sensitive surveys: a literature review. *Quality & Quantity*, 47(4):2025–2047.

Ladson-Billings, G. (1998). Just what is critical race theory and what's it doing in a nice field like education? *International Journal of Qualitative Studies in Education*, 11(1):7–24.

Lauterman, T. and Ackerman, R. (2014). Overcoming screen inferiority in learning and calibration. *Computers in Human Behavior*, 35:455–463.

Lee, A. T. C., Richards, M., Chan, W. C., Chiu, H. F. K., Lee, R. S. Y., and Lam, L. C. W. (2018). Association of daily intellectual activities with lower risk of incident dementia among older chinese adults. *JAMA Psychiatry*, 75(7):697–703.

Lemire, D. (2012). A historiographical survey of literacy in britain between 1780 and 1830. *Constellations (journal of the University of Alberta)*. Examines historiography of rising literacy prior to Victorian leisure reading boom.

Levitin, D. J. (2014). *The Organized Mind: Thinking Straight in the Age of Information Overload*. Dutton.

Levy, D. M. (2016). *Mindful Tech: How to Bring Balance to Our Digital Lives*. Yale University Press.

Lieder, F. and Griffiths, T. L. (2020). Resource-rational analysis: Understanding human cognition as the optimal use of limited computational resources. *Behavioral and Brain Sciences*, 43:e1.

Lloyd, A. J. (2018). Education, literacy and the reading public. *Gale Primary Sources, University of Cambridge essay*. Rise of literacy and reading public in nineteenth-century Britain.

Lupton, D. (2016). *The Quantified Self: A Sociology of Self-Tracking*. Polity Press, Cambridge.

Macdonald, K. T., Barnes, M. A., Miciak, J., Roberts, G., Halverson, K. K., Vaughn, S., and Cirino, P. T. (2021). Sustained attention and behavioural ratings of attention in struggling readers. *Journal of Clinical and Experimental Neuropsychology*, 43(7):732–750.

MacKinnon, D. P., Fairchild, A. J., and Fritz, M. S. (2007). Mediation analysis. *Annual Review of Psychology*, 58(1):593–614.

Mar, R. A. (2011). The neural bases of social cognition and story comprehension. *Annual Review of Psychology*, 62:103–134.

Mar, R. A., Oatley, K., and Peterson, J. B. (2009). Exploring the link between reading fiction and empathy: Ruling out individual differences and examining outcomes. *Communications*, 34(4):407–428.

Mar, R. A. and Rain, M. (2015). Narrative fiction and expository nonfiction evoke differential patterns of cognitive and affective responses. *Journal of Cognitive Psychology*, 27(5):497–514.

Mayer, R. E. (2009). *Multimedia Learning*. Cambridge University Press, Cambridge, 2 edition.

Mitchell, M. (2019). *Artificial Intelligence: A Guide for Thinking Humans*. Pelican Books, London.

Mol, S. E. and Bus, A. G. (2011). To read or not to read: A meta-analysis of print exposure from infancy to early adulthood. *Psychological Bulletin*, 137(2):267–296.

Montaigne, M. d. (2004). *The Essays*. Penguin Classics, London. Translation and notes by M. A. Screech.

Mullis, I. V. S., Martin, M. O., Foy, P., and Hooper, M. (2017). *PIRLS 2016 International Results in Reading*. TIMSS & PIRLS International Study Center, Boston College, Chestnut Hill, MA.

Mullis, I. V. S., Martin, M. O., Kennedy, A. M., and Foy, P. (2007). *PIRLS 2006 International Report: IEA's Progress in International Reading Literacy Study in Primary School in 40 Countries*. TIMSS & PIRLS International Study Center, Boston College, Chestnut Hill, MA.

National Endowment for the Arts (2019). U.s. patterns of arts participation: A full report from the 2017 survey of public participation in the arts.

National Literacy Trust (2025). Children and young people's reading in 2025: Findings from our annual literacy survey.

Newport, C. (2016). *Deep Work: Rules for Focused Success in a Distracted World*. Grand Central Publishing, New York.

Newport, C. (2019). *Digital Minimalism: Choosing a Focused Life in a Noisy World*. Portfolio, New York.

Nussbaum, M. C. (2010). *Not for Profit: Why Democracy Needs the Humanities*. Princeton University Press.

Oatley, K. (2002). Emotions and the story worlds of fiction. In Green, M. C., Strange, J. J., and Brock, T. C., editors, *Narrative Impact: Social and Cognitive Foundations*, pages 39–69. Lawrence Erlbaum Associates, Mahwah, NJ.

O'Brien, R. M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality & Quantity*, 41:673–690.

OECD (2000). Pisa 2000 student questionnaire. Available at: `https://www.oecd.org/pisa/data/pisa2000questionnaires/` (Accessed July 2025).

OECD (2002a). Pisa 2000 database. Available at: https://www.oecd.org/pisa/data/pisa2000database/ (Accessed July 2025).

OECD (2002b). Pisa 2000 technical report. Available at: https://www.oecd.org/education/school/programmeforinternationalstudentassessmentpisa/33688233.pdf (Accessed July 2025).

OECD (2003). Pisa 2003 student questionnaire. Available at: https://www.oecd.org/pisa/data/pisa2003questionnaires/ (Accessed July 2025).

OECD (2005a). Pisa 2003 database. Available at: https://www.oecd.org/pisa/data/pisa2003database/ (Accessed July 2025).

OECD (2005b). Pisa 2003 technical report. Available at: https://www.oecd.org/education/school/programmeforinternationalstudentassessmentpisa/35188570.pdf (Accessed July 2025).

OECD (2006). Pisa 2006 student questionnaire. Available at: https://www.oecd.org/pisa/data/pisa2006questionnaires/ (Accessed July 2025).

OECD (2008). Pisa 2006 database. Available at: https://www.oecd.org/pisa/data/pisa2006database/ (Accessed July 2025).

OECD (2009a). Pisa 2006 technical report. Available at: https://www.oecd.org/education/school/programmeforinternationalstudentassessmentpisa/42025182.pdf (Accessed July 2025).

OECD (2009b). Pisa 2009 student questionnaire. Available at: https://www.oecd.org/pisa/data/pisa2009questionnaires/ (Accessed July 2025).

OECD (2010). Pisa 2009 results: Learning to learn – student engagement, strategies and practices (vol. iii).

OECD (2011). Pisa 2009 database. Available at: https://www.oecd.org/pisa/data/pisa2009database/ (Accessed July 2025).

OECD (2012a). Pisa 2009 technical report. Available at: https://www.oecd.org/pisa/pisaproducts/48852630.pdf (Accessed July 2025).

OECD (2012b). Pisa 2012 student questionnaire. Available at: https://www.oecd.org/pisa/data/pisa2012questionnaires/ (Accessed July 2025).

OECD (2013). Oecd skills outlook 2013: First results from the survey of adult skills (piaac).

OECD (2014a). Pisa 2012 database. Available at: https://www.oecd.org/pisa/data/pisa2012database/ (Accessed July 2025).

OECD (2014b). Pisa 2012 technical report. Available at: https://www.oecd.org/pisa/pisaproducts/PISA-2012-technical-report-final.pdf (Accessed July 2025).

OECD (2015). Pisa 2015 student questionnaire. Available at: https://www.oecd.org/pisa/data/pisa2015questionnaires/ (Accessed July 2025).

OECD (2017a). Pisa 2015 database. Available at: https://www.oecd.org/pisa/data/2015database/ (Accessed July 2025).

OECD (2017b). Pisa 2015 technical report. Available at: https://www.oecd.org/pisa/data/pisa2015technicalreport/PISA2015-Tech-Report.pdf (Accessed July 2025).

OECD (2018). The future of education and skills: Education 2030 (oecd education policy perspectives no. 98).

OECD (2018). Pisa 2018 student questionnaire. Available at: https://www.oecd.org/pisa/data/pisa2018questionnaires/ (Accessed July 2025).

OECD (2018). Preparing our youth for an inclusive and sustainable world: The oecd pisa global competence framework. Accessed: 2025-08-02.

OECD (2019). Pisa 2018 technical report. Available at: https://www.oecd.org/pisa/data/pisa2018technicalreport/ (Accessed July 2025).

OECD (2020). Pisa 2018 database. Available at: https://www.oecd.org/pisa/data/2018database/ (Accessed July 2025).

OECD (2021). *21st-Century Readers: Developing Literacy Skills in a Digital World*. OECD Publishing, Paris. PISA Report.

OECD (2022). Pisa 2022 student questionnaire. Available at: https://www.oecd.org/pisa/data/pisa2022questionnaires/ (Accessed July 2025).

OECD (2023). Survey of adult skills: United states – country note (cycle 1, round 3).

OECD (2024a). Fewer books and more educational software: Trends in students' home learning resources. Available at: https://www.oecd.org/content/dam/oecd/en/publications/reports/2024/09/fewer-books-and-more-educational-software_c0e60164/0e179a87-en.pdf (Accessed August 2025).

OECD (2024b). Members and partners. Accessed August 1, 2025.

OECD (2024c). Pisa 2022 database. Available at: https://www.oecd.org/pisa/data/2022database/ (Accessed July 2025).

OECD (2024d). Pisa 2022 user guide. Available at: https://www.oecd.org/pisa/data/pisa2022technicalreport/ (Accessed July 2025).

Panero, M. E., Weisberg, D. S., Black, J., Goldstein, T. R., Barnes, J. L., Brownell, H., and Winner, E. (2016). Does reading a single passage of literary fiction really improve theory of mind? an attempt at replication. *Journal of Personality and Social Psychology*, 111(5):e46–e54.

Pew Research Center (2012). The rise of e-reading.

Pew Research Center (2021). Who doesn't read books in america?

Pew Research Center (2022). Three-in-ten americans now read e-books.

Pew Research Center (2024). Teens, social media and technology 2024. Accessed: 20 July 2025.

Pfost, M., Dörfler, T., and Artelt, C. (2013). Students' extracurricular reading behavior and the development of vocabulary and reading comprehension. *Learning and Individual Differences*, 26:89–102.

Pieper, J. (1952). *Leisure: The Basis of Culture*. Pantheon Books.

Pinker, S. (2007). *The Language Instinct: How the Mind Creates Language*. Penguin Books, London.

Plato (2006). *Philebus*. Penguin Classics. Translated by R. Waterfield.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., and Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5):879–903.

Popper, K. (2002). *The Open Society and Its Enemies*. Routledge, 5th edition. Originally published in 1945.

Powell, W. W. and Snellman, K. (2004). The knowledge economy. *Annual Review of Sociology*, 30(1):199–220.

Price, C. J. (2012). A review and synthesis of the first 20 years of pet and fmri studies of heard speech, spoken language and reading. *NeuroImage*, 62(2):816–847.

Pugh, K. R., Mencl, E. W., Shaywitz, B. A., Shaywitz, S. E., Fulbright, R. K., Constable, R. T., Skudlarski, P., Marchione, K. E., Jenner, A. R., Fletcher, J. M., Liberman, A. M., Shankweiler, D. P., Lacadie, C., and Gore, J. C. (2001). Neurobiological studies of reading and reading disability. *Journal of Communication Disorders*, 34(6):479–492.

Putchavayala, K. C., Sasidharan, K. R., Dwivedi, K., and Singh, D. (2023). Correlation between excessive smartphone usage, basic psychological needs, and mental health of university students. *Journal of Mental Health and Human Behaviour*, 28(1):65–71.

Reeves, B., Ram, N., Robinson, T. N., Cummings, J. J., Giles, C. L., Pan, J., Chiatti, A., Cho, M. J., Roehrick, K., Yang, X., Gagneja, A., Brinberg, M., Muise, D., Lu, Y., Luo, M., Fitzgerald, A., and Yeykelis, L. (2020). Screenomics: A framework to capture and analyze personal life experiences and the ways that technology shapes them. *Human–Computer Interaction*, 35(1):1–52.

Rhoads, M. (2025). The reading crisis: Where are we at and where do we go from here? `https://matthewrhoads.com/2025/04/01/the-reading-crisis-where-are-we-at-and-where-do-we-go-from-here/`. Accessed: 2025-08-02.

Rohrer, J. M. (2018). Thinking clearly about correlations and causation: Graphical causal models for observational data. *Advances in Methods and Practices in Psychological Science*, 1(1):27–42.

Rosenblatt, L. M. (1994). *The Reader, the Text, the Poem: The Transactional Theory of the Literary Work*. Southern Illinois University Press.

Royston, P., Altman, D. G., and Sauerbrei, W. (2006). Dichotomizing continuous predictors in multiple regression: A bad idea. *Statistics in Medicine*, 25(1):127–141.

Saenger, P. (1997). Silent reading: Its impact on late medieval script and society. In Cavallo, G. and Chartier, R., editors, *A History of Reading in the West*, pages 200–212. University of Massachusetts Press.

Salmerón, L., Vargas, C., Delgado, P., and Barón, J. D. (2023). Relation between digital tool practices in the language arts classroom and reading comprehension scores. *Reading Research Quarterly*. Advance online publication.

Sapolsky, R. M. (2017). *Behave: The Biology of Humans at Our Best and Worst*. Penguin Press, New York.

Sapolsky, R. M. (2023). *Determined: A Science of Life Without Free Will*. Penguin Press, New York.

Saxe, R. and Kanwisher, N. (2003). People thinking about thinking people: The role of the temporo-parietal junction in "theory of mind.". *NeuroImage*, 19(4):1835–1842.

Schwabe, A., Kosch, L., Boomgaarden, H. G., and Stocker, G. (2023). Book readers in the digital age: Reading practices and media technologies. *Mobile Media & Communication*, 11(3):367–390.

Sharpe, K. and Zwicker, S. N. (2003). *Reading, Society and Politics in Early Modern England*. Cambridge University Press.

Skowronek, J., Seifert, A., and Lindberg, S. (2023). The mere presence of a smartphone reduces basal attentional performance. *Scientific Reports*, 13:Article 7972.

Society for Neuroscience (2020). The brain and reading: A neuroscience perspective. SfN BrainFacts.org.

Spiegelhalter, D. (2019). *The Art of Statistics: Learning from Data*. Pelican Books, London.

Stanovich, K. E. (1986). Matthew effects in reading: Some consequences of individual differences in the acquisition of literacy. *Reading Research Quarterly*, 21(4):360–407.

Statista (2018). Average number of books read per year by consumers in the united states as of august 2018, by income.

Statista (2024). Book market in the united states– statistics& facts. Online report. Retrieved from Statista database on [Access Date]; original data sources vary.

Stern Center for Language and Learning (2024). The reading crisis. `https://sterncenter.org/the-reading-crisis/`. Accessed: 2025-08-02.

Stock, B. (1983). *The Implications of Literacy: Written Language and Models of Interpretation in the Eleventh and Twelfth Centuries*. Princeton University Press.

Sullivan, A. and Brown, M. (2013). Social inequalities in cognitive scores at age 16: The role of reading. Technical Report CLS Working Paper 2013/10, Centre for Longitudinal Studies, Institute of Education, University of London, London, UK.

Sullivan, A. and Brown, M. (2015). Vocabulary from adolescence to middle age. *Longitudinal and Life Course Studies*, 6(2):173–189.

Sun, Y.-J., Sahakian, B. J., Langley, C., Yang, A., Jiang, Y., Kang, J., Zhao, X., Li, C., Cheng, W., and Feng, J. (2024). Early-initiated childhood reading for pleasure: Associations with better cognitive performance, mental well-being and brain structure in young adolescence. *Psychological Medicine*, 54(2):359–373.

Sweller, J. (2011). Cognitive load theory. In Ross, B. H., editor, *Psychology of Learning and Motivation*, volume 55, pages 37–76. Academic Press.

Tamir, D. I., Bricker, A. B., Dodell-Feder, D., and Mitchell, J. P. (2016). Reading fiction and reading minds: The role of simulation in the default network. *Social Cognitive and Affective Neuroscience*, 11(2):215–224.

Terenzini, P. T., Springer, L., Pascarella, E. T., and Nora, A. (1995). Influences affecting the development of students' critical thinking skills. *Research in Higher Education*, 36(1):23–39.

Todd, A. R., Bodenhausen, G. V., Richeson, J. A., and Galinsky, A. D. (2011). Perspective taking combats automatic expressions of racial bias. *Journal of Personality and Social Psychology*, 100(6):1027–1042.

Trasmundi, S. B. and Toro, J. (2023). Mind wandering in reading: An embodied approach. *Frontiers in Human Neuroscience*, 17:1061437.

Turel, O., He, Q., Xue, G., Xiao, L., and Bechara, A. (2014). Examination of neural systems sub-serving facebook "addiction". *Psychological Reports: Disability and Trauma*, 115(3):675–695.

Turkle, S. (2015). *Reclaiming Conversation: The Power of Talk in a Digital Age*. Penguin Press.

Twenge, J. M., Martin, G. N., and Spitzberg, B. H. (2019). Trends in u.s. adolescents' media use, 1976–2016: The rise of digital media, the decline of tv, and the (near) demise of print. *Psychology of Popular Media Culture*, 8(4):329–345.

UCLA Institute for Digital Research and Education (2024). Coding systems for categorical variables in regression analysis. `https://stats.oarc.ucla.edu/spss/faq/coding-systems-for-categorical-variables-in-regression-analysis/`. Retrieved August 14, 2025, from the UCLA Statistical Consulting website.

Uncapher, M. R. and Wagner, A. D. (2018). Minds and brains of media multitaskers: Current findings and future directions. *Proceedings of the National Academy of Sciences*, 115(40):9889–9896.

Vágvölgyi, R., Coldea, A., Dresler, T., Schrader, J., and Nuerk, H.-C. (2016). A review about functional illiteracy: Definition, cognitive, linguistic, and numerical aspects. *Frontiers in Psychology*, 7:1617.

Vahedi, Z. and Saiphoo, A. H. (2018). The association between smartphone use, stress, and anxiety: A meta-analytic review. *Stress and Health*, 34(3):347–358.

von Hippel, P. T., Scarpino, S. V., and Holas, I. (2016). Robust estimation of inequality from binned incomes. *Sociological Methodology*, 46(1):212–251.

Wang, Y., Wang, S., Zhu, W., Liang, N., Zhang, C., Pei, Y., Wang, Q., Li, S., and Shi, J. (2022). Reading activities compensate for low education-related cognitive deficits. *Alzheimer's Research & Therapy*, 14:Article 115.

Warm, T. A. (1989). Weighted likelihood estimation of ability in item response theory. *Psychometrika*, 54(3):427–450.

Webster, F. (2006). *Theories of the Information Society*. Routledge, London, 3 edition.

West, J. D. and Bergstrom, C. T. (2021). Misinformation in and about science. *Proceedings of the National Academy of Sciences*, 118(15).

Willingham, D. T. (2017). *The Reading Mind: A Cognitive Approach to Understanding How the Mind Reads*. Jossey-Bass, San Francisco, CA.

Wilmer, H. H., Sherman, L. E., and Chein, J. M. (2017). Smartphones and cognition: A review of research exploring the links between mobile technology habits and cognitive functioning. *Frontiers in Psychology*, 8:605.

Wolf, M. (2007). *Proust and the Squid: The Story and Science of the Reading Brain*. HarperCollins, New York.

Wolf, M. (2018). *Reader, Come Home: The Reading Brain in a Digital World*. Harper.

Wooldridge, J. M. (2016). *Introductory Econometrics: A Modern Approach*. Cengage Learning, Boston, MA, 6 edition.

Wooldridge, M. (2020). *The Road to Conscious Machines: The Story of AI*. Pelican Books, London.

World Bank (2024). World development indicators: Oecd members and high-income economies. Accessed August 17, 2025.

World Economic Forum (2024). Global risks report 2024. `https://www.weforum.org/reports/global-risks-report-2024`. World Economic Forum.

World Economic Forum (2025). The future of jobs report 2025.

Wu, T. (2016). *The Attention Merchants: The Epic Scramble to Get Inside Our Heads*. Alfred A. Knopf, New York.

YouGov (2025). 40% of britons haven't read a single book in the last 12 months.

Zhang, M., Bernhardt, B. C., Wang, X., Varga, D., Krieger Redwood, K., Royer, J., Rodríguez Cruces, R., Vos de Wael, R., Margulies, D. S., Smallwood, J., and Jefferies, E. (2022). Perceptual coupling and decoupling of the default mode network during mind wandering and reading. *eLife*, 11:e74011.

Zuboff, S. (2019). *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. PublicAffairs.

Appendix

A.1 Variable Definitions for Meta Regression

Table A.1: Description of Meta Regression Variables within Dataset

Variable	Source	Explanation
Dependent Variables		
Understanding and Remembering (metacog_understanding)	PISA 2018 Cognitive Test and Student Questionnaire	Meta-cognitive skill assessing how students comprehend and recall text-based information. A scaled index acting as a continuous numerical variable from -1.64-1.5.
Summarising (metacog_summarising)	PISA 2018 Cognitive Test and Student Questionnaire	Student ability to extract and condense relevant ideas from texts. A scaled index acting as a continuous numerical variable from -1.72-1.36.
Assessing Credibility (metacog_credibility)	PISA 2018 Cognitive Test and Student Questionnaire	Evaluates how well students judge source reliability and exhibit general critical thinking. A scaled index acting as a continuous numerical variable from -1.41-1.33.

Cognitive Flexibility (cognitive_flexibility)	PISA 2018 Cognitive Test and Student Questionnaire	Adaptability in switching between tasks or perspectives. A continuous variable derived by the OECD using weighted likelihood estimation (WLE), a psychometric technique that estimates latent trait levels based on multiple questionnaire items. Values range from -3.2784-2.1449.
Perspective Taking (perspective_taking)	PISA 2018 Cognitive Test Student Questionnaire	Ability to adopt the viewpoints of others in social or textual contexts. A continuous variable derived by the OECD using weighted likelihood estimation (WLE), a psychometric technique that estimates latent trait levels based on multiple questionnaire items. Values range from -3.2053-1.9097.
Key Predictors		
Books at Home (books_home)	PISA 2018 Student Questionnaire	Student-reported estimate of the number of books at home. Coded categorically: 1 = 0–10, 2 = 11–25, 3 = 26–100, 4 = 101–200, 5 = 201–500, 6 = 500+. Proxy for home literacy environment.
Reading Time (read_time_numeric)	PISA 2018 Student Questionnaire	Daily time spent reading for enjoyment. Coded: 1 = None, 2 = Up to 30 mins, 3 = 31–60 mins, 4 = 1–2 hours, 5 = More than 2 hours.
Control Variables		
Demographic Controls		
Age	PISA 2018 Student Questionnaire	Student's age in years. Range: 15.08–16.33.
Gender	PISA 2018 Student Questionnaire	1 = female, 2 = male.

Parental Background and Socioeconomic Status		
Family Wealth Index (family_wealth_index)	PISA 2018 Index	Household wealth index based on possessions and living conditions. A Continuous index. Range: –7.55 to 4.75.
Socioeconomic Index (socioeconomic_index)	PISA 2018 Index	Composite SES score based on parental education, occupation, and resources. Range: -8.1734-4.2051.
Parental Occupation Status (parent_occ_status)	PISA 2018 Index	Highest ISEI occupational status of either parent. Range: 11.01-88.96.
Home Possessions (home_possessions)	PISA 2018 Index	General household items (e.g., own room, dishwasher, etc.). Range: -10.2033-5.9236.
Home Educational Resources (home_edu_resources)	PISA 2018 Index	Access to books, quiet study space, and learning technology. Range: -4.5253-1.2196.
Cultural Possessions (cultural_possessions)	PISA 2018 Index	Number of culturally relevant items (e.g., literature, art, music). Range: -2.8044-2.3842.
Educational Background		
Mother's Education (mother_edu)	PISA 2018 Student Questionnaire	Highest ISCED level attained by mother. Recoded: 0 = None to 6 = ISCED 5A/6.
Father's Education (father_edu)	PISA 2018 Student Questionnaire	Highest ISCED level attained by father. Recoded: 0 = None to 6 = ISCED 5A/6.
Highest Parental Education (highest_parent_edu)	Constructed Variable	Highest of mother/father ISCED levels. Range: 0–6.
Parental Years of Education (parent_edu_years)	Constructed Variable	Sum of estimated school years from ISCED levels. Range: 3–18 years.

Student Education Level (student_edu_level)	PISA 2018 Index	ISCED level of student 1-5, where 1 = ISCED 1 (Primary), 2 = ISCED 2 (Lower Secondary), 3 = ISCED 3 (Upper Secondary), 4 = ISCED 4 (Post-sec non-tertiary), 5 = ISCED 5 (Tertiary).
School-Assigned Reading Materials		
Texts with Diagrams/Maps (school_text_diagrams)	PISA 2018 Student Questionnaire	Frequency of reading texts with diagrams/maps. Specific question was how many times you had to read the following type of text. Scale of 1-4 where 1 = Many Times, 2 = Two or Three Times, 3 = Once, 4 = Not at all.
Fiction Texts (school_text_fiction)	PISA 2018 Student Questionnaire	Frequency of reading assigned fiction. Specific question was how many times you had to read the following type of text. Scale of 1-4 where 1 = Many Times, 2 = Two or Three Times, 3 = Once, 4 = Not at all.
Tables/Graphs (school_text_tables_graphs)	PISA 2018 Student Questionnaire	Frequency of reading tables or graphs. Specific question was how many times you had to read the following type of text. Scale of 1-4 where 1 = Many Times, 2 = Two or Three Times, 3 = Once, 4 = Not at all.
Digital Hyperlinked Texts (school_text_digital_links)	PISA 2018 Student Questionnaire	Reading digital texts with clickable content. The specific question was: how often did you have to read the following type of text? Scale of 1-4 where 1 = Many Times, 2 = Two or Three Times, 3 = Once, 4 = Not at all.
Digital Literacy Instruction		

Keywords/Search Strategies (diglit_keywords_search)	PISA 2018 Student Questionnaire	Taught to refine online search queries. The specific question: At school, have you been taught the following? Answer is either yes (1) or no (2).
Judging Trustworthiness (diglit_trust_info)	PISA 2018 Student Questionnaire	Taught to assess reliability of online info. The specific question: At school, have you been taught the following? Answer is either yes (1) or no (2).
Comparing Websites (diglit_compare_pages)	PISA 2018 Student Questionnaire	Taught to compare content across sites. The specific question: At school, have you been taught the following? Answer is either yes (1) or no (2).
Privacy Awareness (diglit_privacy_awareness)	PISA 2018 Student Questionnaire	Instruction on managing personal data online. The specific question: At school, have you been taught the following? Answer is either yes (1) or no (2).
Search Snippet Use (diglit_search_snippet)	PISA 2018 Student Questionnaire	Taught to interpret preview text in search engines. The specific question: At school, have you been taught the following? Answer is either yes (1) or no (2).
Bias and Subjectivity (diglit_subjectivity_bias)	PISA 2018 Student Questionnaire	Taught to detect biased or subjective content. The specific question: At school, have you been taught the following? Answer is either yes (1) or no (2).
Phishing Detection (diglit_detect_phishing)	PISA 2018 Student Questionnaire	Taught to spot fraudulent/scam content. Specific question: At school, have you been taught the following? Answer is either yes (1) or no (2).

Global and Cultural Citizenship

Learn About Economies (learn_economies)	PISA 2018 Student Questionnaire	School teaches about economic interdependence. The specific question: Do you learn the following at school? Answer is either Yes (1) or No (2).
Conflict Resolution (learn_conflict_resolution)	PISA 2018 Student Questionnaire	Lessons on resolving interpersonal conflict.
Cultural Awareness (learn_about_cultures)	PISA 2018 Student Questionnaire	Activities promoting cultural understanding. Do you learn the following at school? Answer is either Yes (1) or No (2).
Current News Events (learn_current_news)	PISA 2018 Student Questionnaire	Exposure to current events in class. Do you learn the following at school? Answer is either Yes (1) or No (2).
News Opinion (learn_opinion_on_news)	PISA 2018 Student Questionnaire	Opportunities to discuss news viewpoints. Do you learn the following at school? Answer is either Yes (1) or No (2).
Celebrate Diversity (learn_celebrate_diversity)	PISA 2018 Student Questionnaire	Lessons on valuing cultural differences. Do you learn the following at school? Answer is either Yes (1) or No (2).
Discuss Global Events (learn_world_discussion)	PISA 2018 Student Questionnaire	Classroom discussions on world events. Do you learn the following at school? Answer is either Yes (1) or No (2).
Groupwork on Global Issues (learn_global_issues)	PISA 2018 Student Questionnaire	Group projects on global/intercultural topics. Do you learn the following at school? Answer is either Yes (1) or No (2).
Multiple Perspectives (learn_perspectives)	PISA 2018 Student Questionnaire	Teaching encourages viewing multiple perspectives. Do you learn the following at school? Answer is either Yes (1) or No (2).

Cross-Cultural Communication (learn_communication)	PISA 2018 Student Questionnaire	Lessons on engaging with other cultures. Do you learn the following at school? Answer is either Yes (1) or No (2).
Other Controls		
Subjective Wellbeing (subjective_wellbeing)	PISA 2018 Index	Measure of positive emotional states. A continuous variable derived by the OECD using weighted likelihood estimation (WLE), a psychometric technique that estimates latent trait levels based on multiple questionnaire items. Range: -3.0666-1.2386.
Intercultural Awareness (intercultural_awareness)	PISA 2018 Index	Engagement with and respect for cultural differences. A continuous variable derived by the OECD using weighted likelihood estimation (WLE), a psychometric technique that estimates latent trait levels based on multiple questionnaire items. Range: -2.7948-2.0513.
Discrimination Climate (school_discrimination)	PISA 2018 Index	Perceived fairness and respect in school. A continuous variable derived by the OECD using weighted likelihood estimation (WLE), a psychometric technique that estimates latent trait levels based on multiple questionnaire items. Range: -1.1549-3.1825.

ECEC Duration (ecec_duration)	PISA 2018 Index	Years of early childhood education and care. Coded from 0-8 where: 0 = Attended ECEC for less than a year 1 = Attended ECEC for at least one but less than two years 2 = Attended ECEC for at least two but less than three years 3 = Attended ECEC for at least three but less than four years 4 = Attended ECEC for at least four but less than five years 5 = Attended ECEC for at least five but less than six years 6 = Attended ECEC for at least six but less than seven years 7 = Attended ECEC for at least seven but less than eight years 8 = Attended ECEC for at least eight years
Learning Time (learning_time_mins)	PISA 2018 Index	Estimated time spent learning (minutes per week). Range: 100-3000 (mins).

Note: All variables are drawn from the PISA 2018 dataset unless otherwise indicated.

A.2 Variance Inflation Factor

Table A.2: Variance Inflation Factor (VIF) Values Across Regressions

Variable	Meta-Understand	Meta-Summarising	Meta-Credibility	Cognitive Flexibility	Perspective Taking
Intercept	7.66	7.66	7.67	7.64	7.65
Reading Time	1.02	1.02	1.02	1.02	1.02
Books at Home	1.02	1.02	1.02	1.02	1.02

Note 1: Variable names have been retitled — Reading Time = `read_time_numeric`; Books at Home = `books_home`.
Note 2: VIF quantifies multicollinearity; values above 5–10 may signal problematic redundancy. All predictors here are well below that threshold.
Note 3: The higher VIF for the intercept reflects model centering and is not a multicollinearity concern.

A.3 Meta Model 2 Results with Attitudinal controls included.

Table A.3: Regression Results of Reading Time and Books at Home on Cognitive and Psychological Outcomes with Controls (including attitudes)

	Understanding (n = 139,524)	**Summarising** (n = 140,325)	**Credibility** (n = 139,300)	**Flexibility** (n = 143,309)	**Perspective Taking** (n = 143,180)
Main Predictors					
Reading Time (β)	0.014***	0.001	0.012***	–0.002	0.014***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Books at Home (β)	0.012***	0.029***	0.020***	0.005	–0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Model Statistics					
R-squared	0.106	0.143	0.127	0.140	0.131
Adj. R-squared	0.106	0.143	0.127	0.140	0.131
F-statistic	360.4	510.5	440.9	508.6	470.8
Log-Likelihood	–186840	–183820	–184100	–188150	–188610
AIC	3.738e+05	3.677e+05	3.683e+05	3.764e+05	3.773e+05

Levels of statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Standard errors in parentheses.
Notes: Coefficients are greatly attenuated when attitudes are included, suggesting attitudes play a strong mediating role between books-at-home, reading time, and outcomes. They are therefore justifiably excluded from the main model.
Model includes 46 control variables and is estimated using OLS without clustered errors or fixed effects. Dependent variables are standardised cognitive and psychological indices from PISA 2018.

A.4 Midpoint Regression Analysis

Table A.4: Regression of Books at Home on Metacognitive Outcomes (midpoint coding; country FE, clustered SEs)

	Understanding (n = 527,989)	**Summarising** (n = 528,486)	**Credibility** (n = 520,765)	**Flexibility** (n = 424,432)	**Perspective Taking** (n = 425,915)
Main Predictor					
Books at Home (per 100 books)	0.040***	0.050***	0.062***	0.053***	0.028***
	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Model Statistics					
R^2	0.054	0.079	0.090	0.043	0.040
Adj. R^2	0.054	0.079	0.090	0.043	0.040
F-statistic	766.2	3014.0	7514.0	1616.0	5762.0
Log-Likelihood	-7.335×10^5	-7.277×10^5	-7.066×10^5	-6.025×10^5	-6.037×10^5
AIC	1.467×10^6	1.456×10^6	1.413×10^6	1.205×10^6	1.207×10^6

Levels of statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Standard errors in parentheses. *Notes:* OLS with country fixed effects; standard errors clustered by country. *Books at Home* uses midpoint coding of the six PISA bands with midpoints $[5, 18, 63, 150, 350, 600]$ (top bin set to 600) and is reported *per 100 books* for readability.

A.4.1 Books-at-Home midpoint coding and interpretation

The PISA six-category item on books at home was recoded to midpoints [5, 18, 63, 150, 350, 600] corresponding to the original bands (*0–10*, *11–25*, *26–100*, *101–200*, *201–500*, *>500*), with the open-ended top bin set to 600. Midpoint coding places the predictor on a book-count scale (rather than 1–6 categories) and relaxes the implicit equal-spacing assumption of the ordinal index; for readability, coefficients are reported *per 100 books*. Country fixed effects and cluster standard errors by country are retained, as in the main models.

Using midpoint coding, *Books at Home* is positively associated with all outcomes: per 100 additional books, coefficients range from about +0.028 (perspective taking) to +0.062 (credibility), all $p < 0.001$. The *read_time_numeric* measure is likewise positive across outcomes, with per-step effects (on the 1–5 scale) of roughly +0.052 to +0.104 ($p < 0.001$ throughout). These results are associative, not causal; coefficients for books are presented per 100 books purely for readability under midpoint coding.

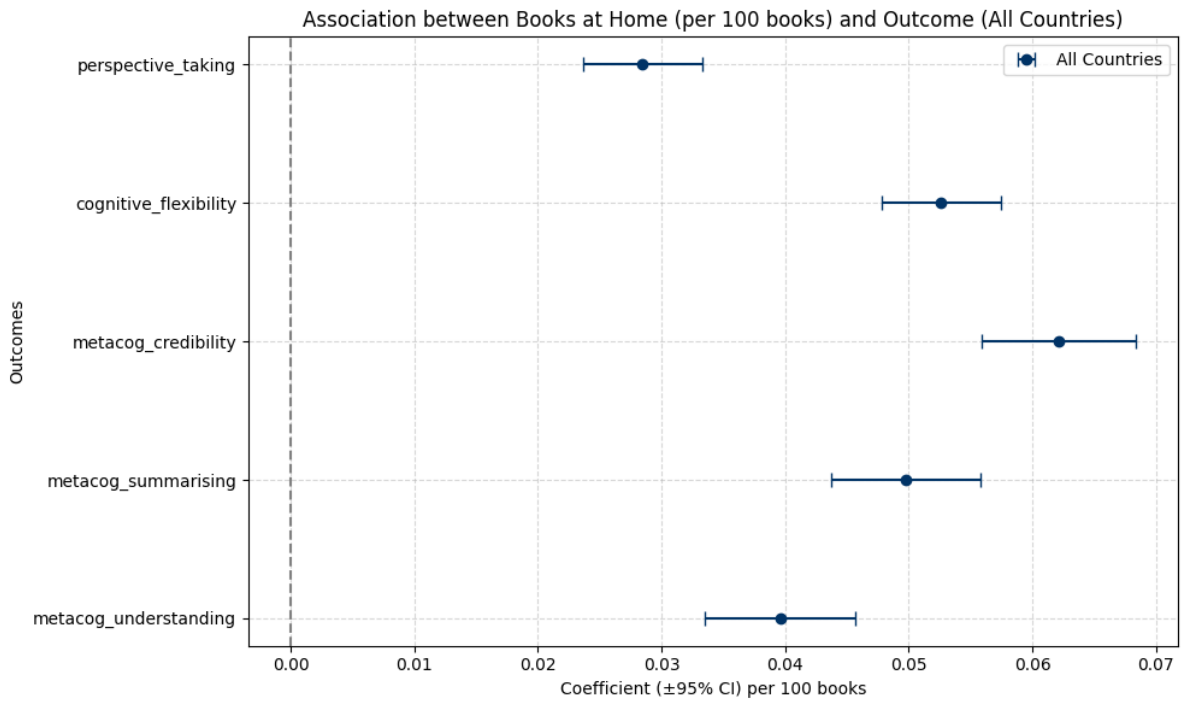

Figure A.1: Midpoint robustness: association of *Books at Home* with outcomes (per 100 books).

A.4.2 Books-at-Home midpoint coding with OECD status seperated

Using midpoint coding and splitting by OECD status, *Books at Home (per 100)* are positively associated with all metacognitive outcomes in both groups (all $p < 0.001$). Magnitudes are generally slightly larger in the OECD sample for *Summarising* and *Credibility* (e.g., books ≈ 0.056 and 0.074), while *Cognitive flexibility* shows similar books effects across groups (≈ 0.053 OECD vs 0.054 non-OECD).

Table A.5: Regression of Books at Home on Metacognitive Outcomes (midpoint coding), OECD vs non-OECD

	Understanding	**Summarising**	**Credibility**	**Flexibility**	**Perspective Taking**
OECD (country FE; clustered SEs)					
Books at Home (per 100 books)	0.044***	0.056***	0.074***	0.053***	0.028***
	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)
R^2	0.052	0.067	0.067	0.043	0.047
N	268,594	268,092	263,878	197,938	198,876
Log-Likelihood	-3.7168×10^5	-3.6825×10^5	-3.6406×10^5	-2.7727×10^5	-2.7654×10^5
AIC	7.434×10^5	7.366×10^5	7.282×10^5	5.546×10^5	5.531×10^5
non-OECD (country FE; clustered SEs)					
Books at Home (per 100 books)	0.031***	0.038***	0.041***	0.054***	0.030***
	(0.005)	(0.005)	(0.005)	(0.004)	(0.004)
R^2	0.042	0.043	0.070	0.041	0.033
N	259,395	260,394	256,887	226,494	227,039
Log-Likelihood	-3.6178×10^5	-3.5919×10^5	-3.4169×10^5	-3.2510×10^5	-3.2688×10^5
AIC	7.236×10^5	7.185×10^5	6.835×10^5	6.503×10^5	6.538×10^5

Levels of statistical significance: *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Standard errors in parentheses. *Notes:* OLS with country fixed effects; SEs clustered by country. *Books at Home* uses midpoint coding of PISA bands with midpoints $[5, 18, 63, 150, 350, 600]$ (top bin set to 600) and is reported *per 100 books*.

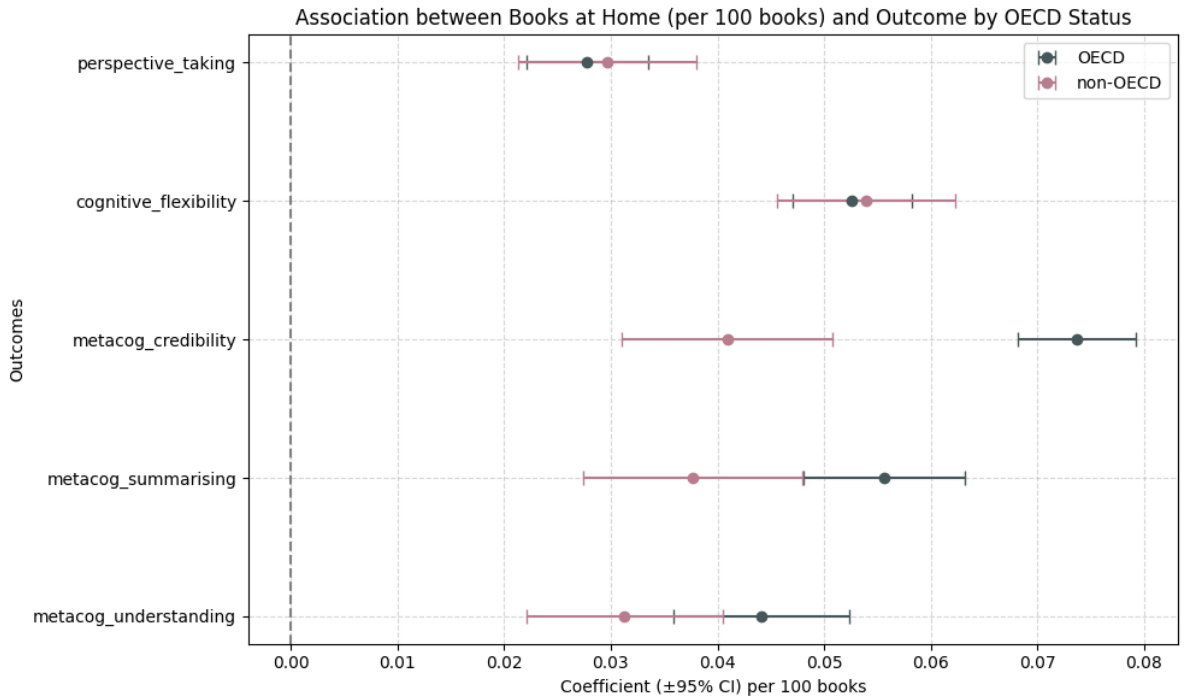

Figure A.2: Midpoint robustness by OECD status: coefficients for *Reading Time* (per 1 step) and *Books at Home* (per 100 books) across outcomes.

A.5 Non-Linear Regression

A.5.1 Non-Linear Model Specification

The following model extends the main linear regression by including a squared term for daily reading time to test for potential non-linear effects:

$$Y_i = \beta_0 + \beta_1 \texttt{read\_time\_numeric}_i + \beta_2 \texttt{read\_time\_sq}_i + \beta_3 \texttt{books\_home}_i + \varepsilon_i \quad (1)$$

Where:

- Y_i — the dependent variable for student i, representing one of the five outcomes: metacognitive understanding, summarising, source credibility, cognitive flexibility, or perspective taking.
- β_0 — model intercept.
- $\texttt{read\_time\_numeric}_i$ — a numeric ordinal variable representing daily reading time, ranging from 1 (none) to 5 (more than 2 hours).
- $\texttt{read\_time\_sq}_i$ — the square of daily reading time, included to capture non-linear (e.g. diminishing) effects.
- $\texttt{books\_home}_i$ — ordinal proxy for the number of books at home (1–6), with categories such as 0–10 books up to 500+ books.
- ε_i — the error term.

A.5.2 Non-Linear Regression Model Results

Table A.6: Non-Linear Robustness Model: Squared Reading Time Term

	Understanding (n = 527,989)	**Summarising** (n = 528,486)	**Credibility** (n = 520,765)	**Flexibility** (n = 424,432)	**Perspective Taking** (n = 425,915)
Reading Time (β)	0.277***	0.266***	0.184***	–0.009	0.159***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Reading Time^2 (β)	–0.038***	–0.038***	–0.026***	0.008***	–0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
R-squared	0.033	0.040	0.043	0.013	0.021
AIC	1.479e+06	1.477e+06	1.440e+06	1.218e+06	1.216e+06

Notes: Standard errors in parentheses. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Model includes squared term for daily reading time to test for non-linear effects.

A.6 Ancillary Validation: Socioeconomic Status and Books at Home (2018)

A.6.1 Model Specification

The association between students' socioeconomic index and reported books at home is estimated in the 2018 data using (i) pooled OLS and (ii) a within-country specification with country fixed effects and clustered standard errors. PISA's Economic, Social and Cultural Status (ESCS) index is a standardized composite (OECD mean = 0, SD = 1) of parental education, parental occupational status (ISEI), and household possessions (e.g., books, cultural and educational resources).

Pooled OLS (2018) without country fixed effects and clustered SEs

$$\texttt{books\_home}_i = \alpha_0 + \alpha_1 \, \texttt{socioeconomic\_index}_i + u_i \tag{2}$$

Pooled OLS (2018) with country fixed effects and clustered SEs

$$\texttt{books\_home}_{ic} = \alpha_0 + \alpha_1 \, \texttt{socioeconomic\_index}_{ic} + \delta_c + u_{ic} \tag{3}$$

Where:

- $\texttt{books\_home}_{ic}$ — ordinal proxy for books at home (1–6), corresponding to: 0–10, 11–25, 26–100, 101–200, 201–500, 500+, for student i in country c.
- $\texttt{socioeconomic\_index}_{ic}$ — student i's ESCS score.
- δ_c — country fixed effects absorbing between-country differences.
- u_i, u_{ic} — error terms.

A.6.2 ESCS Regression Model Results (2018)

Table A.7: ESCS → Books at Home (2018 ancillary validation)

	(1) Pooled OLS	(2) Country FE, clustered SEs
Socioeconomic index (ESCS)	0.666***	0.644***
	(0.001)	(0.024)
Intercept	3.064***	2.790***
	(0.002)	(0.020)
R^2	0.264	0.317
Observations	593,387	593,387
Country fixed effects	No	Yes
SE type	Conventional	Clustered (country)

Notes. Coefficients with standard errors in parentheses. *** $p < 0.001$. `books_home` is an ordinal index (1–6) corresponding to 0–10, 11–25, 26–100, 101–200, 201–500, 500+. Column (2) includes country fixed effects and reports standard errors clustered by country.

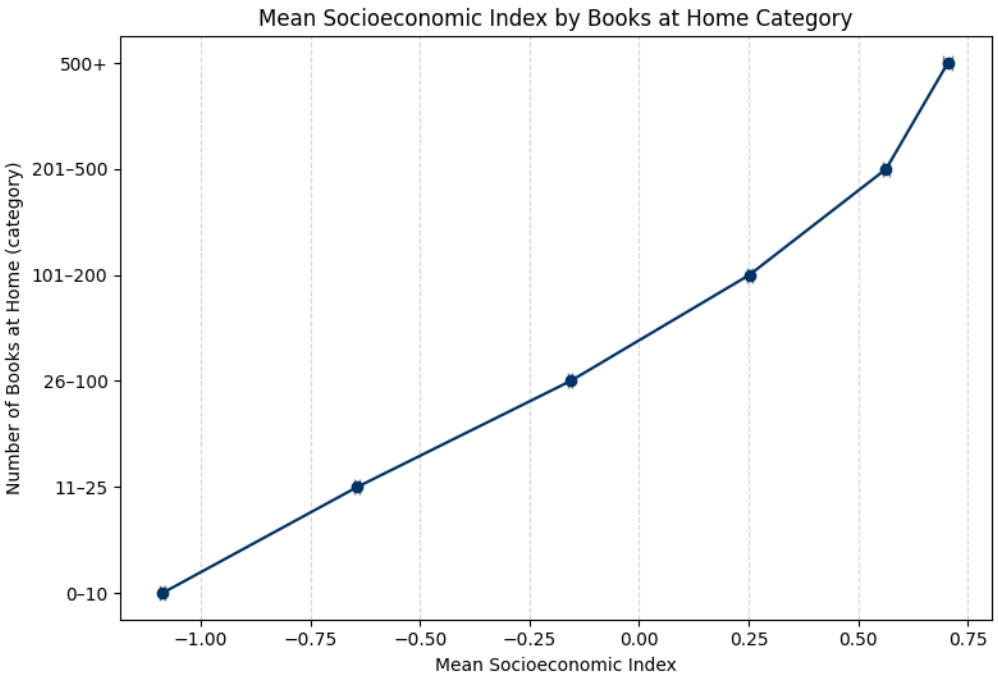

Figure A.3: Mean ESCS by books-at-home category (2018, all countries). Points show category means

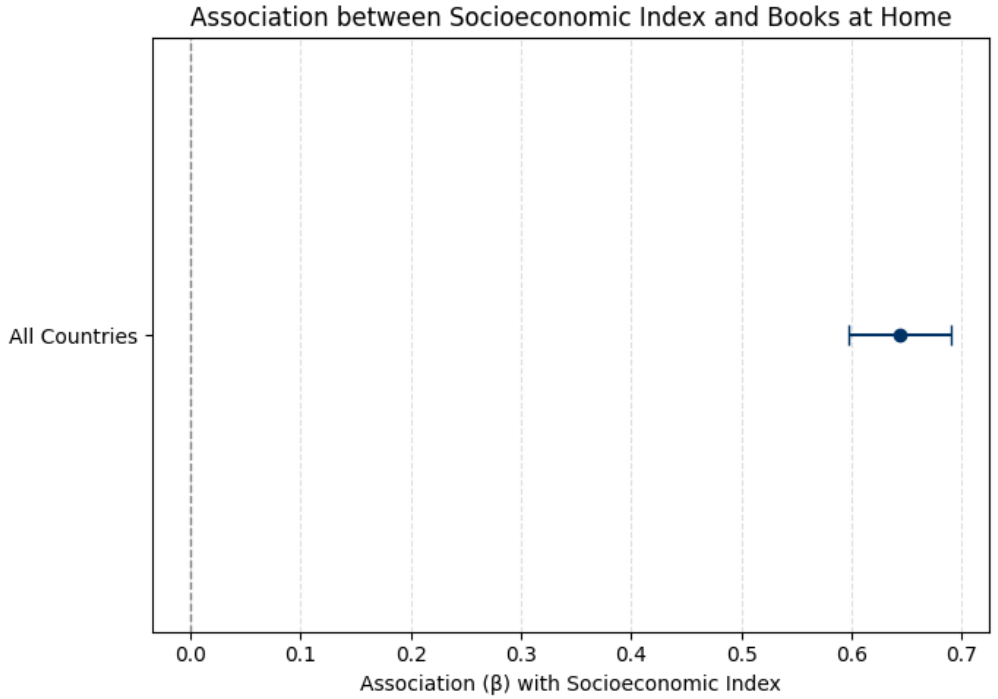

Figure A.4: Co-efficient of Socioeconomic Index on Books at Home (with country FEs and SEs)

A.7 Python Scripts

A.7.1 Analysis Scripts

Table A.8: Overview of Python Analysis and Trend Scripts

Script Name	Purpose	Access Link
2018_reg.py	Regression models predicting cognitive and psychosocial outcomes using PISA 2018 + Regression models predicting books at home and SES status.	https://github.com/Joe-Speed/pisa-scripts/blob/main/2018_reg.py
2018_midpointreg.py	Regression model predicting cognitive and psychosocial outcomes using PISA 2018 where books at home ordinal categories are recoded with midpoints.	https://github.com/Joe-Speed/pisa-scripts/blob/main/2018_midpointreg.py
analyse_pisa2000.py	Descriptive analysis of PISA 2000	https://github.com/Joe-Speed/pisa-scripts/blob/main/analyse_pisa2000.py
analyse_pisa2009.py	Descriptive analysis of PISA 2009	https://github.com/Joe-Speed/pisa-scripts/blob/main/analyse_pisa2009.py
analyse_pisa2018.py	Descriptive analysis of PISA 2018	https://github.com/Joe-Speed/pisa-scripts/blob/main/analyse_pisa2018.py
att_trend.py	Generates reading attitude trend plots (2000–2018)	https://github.com/Joe-Speed/pisa-scripts/blob/main/att_trend.py
read_time_trend.py	Generates reading time trend plots (2000–2018)	https://github.com/Joe-Speed/pisa-scripts/blob/main/read_time_trend.py
books_trend.py	Generates books-at-home distribution plots (2003–2022)	https://github.com/Joe-Speed/pisa-scripts/blob/main/books_trend.py

A.7.2 Data Cleaning and Loading Scripts

Table A.9: Overview of Python Data Loading Scripts

Script Name	Purpose	Access Link
load_pisa2000.py	Load and clean PISA 2000 (fixed-width)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2000.py
load_pisa2003.py	Load and clean PISA 2003 (fixed-width)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2003.py
load_pisa2006.py	Load and clean PISA 2006 (fixed-width)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2006.py
load_pisa2009.py	Load and clean PISA 2009 (fixed-width)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2009.py
load_pisa2012.py	Load and clean PISA 2012 (fixed-width)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2012.py
load_pisa2015.py	Load and clean PISA 2015 (SPSS)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2015.py
load_pisa2018.py	Load and clean PISA 2018 (SPSS)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2018.py
load_pisa2022.py	Load and clean PISA 2022 (SPSS)	https://github.com/Joe-Speed/pisa-scripts/blob/main/load_pisa2022.py