

Abstract

Children's reading habits can contribute to the development of reading comprehension skills. Increased digitalization during the last years has introduced new reading practices. Accordingly, an adequate measurement is necessary to accurately examine the current reading habits of children for different purposes and across different media. Here we present the Multidimensional Reading Habits Instrument (MRHI), which is composed of two questionnaires that differentiate between purpose (leisure and academic) and reading media (print and digital formats). A total of 2,077 Spanish children from fourth to sixth grade participated in the validation process. CFA with class cluster control for each questionnaire evidenced good internal structure. The relationship between the proposed reading habits dimensions, reading comprehension and reading motivation evidenced adequate concurrent validity of the MRHI. We discuss the possible MRHI uses for practitioners and researchers in primary school.

Keywords

reading habits; primary school; validation; questionnaire; reading comprehension

Introduction

In the past, reading literacy has been defined as the process of extracting and constructing meaning from written texts (Snow, 2002). The current information landscape, characterized by vast amounts of easily accessible information through different media, has reshaped the ways and tasks people perform when interacting with texts. Accordingly, new definitions of reading literacy have been proposed to accommodate the new sets of skills needed to successfully participate in education and society nowadays (OECD, 2019a). Specifically, the 2018 PISA reading framework defines reading literacy as ‘understanding, using, evaluating, reflecting on and engaging with texts in order to achieve one’s goals, to develop one’s knowledge and potential and to participate in society’ (OECD, 2019a, p. 28). A critical task for literacy researchers is to examine the factors that contribute to adequate development of such new competence of reading literacy during primary school, by paying attention to both individual as well as contextual factors (Butterfuss et al., 2020; Cain & Barnes, 2017). Here, we focus on a particularly relevant factor: students' reading habits, defined as the frequency of independent engagement in different reading activities (McGeown et al., 2015). Reading habits may support comprehension development via repeated reading practice and exposure to increasingly complex linguistic information (Allington & McGill-Franzen, 2021; Stanovich & Cunningham, 1992). The present study aims to elaborate and validate an instrument that provides further insight into current reading habits in young students, differentiating between the reading purpose (leisure or academic) and the reading media (print or digital) in which reading takes place. As part of the sources of validity evidence, we will examine the relationship of the different reading habits dimensions to reading comprehension and motivational factors.

Characteristics of reading habits in primary school: context, purpose and reading media

During their development, students' reading habits can vary according to multiple factors, such as context, purposes or media (Clark & Teravainen-Goff, 2020; Willingham, 2017). First, an essential factor is the context where reading takes place. To refer to those reading habits that students engage in

inside the school, researchers usually use the term in-school reading. Conversely, autonomous reading, outside formal educational contexts, is known as out-of-school reading (Anderson et al., 1988; OECD, 2019a). Secondly, reading can be defined, at the same time, by the student's purpose (Wood et al., 2022), either due to an inner joyful drive (i.e., leisure reading) or to the need to complete school tasks, such as studying for a test or doing classwork or homework (i.e., academic reading) (Lupo et al., 2017; McKenna et al., 2012). In the literature, free-time, pleasure reading has been referred as 'lei-sure reading' (e.g., Jabbar & Warraich, 2023; Torppa et al., 2020; Willingham, 2017) but also 'enjoyment reading' (e.g., Wang & Guthrie, 2004) and 'extracurricular reading' (e.g., Pfof et al., 2013). All these terms describe the type of reading engagement in which there is no explicit instruction or perceived obligation to do so (McKenna et al., 2012). In contrast, academic reading is part of the school's instruction, so students read to fulfil some educational goal (i.e., homework or study) (Wang & Guthrie, 2004). Lastly, the reading medium is a relevant factor in reading habits since nowadays students do not only read printed materials. The proliferation of digital reading devices, coupled with widespread access to such technologies and the diversity of reading materials like e-books, social media platforms and digital newspapers, has introduced new reading habits into the population (OECD, 2019b). National data suggest that the computer is one of the most used digital devices among Spanish children (Instituto Nacional de Estadística [INE], 2023). Reports from 500,000 children between 10 and 12 years old indicate that computer usage is high, with 89.5% of 10-year-olds, 92.5% of 11-year-olds and 93.9% of 12-year-olds using a computer. In contrast, mobile phone ownership is notably lower among younger children, with 23.3% of 10-year-olds, 45.7% of 11-year-olds and 65.0% of 12-year-olds owning a mobile phone. Survey studies suggest that the surge in digital device accessibility could be displacing the traditional practice of reading printed books (Merga & Roni, 2017).

Previous literature has focused on reading attitudes of middle and high school students, making the distinction of reading purpose (recreational-academic) and reading media (print-digital) (Lupo et al., 2017; McKenna et al., 2012). In these studies, the focus was on the affective dimension of reading. However, less is known about the extent to which primary school students engage in

reading habits (behavioural dimension of reading attitudes), depending on the reading purpose, in combination with their reading media. Thus, this is still an open question that could be further addressed with an appropriate instrument. Because we identify some individual restrictions regarding in-school reading, such as school rules about personal digital usage (e.g., Selwyn & Bulfin, 2016) or in-class low variability due to teachers' management (e.g., McKenna et al., 2012), in the current study, we present an instrument designed to examine out-of-school reading habits. As we shall review next, research has identified two main factors related to several out-of-school reading habits that will represent the basis of our validation process: reading comprehension and reading motivation.

Associations of reading habits with reading comprehension and reading motivation

Reading habits and reading comprehension. A large body of literature has evidenced positive longitudinal associations between reading habits and reading comprehension in a wide range of ages and countries (Allington & McGill-Franzen, 2021; Mol & Bus, 2011; Sparks et al., 2014; van Bergen et al., 2018, 2020). This relationship has been proved to be bidirectional, meaning that higher reading abilities also promote reading frequency; such a mutual relationship has been labelled as the 'virtuous circle of reading' (Pfof et al., 2013) and has been replicated by affective attitudinal research (Lupo et al., 2017). Importantly, the evidence that supports this virtuous circle is based mostly on leisure print-reading habits. Less is known about newer reading habits in young students, like digital reading, or reading for other purposes, such as for school-related tasks. Recently, the meta-analysis by Altamura et al. (2025) suggested that the virtuous circle of reading is not replicated when it comes to leisure digital reading habits. The average effect size, based on the data from 25 studies (39 effect sizes) was .055, representing practically a null relationship between reading comprehension and leisure digital reading habits. Moreover, this 'not-so-virtuous circle' seems to be different depending on the reader's educational stage. At early stages (primary and middle school), negative relationships were observed between leisure digital reading and reading comprehension ($r = -.095$ and $r = -.025$, respectively), while at later

stages (high school and university), the relationship was positive ($r = .085$ and $r = .075$). Although the causal mechanisms for this phenomenon are still unknown, a potential reason is that older students possess a broader knowledge base and employ more advanced self-regulation strategies, which may help them to develop methods to reduce the shallow processing and distractions associated with on-screen reading (Salmerón et al., 2023).

The small correlation between digital reading and reading comprehension is supported by studies focusing on the affective dimension of reading attitudes. Specifically, Lupo et al. (2017) found no significant correlations between recreational digital text attitudes and reading comprehension from high school students. Conversely, students demonstrated the most positive attitudes toward this type of text, compared to recreational print and academic (print and digital), matching with the current rising frequencies of digital device use in young students (Merga & Roni, 2017; OECD, 2019b). Consistent with the scarce literature that has pursued out-of-school academic reading, the meta-analysis from Altamura et al. (2025) did not include academic reading habits. Some studies point towards non-significant positive correlations between academic print reading and reading comprehension in primary school students (McGeown et al., 2016). Additionally, some studies with adolescents also point towards a null relationship between out-of-school academic digital reading habits and reading comprehension (Petko et al., 2017), while others point to a small negative relationship, either for leisure or academic purposes (Park & Weng, 2020). In this study, we will provide sources of validity evidence regarding the relationship between reading habits and reading comprehension focusing on the behavioural dimension.

Reading habits and reading motivation

The pleasure or enjoyment that a reader feels can be partially explained in motivational terms. Extensive research supports the strong association between motivation and reading habits, referred to as reading behaviour in some studies (Schiefele et al., 2012; Soemer & Schiefele, 2018; Troyer et al., 2019). Similarly to the reviewed studies about reading habits and comprehension, this research has focused mainly on leisure print reading. Generally, intrinsic motivation is associated with a higher frequency of leisure

print reading (Schiefele et al. 2012; Soemer & Schiefele, 2018; Troyer et al., 2019), while extrinsic is negatively associated (Becker et al., 2010; Wang & Guthrie, 2004; Troyer et al., 2019). Few studies have analysed the role of reading motivation on different reading media habits. McGeown et al. (2016) examined the reading habits of 8-to-11-year-old students. The authors replicated previous patterns in which intrinsic motivation positively predicted leisure print reading and evidenced that extrinsic motivation positively predicted leisure digital reading. Additionally, McGeown et al. (2016) included one item that tapped academic reading; in this case, the item was limited to print. They found that some indicators of the motivation dimensions, such as school grades (extrinsic) and curiosity (intrinsic), predicted academic reading (McGeown et al., 2016). As far as we know, no other study has addressed the relationship between digital reading habits and reading motivation. While previous behavioural research has provided valuable insights based on its specific objectives, a comprehensive measurement is necessary to fully capture the multidimensional nature of reading habits. To that endeavour, we will review in detail how past research has addressed reading habit measurement.

Reading habit measurement: dimensionality and validity

Reading habits can be measured through different methodologies; each offers advantages and disadvantages that need to be considered by researchers (Locher & Philipp, 2023). Self-questionnaires are the most widely used due to their ease and speed, but their accuracy can be compromised by limited response options and memory bias. More precise methods, such as reading diaries (Locher et al., 2023) and experience sampling (Sonnenberg et al., 2012), demand greater time and effort, and they may alter subsequent reading behaviour. Another common but indirect method is the use of checklists, which include author and title recognition tests. Locher and Philipp (2023) highlight their imprecise measurement and lack of comparability across studies. Digital log data provide objective measurements (Parry et al., 2021), though cannot track offline activities, like print reading. Lastly, interviews offer rich qualitative data but are time-consuming and not easily generalizable (Rutledge & Hogg, 2020).

From the available methods, self-questionnaires are the most employed to measure reading habits (Altamura et al., 2025; Jabbar & Warraich, 2023). For

this reason, we will focus on this method. However, their widespread use is not translated into homogeneous instruments. These differences influence the representativeness of the constructs and may lead to inaccurate conclusions across studies. In Table A1 (see Appendix 1) we present a summary of the items employed in some studies that have measured children's reading habits for leisure and/or academic purposes and have attempted to distinguish the reading media employed. Following Locher and Philipp's (2023) dimensions, we have selected proximal and general studies. Accordingly, we have categorized item information according to the purpose of reading (leisure or academic) and reading media (print or digital), as suggested by Locher and Philipp (2023) and exemplified by McKenna et al. (2012) and Lupo et al. (2017). We will describe the common aspects through these studies in terms of content validity, referring to the extent to which a set of items can represent a content domain (DeVellis & Thorpe, 2022), including the specificity (number of items) and representativeness (variety of content). From each study, we will detail the measurement of reading frequency (which question, if available, and answer options were presented) and the psychometric properties of the items/scales employed (dimensionality and internal consistency, when available). After selecting relevant literature, we categorized the items employed by six local studies (Duncan et al., 2016; Johnson, 2013; Kanninen et al., 2022; McGeown et al., 2016; Pfof et al., 2013; Torppa et al., 2020) and three international assessment scales from PIRLS 2016 and 2021 (Mullis et al., 2017a, 2017b, 2023). This summary will serve as a starting point to our main objective: the elaboration of a comprehensive instrument to measure reading habits.

With regard to the reading purpose, we find a stronger focus on leisure reading habit measurement, presenting higher specificity than academic reading habits. The number of leisure reading items varies from one (e.g., in PIRLS, 2016 and 2021, Mullis et al., 2017b, 2023) to 14 (e.g., Duncan et al., 2016). The studies including different types of activities reflect higher representativeness (e.g., Duncan et al., 2016; Kanninen et al., 2022; McGeown et al., 2016; Pfof et al., 2013; Torppa et al., 2020) than those that include only one low-specific activity (e.g., 'How much time do you spend reading outside of school on a normal school day?' in PIRLS, 2021, Mullis et al., 2023). In the case of academic reading habits, the range of items goes from one (e.g., Duncan et al.,

2016; McGeown et al., 2016, Mullis et al., 2017a) to five (e.g., Johnson, 2013). Again, there are different degrees of content validity of the academic reading dimension, from broad single items (e.g., ‘School textbook’ in McGeown et al., 2016) to more specific sets of reading activities (e.g., at school: ‘use the Internet, use email, instant messaging, use the Internet to play games, visit websites’ in Johnson, 2013).

Adding to the differences per reading purpose, we also find different item choices depending on the reading media. Usually, for leisure reading habits there is a rather balanced set of items for print and digital reading in the same study (e.g., Duncan et al., 2016; Kannianen et al., 2022; McGeown et al., 2016; Pfof et al., 2013; Torppa et al., 2020). Regarding digital reading, these items cover different digital reading activities, from static reading (e-book) to Internet navigation or social communication. Conversely, for academic reading habit measurement, studies usually include items that tap exclusively one of the two reading media: print (e.g., Duncan et al., 2016; McGeown et al., 2016) or digital (Johnson, 2013; Mullis et al., 2017a, 2017b, 2023; Pfof et al., 2013).

Beyond the specificity and representativeness of the selected items, another important aspect is how reading frequency is measured. We find heterogeneity across the recall interval prompts and the units of frequency presented in the answers’ options. Some of the selected studies use prompts that ask for broad or unspecific periods of time (e.g., ‘How often/much time do you. . .?’ in Mullis et al., 2017b, 2023; Pfof et al., 2013), while other studies refer to recall intervals with more specific time-frames, whether within a day (Mullis et al., 2017b, 2023), the previous weekend (Duncan et al., 2016) or an average week (McGeown et al., 2016). This feature is important because asking for specific days may lead to lower representativeness than asking in average terms (Locher & Philipp, 2023; Sonnenberg et al., 2012). With regard to the answers’ options, most studies use stylized estimates, precisely, Likert scales which also vary in the units of reading frequency. Usually, studies that employ broad recall intervals use a combination of times per day, week and month (e.g., Kannianen et al., 2022; Pfof et al., 2013; Torppa et al., 2020). Conversely, studies that use prompts referring to specific days tend to use smaller time units, such as hours spent reading (e.g., Duncan et al., 2016; Mullis et al., 2017a, 2017b, 2023).

Lastly, regarding the psychometric properties of the instruments, few studies explore the dimensionality of the scales employed (e.g., Kanninen et al., 2022; Pfoest et al., 2013; Torppa et al., 2020). Even though it is recommended to analyse the internal structure or consistency of any assessment instrument's items (American Educational Research Association et al., 2014), not all the studies have psychometric data available. This can also be due to the purposes of each study, since in some cases they treat all or some items separately (e.g., Duncan et al., 2016).

Research objectives

In sum, research measuring reading habits presents considerable lack of consistency and has not addressed differences depending on the purpose (leisure or academic) and the reading media (print or digital). This study aims to address these gaps by developing and validating an out-of-school reading habit measurement instrument for primary school students. Our research objectives are:

- to describe the current reading habits of Spanish primary school students by presenting descriptive data from the newly developed instrument. Additionally, we will explore the role of gender and grade;
- to assess the sources of validity evidence based on internal structure by evaluating the instrument's dimensionality and internal consistency;
- to examine the sources of validity evidence based on relationships with other variables by investigating how different dimensions of reading habits (leisure-print, leisure-digital, academic-print, academic-digital) relate to students' reading comprehension and motivation.

Method

Participants

2,077 students participated in the study. The students were in three school grade levels corresponding to the last years of primary education in Spain: grades 4, 5 and 6. The minimum age, in fourth grade, is nine years, and

the maximum age, in sixth grade, is 12 years. Students belonged to 16 schools, from public to private systems. Data from 94 teachers indicate that digital devices are used, on average, around one or two times per month in class for reading comprehension instruction. For more detailed information about sociodemographic information, refer to Table 1. The Research Ethics Commission of the University of Valencia approved the protocol of the study (register # 1894095). APA ethical standards and the guidelines of the Helsinki Protocol were followed in conducting the study. Parents or legal guardians signed an informed consent form.

[Insert Table 1 here]

Instruments

Reading habits. We constructed the Multidimensional Reading Habits Instrument (MRHI), an instrument that comprises two questionnaires differentiating the reading purpose (leisure and academic). These two questionnaires contain eight items each; half of the items ask for reading activities performed in printed materials and the other half ask for digital reading. An English version of the MRHI is available in the supplementary materials.

Reading comprehension test. We used the Reading Comprehension Assessment (ACL) tests (Català et al., 2001), a standardized Spanish reading comprehension test. The corresponding version was used for each grade. These tests present narrative, expository and discontinuous texts (e.g., maps or tables). The questions cover the main dimensions of reading comprehension: literal, inferential and evaluation. Good internal consistency was determined, using a tetrachoric matrix to calculate ordinal omega scores ($\omega_{ACL\ 4th} = .81$, $\omega_{ACL\ 5th} = .81$, $\omega_{ACL\ 6th} = .82$).

Reading motivation. We used an expanded version of the Elementary School Motivation Scale (ESMS-E) (Ramos et al., 2022). The items of the intrinsic and external dimensions were taken from this version (Mañá et al., 2023), three items for intrinsic (e.g., ‘I like reading’) and three for extrinsic (e.g., ‘I read to please my parents or my teacher’). Students indicated their degree of agreement with generic reading statements on a five-point scale from 1 (‘strongly disagree’) to 5 (‘strongly agree’). Dimension scores were calculated as the average of the corresponding items. Good internal consistency was determined, using a tetrachoric matrix to calculate ordinal omega scores (ω for intrinsic dimension = .87, ω for extrinsic dimension = .72).

Procedure

The procedure to create the MRHI was based on the guidelines recommended by Kishore et al. (2021), consisting of four points. (1) To select the most appropriate items for our instrument, we first reviewed previous studies that used reading habit questionnaires tapping purpose and media. This review has been presented in the introduction section and summarized in Table A1 (see Appendix 1). (2) We selected the most common items across the reviewed studies and adapted them to fit in a homogeneous structure. We ensured that the number of items was the same in each questionnaire and dimension. Therefore, some items regarding academic reading needed to be created. Regarding the prompt for this reading purpose, we focused solely on teachers' instructions for academic reading (instead of also referring to parents' demands) to maintain consistency with previous studies, to ensure a clear distinction between school-related and leisure reading and to avoid the complexities introduced by diverse family structures, which could lead to measurement inconsistencies. The initial items were based on authentic school experiences in Spain and national statistical data (i.e., prevalence of computers over smartphones, INE, 2023). Thanks to the combined work of the authors, the opinion of one academic expert on psychometric assessments and two schoolteachers, we finally drafted two questionnaires, one for each reading purpose, leisure and academic reading, with two dimensions each, depending on the reading media: print or digital. For the measurement of reading frequency, we selected a four-point scale that combines times per day, week

and month (0: 'Every day or almost every day', 1: 'Once or twice a week', 2: 'Once or twice a month', 3: 'Never or hardly ever'). This decision was based on methodological studies that have determined that five-point scales lead to more confusion on young students than four-point scales, especially when they include 'moderate' options (Coombes et al., 2021). (3) To assess the comprehensibility of the items, we asked for the collaboration of five young readers and their parents (two boys and three girls between eight and 11 years old). They answered the proposed questionnaires and were explicitly asked about the comprehensibility and difficulty of the items. We asked the parents to inform us of any doubt they received from their children during the questionnaire completion. After this qualitative assessment, we corrected and corroborated the suitability and comprehensibility of the items. (4) Data collection took place between March and June 2022. In the assessment session, students completed first the reading comprehension test, followed by the reading habits questionnaire and motivation scale. All tests were completed individually on printed material, usually in the reference classroom, where there was always at least one examiner.

Data analyses

As a first step in the psychometric evaluation, we ran descriptive analysis for the whole sample. For each school grade, see the supplementary materials. We calculated central tendency (mean and standard deviation) and normality (skewness and kurtosis) measures. For the latest, we considered absolute skewness values ≤ 2 or an absolute kurtosis ≤ 4 to reflect considerable normality (Mishra et al., 2019). Secondly, to evaluate the internal structure of the questionnaires and its dimensions, we performed two confirmatory factor analysis (CFA) in Mplus 8.11 (L. K. Muthén & Muthén, 2017). We employed the Weighted Least Squares Mean (WLSM) for ordered data with cluster by class ($n_{\text{class}} = 122$). This strategy provides high robustness to the results by considering the group-level influences on the measured variables (B. O. Muthén, 1994). Model fit was assessed using Standardized Root Mean Square Residual (SRMR). This index ranges from 0 to 1, with a lower value indicating better fit or lower residuals. Hu and Bentler (1999) consider that values below .08 indicate a good model fit. As a parsimony-

adjusted index, we used the Root Mean Square Error of Approximation (RMSEA). It also ranges from 0 to 1, with smaller values being more desirable. Some authors (e.g., Byrne, 2010) suggest the following criteria: 0 = perfect fit, $< .05$ = close fit, $.05-.08$ = adequate fit, $.08-.10$ = mediocre fit and above $.1$ = inadequate fit. Lastly, as the incremental fit index, we used the Comparative Fit Index (CFI). Its values range from 0 to 1, with higher values being the most appropriate. Values above $.90$ are considered acceptable values, and values of $.95$ indicate a very adequate fit (Hu & Bentler, 1999). Based on the obtained CFA factor loadings of each scale, we calculated composite reliability for each of the four dimensions (leisure print, leisure digital, academic print and academic digital). This is a robust indicator of internal consistency that accounts for the interrelatedness of items within each sub-scale (Bentler, 2009). The criteria for composite reliability values depend much on the number of items included in the scale, with authors supporting $< .60$ when a scale has fewer than five items (Netemeyer et al., 2003).

Lastly, to establish concurrent validity evidence for the relationship between the proposed reading habits, reading comprehension and motivation, we employed Pearson's correlation. To provide information about gender and grade in relation to the measured variables, we used Spearman's rank-order correlation coefficient. For these analyses and the descriptives, we employed SPSS 26 (IBM Corp, 2019).

Results

Descriptive results

Table 2 reports the main descriptive values for the whole sample and all the items of each questionnaire. Overall, the most frequent activities are those related to academic reading in print. Schoolbooks, worksheets and exercises from the notebooks are read, on average, between 'Once or twice a week' and 'Every or almost every day'. Fiction books for school are read between 'Once or twice a month' and 'Once or twice a week'. The second most frequent activity, on average, is leisure digital reading. For example, 'reading on the Internet about information that is of interest to the reader' and 'to communicate with others' are activities performed, on average, 'Once or twice

a week'. It contrasts with the lower frequency of leisure digital books (average close to 'Never or almost never'). Similar frequencies are reported for academic digital reading. We observe that the use of digital books is also not common, being the least frequent reading activity for academic purposes (average between 'Never or almost never' and 'Once or twice a week'). However, this does not mean that students do not use technologies for their schoolwork, since they indicate that, on average, they use the Internet 'to look for information to do their tasks', 'to better understand some topics' and 'to send emails with their classmates and/or teachers' between 'Once or twice a month' and 'Once or twice a week'. Lastly, children reported leisure print activities as the least frequent reading activities. On the one hand, children claimed to read printed books, both those from topics of interest and fiction books, between 'Once or twice a month' and 'Once or twice a week'. On the other hand, other types of printed content are not that frequent; e.g., comic and magazine frequencies are close to 'Never or almost never'. Regarding the normality of the items, the skewness and kurtosis indexes indicated that the items' answers follow a normal distribution. Detailed descriptives differentiating by gender and grades are provided in Tables A2 to A5 in Appendix 1.

[Insert Table 2 here]

Internal structure

The internal structure of the questionnaires was assessed through two confirmatory factor analyses (CFAs). Both CFAs showed adequate model fit indexes. First, the leisure reading purposes questionnaire showed the following values: RMSEA = .052, 90% CI [.043, .061]; CFI = .900; SRMR = .042 (N = 2,059). To obtain a model closer to the reality, we indicated the existence of a correlation between item 7 and 8 errors (Internet to communicate and send emails). The reason was theoretically based, since in the literature these items are presented separately but convey a close activity: communication. The overall correlation between the two reading formats dimensions, print and digital, was statistically significant and negatively associated ($r = -.126$, $p =$

.018). This means that the more time a student reads for leisure in print, the less they report reading on digital media and vice versa. Standardized parameter estimates for this model are shown in Figure 1a. Second, appropriate goodness of model fit indexes was obtained for the academic reading purpose questionnaire: RMSEA = .023, 90% CI [.013, .033]; CFI = .986; SRMR = .026 (N = 2,057). In this case, both media dimensions were positively correlated ($r = .349$, $p < .001$); thus, if a student reports more time reading for academic purposes in print, they will also report higher frequencies for academic digital reading. Standardized parameter estimates for this model are shown in Figure 1b. All factor loadings were significant in both CFAs. Based on the factor loadings of each CFA, we calculated composite reliability indexes for each dimension. For leisure reading, the composite reliability was .367 for the print dimension and .633 for the digital. In the academic reading questionnaire, the composite reliability was .581 for print and .722 for digital dimension. Considering the acceptable threshold of .60 for composite reliability (Netemeyer et al., 2003), the print dimensions presented poor internal consistency. We will expose in more detail factors influencing reliability values in the discussion.

[Insert Figure 1 here]

Evidence of test-criterion validity

As for the evidence of test criterion validity, we present Pearson correlations of the proposed reading habits dimensions with the scores of reading comprehension and reading motivation constructs (Table 3). As expected for reading comprehension, we find positive correlations between leisure print reading habits and reading comprehension. This association is not significant in the case of academic print, and it turns out negative in the case of both leisure and academic digital reading habits. In this case, the negative correlation value is higher for academic digital reading than for leisure. Similarly, for the relations with motivation, we find positive relationships between intrinsic motivation and print reading habits; the magnitude of this correlation stands out from the other dimensions, and it contrasts with the small

negative relations exhibited with digital reading habits. This pattern is present in both reading purposes, leisure and academic. As for extrinsic motivation, we observe positive correlations with digital reading in both purposes' scales, presenting similar magnitudes. In contrast, extrinsic motivation shows negative small magnitude correlation with leisure print reading habits. We replicated associative patterns found in previous studies, except in the case of academic digital reading habits. We cannot compare our results in this area due to the limited available literature.

[Insert Table 3 here]

Additionally, we also explored the relationship of the measured variables with gender and grade. Regarding gender, we observe that, on the one hand, boys engage more in leisure print reading and have slightly higher extrinsic motivation. On the other hand, girls show higher frequencies for academic reading (irrespective of the media), engage in more frequent leisure digital reading and present slightly higher intrinsic motivation for reading. Regarding grade, we determine that higher-grade students engage more frequently in leisure and academic digital reading but less in leisure print reading. There is no significant correlation between grade and academic print reading. Lastly, students also tend to present slightly lower reading comprehension, intrinsic motivation and extrinsic motivation as they advance in grades. To summarize the various sources of validity evidence reported in this study, we have added this information to Table A6. This table gathers the findings from previous research along with our own results, based on the proposed criteria. It allows for a clear comparison, highlighting the alignment between our findings and those of previous studies. The robust criteria accomplishment supports the validity of the MRHI.

Discussion

Considering the heterogeneity in reading habit measurement and the lack of comprehensive instruments for primary school students, this work aimed to

cover the need for an adequate measurement, developing and validating the Multidimensional Reading Habits Instrument (MRHI). This instrument was designed based on previous literature that had aimed to measure reading habits but did not address the different purposes and different reading media in which children engage nowadays. Thus, the MRHI contains two questionnaires differentiating out-of-school reading purposes (leisure and academic) and distinguishes among print and digital reading formats. Acknowledging the new and diverse reading habits is particularly relevant given their different associations with reading comprehension (Altamura et al., 2025; Mol & Bus, 2011).

Reading habit prevalence

Outside school, our data show that students from fourth to sixth grade tend to read more frequently for academic purposes, especially in print. The second most frequent activity is leisure digital reading, followed by academic digital reading, with the lowest frequency for leisure print reading. Our findings show some discrepancies when compared to the results reported in previous studies. For example, previous studies reported the highest frequencies for leisure print reading habits (Kannianen et al., 2022; McGeown et al., 2016; Torppa et al., 2020). Conversely, Pfof et al. (2013) reported leisure digital reading as the most frequent activity. This pattern is supported by global assessment trends indicating a decline in leisure print reading and increased digital reading (Clark et al., 2023; Merga & Roni, 2017; OECD, 2019b). In our study, the higher reading frequency of academic print materials, compared to previous studies, could be due to the limited or null representativeness of academic reading habits in past studies. Because the MRHI explicitly addresses the different reading purposes, the answers of young students could be somehow different from those studies that did not present such differentiated items. All children need to read, at least to some extent, to fulfil their academic tasks at home (e.g., homework) (Willingham, 2017). Therefore, it is logical to observe that academic print reading is the most frequent reading activity.

Regarding sociodemographic factors, boys present higher frequencies for leisure print, while girls show higher frequencies in digital. Meta-analytic

evidence indicates that although girls read more for leisure, boys show stronger preferences for print materials (Jabbar & Warraich, 2023). Regarding academic reading, girls showed higher reading frequencies than boys in both print and digital. Previous studies do not show gender differences regarding schoolbook reading (Duncan et al., 2016; McGeown et al., 2016). Unlike these studies, the MRHI differentiates reading media; therefore, we can expect different results from a more precise measurement and better reflections of their media preferences.

As for age, we observe higher frequencies of digital reading as grade increases. This is supported by other studies such as McGeown et al. (2016) in middle school students and Duncan et al. (2016). Conversely, matching with recent longitudinal studies, leisure print reading frequencies diminish with age (Bittmann, 2025). No significant correlations were found between grade and academic print reading, although in previous research this correlation is significant and positive (Duncan et al., 2016; McGeown et al., 2016). We suggest that these age-related changes may be more closely tied to academic digital reading, an area still underexplored in the literature.

Sources of validity evidence

Our work proposes an instrument with two separate questionnaires according to the reading purpose (leisure and academic) which contain the same number of items for print and for digital reading formats. This ensures equal specificity for each reading habit dimension. Through different sources of validity evidence, the proposed questionnaires show good validity evidence regarding internal structure and test-criterion relationships with reading comprehension and reading motivation. Regarding their internal structure, both questionnaires present good model fit indexes, suggesting that the hypothesized factor structure is a valid representation of the data and accurately reflects the underlying constructs using cluster-control analysis. To our knowledge, this is the first instrument that combines purpose and reading media and explicitly addresses these dimensions. We assessed internal consistency reliability using a composite reliability index, which accounts for class clustering by incorporating factor loadings from the CFAs. Our reliability values range from .367 to .722, a rather large range which is not uncommon in

previous scales measuring reading habits (e.g., Torppa et al., 2020, reported ranges from .46 to .82) (see Table A6). For scales with fewer than five items, values under .60 indicate insufficient internal consistency (Netemeyer et al., 2003). We propose two main reasons why we found these low reliability values. First, the number of items included per dimension in our questionnaires could promote lower reliability values. As Netemeyer et al. (2003) highlights, this index is sensitive to the number of items, being favoured by higher quantities. Balancing item specificity and applicability is crucial, since longer questionnaires can increase internal consistency but also cause fatigue and disengagement (Nunnally & Bernstein, 1994). This is a common issue to all scale developers but is particularly relevant for the assessment of children, who are more prone to fatigue and disengagement than adults (Christensen & James, 2008). The second reason why we could have obtained low reliability indexes is linked to the type of construct we are addressing. Reading habits are a broad construct that involves various activities, and not all activities may be performed to the same extent by every reader. For example, for leisure print, one student may prefer reading only comics, while another student may equally enjoy books, magazines and comics. These differences in reading profiles can lead to a lack of internal consistency since not all items' answers will be homogeneous (Devellis & Thorpe, 2022).

Our second type of validity evidence is based on relationships with other variables, specifically reading comprehension and reading motivation (Schiefele et al., 2012). By examining the correlation between the proposed reading habits and these variables, we obtained reliable criterion-validity evidence. For instance, we obtained positive correlations between leisure print reading habits and reading comprehension, replicating previous findings (Schiefele et al., 2012; Soemer & Schiefele, 2018; Troyer et al., 2019), and null for academic print reading habits as in McGeown et al. (2016).

We could not report previous relationships between out-of-school academic digital reading habits and reading comprehension in primary school students due to lack of research in this population. Nevertheless, some studies from high school students also present the same negative correlation pattern with reading comprehension (Petko et al., 2017) or null associations (Park & Weng, 2020). Our findings confirm consistent negative associations between reading comprehension and digital reading habits in primary school, irrespective of

reading purpose. These patterns follow meta-analytical evidence (Altamura et al., 2025) and support the claims of the shallowing hypothesis (Annisette & Lafreniere, 2017), which describes how frequent use of brief social media promotes rapid and relatively shallow thought, associated with cognitive and moral shallowness. Regarding motivation, we replicated positive correlations between leisure print reading and intrinsic motivation (Schiefele et al., 2012; Soemer & Schiefele, 2018; Troyer et al., 2019). As part of the MRHI validation process, we superficially addressed some unexamined questions that require further investigation. Specifically, to our knowledge, there are no studies that have addressed the relationship between motivation and out-of-school academic digital reading. We support the alignment of our results with previous literature indicating negative relationships between intrinsic motivation and digital communicative texts (leisure) while being positively predicted by extrinsic motivation (McGeown et al., 2016). Future researchers can benefit from having an instrument that explicitly differentiates between leisure and academic reading purposes and accounts for different reading media dimensions to address this type of unexplored research question.

Limitations

The MRHI is not exempt from limitations. First, it is necessary to acknowledge that all the students came from the same region, which can contribute to similarities in school curricula and activities, including homework load. We tried to tackle this issue by recruiting different types of schools. It would be useful to count with students from other schools in Spain and other countries to examine, specifically, possible differences in academic reading habits. Second, the internal consistency reliability of the four dimensions could be higher. As we have discussed previously, it is hard to balance a sufficient number of items that guarantees representativeness of the constructs, facilitates internal consistency and that it does not contribute to students' fatigue (Devellis & Thorpe, 2022; Nunnally & Bernstein, 1994). Especially with young students, it is a challenging task to design assessment instruments that do not compromise their ecological application. If other researchers aim to increase the number of items, caution is advised. Lastly, the present instrument is focused on the reading frequency. Other types of

assessments could be used to triangulate and expand the knowledge about reading habits addressing behavioural variables, such as how long are the reading sessions, or examine the reading materials' characteristics, such as the number of pages or specific topics inside each genre. For example, employing digital devices that can track the reading behaviour of students (Parry et al., 2021) or reading diaries, in the case of print reading (Locher et al., 2023).

Given the wide range of digital devices available, future research could investigate how reading habits vary across different platforms such as computers, tablets, e-readers, smartphones. . . A notable limitation of the MRHI in this regard is its focus on computers and tablets when addressing digital reading. Expanding this scope to include smartphones could be particularly valuable, since while they are less commonly used for extensive book reading (Levratto et al., 2021), they can play a significant role in information navigation and social communication.

Implications

The development of the MRHI and its validation process brings several educational implications and benefits. Firstly, its ease of application and rapid administration makes it a practical tool for researchers and schools, allowing efficient data collection without imposing an overload of tests and scales on participants or administrators. It serves as a rapid and complementary measurement to a variety of variables related to reading processes and behaviours. Secondly, by providing a comprehensive measure that distinguishes between reading purposes (leisure or academic) and reading media (print or digital), this instrument offers a more precise understanding of students' reading habits. This allows educators to gain deeper insights into their students' reading behaviours, facilitating more tailored and effective teaching strategies. Furthermore, the MRHI emerges as a comprehensive tool proposed and encouraged to be freely used by researchers in their investigations to enhance the comparability and reliability of research findings across different contexts. Lastly, as has been evidenced by criterion validity, the reading habit dimensions correlate differently with reading comprehension and reading motivation. Thus, its use can help in monitoring changes in reading habits over time, assess the impact of educational interventions and ultimately support the

continuous improvement of reading programmes to foster better reading comprehension and motivation among students.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Data availability statement

Supplementary materials can be freely accessed at https://osf.io/z25ny/?view_only=28481d1e72c4429e935c0f9cfd818240.

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Table 1

Sociodemographic information of participants

	n	%
Grade		
4	716	34.5
5	666	32.1
6	695	33.5
Gender		
Feminine	919	44.2
Masculine	858	41.3
Prefer not to respond	65	3.1
Missing	235	11.3
Type of school		
Public	442	21.3
Private	597	28.7
State-subsidized school	1,005	48.4
Compensatory education	33	1.6
School location inhabitants		
< 20,000	5	31.3
20,000–30,000	4	25.0
30,000–50,000	1	6.3
> 50,000	6	37.4

Table 2

Descriptive analysis for all items

				Skewness		Kurtosis	
	<i>N</i>	Mean	<i>SD</i>	Statistic	<i>SE</i>	Statistic	<i>SE</i>
Leisure purposes							
<i>Print (average)</i>	2,021	1.07	.57	.34	.05	−.19	.11
Specific-topic books	2,049	1.34	1.04	.12	.05	−1.18	.11
Fiction books	2,048	1.58	1.08	−.09	.05	−1.26	.11
Comics and graphic novels	2,042	.97	1.13	.73	.05	−.96	.11
Magazines	2,052	.41	.73	1.83	.05	2.77	.11
<i>Digital (average)</i>	2,032	1.55	.72	−.24	.05	−.67	.11
Digital books	2,048	.70	.98	1.13	.05	−.03	.11
Internet to look for information	2,051	2.05	.97	−.68	.05	−.61	.11
Internet to communicate	2,043	1.95	1.18	−.67	.05	−1.11	.11
Send emails	2,047	1.49	1.17	−.03	.05	−1.47	.11
Academic purposes							
<i>Print (average)</i>	2,001	2.04	.58	−.74	.05	.46	.11
Fiction books	2,051	1.44	1.02	−.01	.05	−1.12	.11
Schoolbooks	2,041	2.12	.99	−.86	.05	−.39	.11
Worksheets	2,040	2.11	.89	−.75	.05	−.25	.11
Exercise notebooks	2,029	2.47	.80	−1.51	.05	1.62	.11
<i>Digital (average)</i>	2,022	1.35	.73	.15	.05	−.76	.11
Digital schoolbooks	2,035	.95	1.07	.66	.05	−.97	.11
Internet to do homework	2,049	1.72	.97	−.26	.05	−.91	.11
Internet to understand	2,048	1.51	1.02	−.06	.05	−1.11	.11
Class emails	2,049	1.20	1.11	.37	.05	−1.24	.11

Note: *N* is not constant due to missing values in individual items. Reading habits answer scale: (0) ‘Never or hardly ever’; (1) ‘Once or twice a month’; (2) ‘Once or twice a week’; (3) ‘Every day or almost every day’.

Table 3

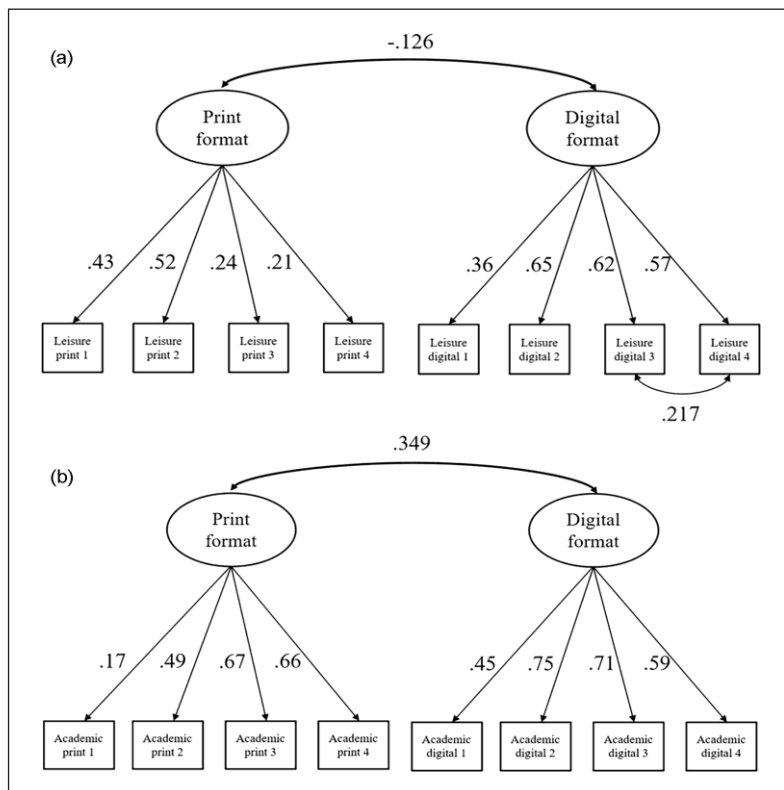
Pearson correlations for aggregated reading habit dimensions of the MRHI, reading comprehension and reading motivation dimensions

	1	2	3	4	5	6	7	8
1. Leisure print								
2. Leisure digital	-.033							
3. Academic print	.183**	.103**						
4. Academic digital	.013	.512**	.215**					
5. Reading comprehension	.148**	-.084**	.044	-.135**				
6. Intrinsic motivation	.540**	-.087**	.183**	-.053*	.225**			
7. Extrinsic motivation	-.052*	.120**	.047*	.150**	-.196**	-.187**		
8. Gender ¹	.103**	-.070**	-.061*	-.094**	-.012	-.096**	.052*	
9. Grade ¹	-.102**	.253**	0.011	.224**	-.134**	-.088**	-.049*	.043

Note: ** $p < .01$; * $p < .05$. ¹For gender (0 = girls, 1 = boys) and grade (0 = fourth, 1 = fifth, 2 = sixth), we employed Spearman's rank-order correlation coefficient.

Figure 1

Graphic representation of standardized factor loadings from leisure and academic reading habits questionnaires' confirmatory factor analyses



Note: (a) leisure reading habits questionnaire; (b) academic reading habits questionnaire

Validation of the multidimensional reading habits instrument for primary school students – unmasked - Appendix

Appendix

Table A1

Summary of reading habits measures differentiating purpose and media in previous literature

Study	Participants' age	Reading purpose	Reading media		Frequency	Psychometric properties	
			Print	Digital	Measurement (indicated in the article)	Dimensionality	Internal consistency
Duncan et al. (2016)	11 -15 (grade 7 to 9)	Leisure	Magazine Comic/graphic novel/manga Poetry Newspaper Song lyrics Set of instructions/manual Non-fiction book Fiction book	Text message/e-mails Networking website (e.g., Facebook) Computer/console game Online searching Factual website or blog (e.g., Wikipedia) Twitter	How much time they had spent reading the material the previous weekend Scale: a 5-point Likert scale (1: Didn't read this, 2: 30 min or less, 3: 1 hr, 4: 2 hr, 5: 3 hr or more).	Treated as independent items	-
		Academic	School textbook/reference book	-			-
Johnson (2013)	8-12 years (grade 3 to 6)	Leisure (two set of items: the first set ended with "at home" and the second with "at someone else's house", referred to as Community level)	-	I use the internet at... I use email at... I instant message at... I use the internet to play games at... I visit websites at...	No specific question or prompt detailed. Scale: Never or hardly ever, once or twice a month, once or twice a week, every day or almost every day	Treated as independent items	-
		Academic (inside of school, items ended with "at school")	-				-
Kanniainen et al. (2022)	12-13 (grade 6)	Leisure	Books (e.g., novels, nonfiction) Newspapers (an example of the Finnish newspaper) Magazines (examples of Finnish magazines targeted to adolescents) Comics	E-book Online newspapers (examples of Finnish online news-papers) Websites on various topics (e.g., interests, hob-bies, sports) Blog posts Forums (e.g., discussionsof games, artists, hobbies).	5-point Likert scale [1 = hardly ever; 2 = rarely (1–2 times permonth); 3 = 1–2 times per week; 4 = almost every day; 5 =every day]		McDonald's omega = 0.62

Validation of the multidimensional reading habits instrument for primary school students – unmasked - Appendix

Study	Participants' age	Reading purpose	Reading media		Frequency	Psychometric properties	
			Print	Digital	Measurement (indicated in the article)	Dimensionality	Internal consistency
McGeown et al. (2016)	8-11 (grade 3 to 5)	Leisure	Fiction/storybook Factual/information book Magazines Comics	On-line searching/web browsing Text messages Emails Social networking site (e.g., Facebook) Twitter	‘How much time in an average week (including the weekend) do you usually spend reading each of these outside of school?’ Scale: 5-point scale: ‘Don’t read this’, ‘Less than 1 hour’, ‘About 1–2 hours’, ‘About 3–4 hours’ and ‘5 hours or more’.	Text messages, emails, social networking and twitter. items were summed to create a composite score measuring short digital texts used for communication	Only reported for the factor "short digital texts used for communication": Cronbach's alpha= .76
		Academic	School textbook				
Pfost et al. (2013)	12-13 years (grade 7)	Leisure	Magazines or newspapers Comics Novels Stories or tales Nonfiction books (e.g., technical or science)	E-mails Online encyclopedias (e.g., Wikipedia) Online forums or chats.	“Outside school, how often do you read...?”: Scale: 4-point scale with the response options 1 (almost never or never), 2 (several times a month), 3 (several times a week), and 4 (several times a day).	Latent class analysis (LCA) model with binary latent class indicators and ordered categorical (ordinal) dependent variables. Obtained profiles: 1) Highly engaged readers: read all types of materials; 2) Online readers; 3) Traditional print readers; 4) Print avoidant readers	-
Torppa et al. (2020)	11-15 (grade 6 to 9)	Leisure	Reading frequency of books Newspapers Comic books Nonfiction books Interest-related books Tabloids Magazines Magazines for adolescents	E-mails Messages and Internet conversations Facebook Blogs	Leisure time reading activity Scale: 5-point Likert scale (1 = not at all or rarely to 5 = several times a day)	Factor analyses (using principal axis factoring, varimax rotation) 4 factors: 1. “Book reading”: Number of books read in one’s free time, Book reading frequency 2. “News and comics”: Newspapers, Comic books, Nonfiction and interest-related books, and Tabloids. 3. “Magazines”: Magazines, Magazines for adolescents. 4. “Digital texts”: E-mails, Messages and Internet conversations, Facebook, Blogs.	Cronbach’s alphas for Book reading: .73 in Grade 6, .80 in Grade 7, and .82 in Grade 9; for News and comics; .51 in Grade 6, .56 in Grade 7, and .55 in Grade 9; for Magazines; .53 in Grade 6, .61 in Grade 7, and .63 in Grade 9; and for Digital texts; .53 in Grade 6, .52 in Grade 7, and .46 in Grade 9.

Validation of the multidimensional reading habits instrument for primary school students – unmasked - Appendix

Study	Participants' age	Reading purpose	Reading media		Frequency	Psychometric properties	
			Print	Digital		Dimensionality	Internal consistency
PIRLS 2016 Student questionnaire (Mullis et al., 2017b)	(9-10 years) Grade 4	Not specified	-	Playing games Watching videos Chatting Surfing the internet	How much time do you spend each day using a computer or tablet for any of the following activities? Scale: No time, 30 min or less, 30 min up to 1 hour, from 1 h to 2 hours, 2h or more	-	-
		Academic (inside and outside school: At home, At school, Some other place)	-	Schoolwork	How often do you use a computer or tablet in each of these places for schoolwork (including classroom tasks, homework, or studying outside of class)? Scale: Never or almost never, Once or twice a month, once or twice a week, Every day or almost every day	-	-
ePIRLS 2016 Student questionnaire (Mullis et al., 2017a)	(9-10 years) Grade 4	Not specified	-	Finding and reading information on the Internet	About how much time do you spend each day finding and reading information on the Internet? Scale: Less than 30 minutes, 30 minutes up to 1 hour, From 1 hour up to 2 hours, 2 hours or more	-	-
PIRLS 2021 Student questionnaire (Mullis et al., 2023)	(9-10 years) Grade 4	Not specified	No items - Low specific question		How often do you borrow books (including ebooks) from your school or local library? Scale: At least once a week -- A Once or twice a month -- A few times a year -- Never or almost never	-	-
		Not specified	No items - Low specific question		How much time do you spend reading outside of school on a normal school day? Scale: 30 min or less, 30 min up to 1 hour, from 1 h to 2 hours, 2h or more	-	-
		Leisure	I read for fun I read to find out about things I want to learn		How often do you do these things outside of school? Scale: Every day or almost every day, once or twice a week, once or twice a month, never or almost never	-	-

Table A2
Descriptive average for all items by gender

	Girls							Boys						
				Skewness		Kurtosis					Skweness		Kurtosis	
	N	Mean	SD	Statistic	SE	Statistic	SE	N	Mean	SD	Statistic	SE	Statistic	SE
<i>Leisure scale</i>														
<i>Print format (average)</i>	905	1.01	0.54	0.39	0.08	0.02	0.16	838	1.14	0.61	0.25	0.08	-0.35	0.17
Specific topics books	914	1.30	1.04	0.20	0.08	-1.17	0.16	853	1.42	1.03	0.00	0.08	-1.15	0.17
Fiction books paper	913	1.69	1.06	-0.21	0.08	-1.19	0.16	852	1.46	1.08	0.05	0.08	-1.26	0.17
Comic books paper	908	0.64	0.95	1.27	0.08	0.36	0.16	850	1.27	1.18	0.31	0.08	-1.42	0.17
Magazines paper	914	0.41	0.70	1.78	0.08	2.82	0.16	854	0.41	0.75	1.80	0.08	2.42	0.17
<i>Digital format (average)</i>	904	1.61	0.73	-0.29	0.08	-0.75	0.16	846	1.51	0.70	-0.27	0.08	-0.59	0.17
Books digital format	911	0.77	1.00	0.98	0.08	-0.37	0.16	854	0.60	0.93	1.36	0.08	0.59	0.17
Internet for information	912	2.12	0.92	-0.73	0.08	-0.44	0.16	854	2.03	0.99	-0.65	0.08	-0.69	0.17
Internet to communicate	911	1.95	1.18	-0.67	0.08	-1.11	0.16	848	1.93	1.18	-0.62	0.08	-1.16	0.17
Leisure emails	913	1.58	1.16	-0.14	0.08	-1.44	0.16	849	1.50	1.15	-0.03	0.08	-1.43	0.17
<i>Academic scale</i>														
<i>Print format (average)</i>	882	2.07	0.57	-0.80	0.08	0.61	0.16	841	2.00	0.59	-0.70	0.08	0.32	0.17
Fiction books paper	912	1.54	0.98	-0.10	0.08	-1.00	0.16	856	1.43	1.00	0.01	0.08	-1.08	0.17
School books paper	907	2.14	0.95	-0.89	0.08	-0.22	0.16	852	2.06	1.02	-0.76	0.08	-0.61	0.17
Worksheets paper	903	2.13	0.90	-0.78	0.08	-0.27	0.16	854	2.09	0.88	-0.69	0.08	-0.31	0.17
Exercises notebook	897	2.47	0.78	-1.49	0.08	1.61	0.16	848	2.43	0.82	-1.39	0.08	1.24	0.17
<i>Digital format (average)</i>	896	1.45	0.74	0.05	0.08	-0.80	0.16	845	1.31	0.72	0.16	0.08	-0.77	0.17
School books digital	904	1.09	1.10	0.44	0.08	-1.23	0.16	849	0.92	1.07	0.73	0.08	-0.86	0.17
Internet for homework	909	1.83	0.95	-0.36	0.08	-0.80	0.16	855	1.64	0.97	-0.17	0.08	-0.96	0.17
Internet to understand	911	1.57	1.02	-0.14	0.08	-1.09	0.16	852	1.48	1.03	-0.01	0.08	-1.13	0.17
Academic emails	910	1.31	1.11	0.23	0.08	-1.31	0.16	855	1.17	1.10	0.40	0.08	-1.20	0.17

Table A3

Descriptive average for all items in fourth grade

	N	Mean	SD	Skewness		Kurtosis	
				Statistic	SE	Statistic	SE
<i>Leisure scale</i>							
<i>Print format (average)</i>	696	1.14	0.55	0.34	0.09	0.01	0.19
Specific topics books	707	1.43	1.05	-0.01	0.09	-1.21	0.18
Fiction books paper	706	1.70	1.07	-0.22	0.09	-1.21	0.18
Comic books paper	704	1.04	1.14	0.61	0.09	-1.11	0.18
Magazines paper	709	0.39	0.74	1.97	0.09	3.23	0.18
<i>Digital format (average)</i>	699	1.32	0.74	0.04	0.09	-0.86	0.18
Books digital format	706	0.69	0.99	1.15	0.09	0.00	0.18
Internet for information	707	1.84	1.03	-0.43	0.09	-0.99	0.18
Internet to communicate	705	1.54	1.22	-0.12	0.09	-1.56	0.18
Leisure emails	705	1.20	1.17	0.37	0.09	-1.37	0.18
<i>Academic scale</i>							
<i>Print format (average)</i>	687	2.01	0.59	-0.58	0.09	-0.07	0.19
Fiction books paper	708	1.52	1.06	-0.11	0.09	-1.20	0.18
School books paper	705	2.03	1.03	-0.72	0.09	-0.67	0.18
Worksheets paper	704	2.12	0.92	-0.83	0.09	-0.18	0.18
Exercises notebook	695	2.38	0.84	-1.26	0.09	0.80	0.19
<i>Digital format (average)</i>	695	1.15	0.72	0.38	0.09	-0.51	0.19
School books digital	703	0.93	1.06	0.65	0.09	-0.99	0.18
Internet for homework	705	1.38	0.98	0.16	0.09	-0.97	0.18
Internet to understand	707	1.35	1.02	0.11	0.09	-1.13	0.18
Academic emails	707	0.94	1.05	0.73	0.09	-0.78	0.18

Table A4

Descriptive average for all items in fifth grade

	N	Mean	SD	Skewness		Kurtosis	
				Statistic	SE	Statistic	SE
<i>Leisure scale</i>							
<i>Print format (average)</i>	646	1.07	0.57	0.43	0.10	-0.07	0.19
Specific topics books	656	1.36	1.05	0.12	0.10	-1.21	0.19
Fiction books paper	654	1.58	1.07	-0.12	0.10	-1.22	0.19
Comic books paper	654	0.97	1.13	0.73	0.10	-0.95	0.19
Magazines paper	658	0.38	0.70	1.87	0.10	2.85	0.19
<i>Digital format (average)</i>							
Books digital format	653	1.56	0.71	-0.18	0.10	-0.71	0.19
Internet for information	658	0.77	1.01	0.98	0.10	-0.39	0.19
Internet to communicate	659	2.09	0.93	-0.69	0.10	-0.53	0.19
Leisure emails	654	1.87	1.20	-0.54	0.10	-1.27	0.19
	657	1.53	1.15	-0.08	0.10	-1.42	0.19
<i>Academic scale</i>							
<i>Print format (average)</i>	640	2.07	0.55	-0.81	0.10	0.88	0.19
Fiction books paper	657	1.45	1.01	-0.05	0.10	-1.11	0.19
School books paper	652	2.15	0.94	-0.90	0.10	-0.18	0.19
Worksheets paper	652	2.16	0.84	-0.68	0.10	-0.30	0.19
Exercises notebook	650	2.51	0.75	-1.60	0.10	2.18	0.19
<i>Digital format (average)</i>							
School books digital	649	1.35	0.70	0.17	0.10	-0.75	0.19
Internet for homework	651	0.92	1.02	0.69	0.10	-0.83	0.19
Internet to understand	657	1.81	0.93	-0.39	0.10	-0.70	0.19
Academic emails	656	1.48	1.03	0.01	0.10	-1.15	0.19
	656	1.18	1.09	0.40	0.10	-1.16	0.19

Table A5

Descriptive average for all items in sixth grade

	N	Mean	SD	Skewness		Kurtosis	
				Statistic	SE	Statistic	SE
<i>Leisure scale</i>							
<i>Print format (average)</i>	679	1.00	0.59	0.33	0.09	-0.43	0.19
Specific topics books	686	1.22	1.00	0.24	0.09	-1.08	0.19
Fiction books paper	688	1.45	1.09	0.06	0.09	-1.28	0.19
Comic books paper	684	0.89	1.11	0.86	0.09	-0.76	0.19
Magazines paper	685	0.45	0.74	1.66	0.09	2.30	0.19
<i>Digital format (average)</i>	680	1.77	0.62	-0.43	0.09	-0.06	0.19
Books digital format	684	0.63	0.94	1.27	0.09	0.38	0.19
Internet for information	685	2.23	0.89	-0.92	0.09	-0.09	0.19
Internet to communicate	684	2.46	0.90	-1.63	0.09	1.58	0.19
Leisure emails	685	1.76	1.11	-0.37	0.09	-1.22	0.19
<i>Academic scale</i>							
<i>Print format (average)</i>	674	2.03	0.58	-0.83	0.09	0.71	0.19
Fiction books paper	686	1.33	0.97	0.12	0.09	-0.99	0.19
School books paper	684	2.18	0.99	-0.97	0.09	-0.22	0.19
Worksheets paper	684	2.06	0.91	-0.70	0.09	-0.36	0.19
Exercises notebook	684	2.53	0.78	-1.71	0.09	2.27	0.19
<i>Digital format (average)</i>	678	1.55	0.71	-0.08	0.09	-0.75	0.19
School books digital	681	1.01	1.13	0.63	0.09	-1.10	0.19
Internet for homework	687	1.98	0.89	-0.52	0.09	-0.52	0.19
Internet to understand	685	1.71	0.97	-0.29	0.09	-0.88	0.19
Academic emails	686	1.49	1.12	0.00	0.09	-1.36	0.19

Table A6

Sources of validity evidence categorization in previous studies and the present study

Source	Criterion	Previous studies	Analysis in this study	Results
Evidence based on internal structure	Dimensionality	Pfost et al. (2013): Latent class analysis to identify readers' profiles regarding reading media. Torppa et al. (2020): Exploratory Factor Analysis (4 factors)	CFA controlling for class cluster	Good model fit indexes: Leisure: RMSEA = .050, 90% CI [.041, .060]; CFI = .904; SRMR = .042 Academic: RMSEA = .024, 90% CI [.014, .034]; CFI = .985; SRMR = .026
	Internal consistency	Kanniainen et al. (2022): McDonalds' Omega = .62 (unidimensional) McGeown et al. (2016): Cronbach Alpha for digital texts = .76 Torppa et al. (2020): Cronbach Alpha values for ranging from .46 to .82 (for 4 factors)	Composite reliability based on CFA controlling for class cluster	Leisure print: .367 Leisure digital: .633 Academic print: .581 Academic digital: .722
Evidence based on relations to other variables	Relationship with reading comprehension	Leisure print: positive associations (Schiefele et al., 2012; Soemer & Schiefele, 2018; Troyer et al., 2019) Leisure digital: null to negative associations (Authors, 2024; McGeown et al., 2016; Pfost et al., 2013; Torppa et al., 2020) Academic print: null associations (McGeown et al., 2016) Academic digital: from adolescents' studies-null (Park & Weng, 2020) to negative associations (Petko et al., 2017)	Pearson correlation	Leisure print: positive associations Leisure digital: negative associations Academic print: null associations Academic digital: negative associations

Table A6 cont.

Sources of validity evidence categorization in previous studies and the present study

Source	Criterion	Previous studies	Analysis in this study	Results
Evidence based on relations to other variables	Relationship with intrinsic reading motivation	Leisure print: positive associations (Schiefele et al., 2012; Soemer & Schiefele, 2018; Troyer et al., 2019) Leisure digital: null to negative associations (McGeown et al., 2016) Academic print: null to positive associations (McGeown et al., 2016) Academic digital: -	Pearson correlation	Leisure print: positive associations Leisure digital: negative associations Academic print: positive associations Academic digital: negative associations
	Relationship with extrinsic reading motivation	Leisure print: negative (Becker et al., 2010; Wang & Guthrie, 2004; Troyer et al., 2019) Leisure digital: positive associations (McGeown et al., 2016) Academic print: null to positive associations (McGeown et al., 2016) Academic digital: -	Pearson correlation	Leisure print: negative associations Leisure digital: positive associations Academic print: positive associations Academic digital: positive associations

Multidimensional Reading Habits Instrument for primary school students (translated into English)

Leisure reading frequency scale

How many times do you do the following reading activities outside of school (at home, in the library, at a relative's house)? We ask about what you read on paper or on the computer (or tablet) because you like it and you feel like doing it, as long as it is not in the school. (Select your answer with an X).

<i>I read because I choose to (for fun)...</i>	Never or almost never	Once or twice a month	Once or twice a week	Every or almost every day
Paper books on topics that interest me (i.e. about the Universe, prehistory, sports...)				
Fiction books on paper (tales or novels that tell a story about some characters)				
Comic books on paper (also mangas or graphic novels)				
Magazines on paper				
Books on tablet or e-book				
On the Internet, to look for things that interest me (i.e. a song's lyrics, a cooking recipe, e-news, timetables...)				
On the Internet, to communicate with other people (i.e. WhatsApp, Instagram, Discord, Skype)				
On the Internet, to receive and send emails (e-mails) to relatives or friends				

Academic reading frequency scale

How many times do you do the following activities outside of school? This time, we ask about what you read on paper or on the computer (or tablet) because it has been sent at school as homework or as a task to do at home. (Select your answer with an X).

<i>I read because my teacher asks me to...</i>	Never or almost never	Once or twice a month	Once or twice a week	Every or almost every day
Fiction books on paper (tales, comics, novels that tell a story about some characters)				
Text books (the ones from the subjects)				
Worksheets from class				
Activities from my notebook				
Text books (the ones from the subjects) in tablet or e-book				
On the Internet, to look for information to do my homework (i.e. use an online dictionary, check webpages like Wikipedia...)				
On the Internet, to look for information that helps to understand better a topic (i.e. explanations in educational webpages or YouTube)				
On the Internet, to receive and send emails (e-mails) to teachers or classmates				

Instrumento Multidimensional de Hábitos Lectores para estudiantes de educación primaria (original en español)

Frecuencia lectora por ocio

¿Cuántas veces realizas las siguientes actividades de lectura fuera del colegio (en casa, en la biblioteca, en casa de algún familiar)? Te preguntamos sobre lo que lees en papel o en el ordenador (o tablet) porque te gusta y te apetece hacerlo, siempre que no sea en el colegio.

<i>Leo porque lo decido yo (por diversión)...</i>	Nunca o casi nunca	Una o dos veces al mes	Una o dos veces a la semana	Todos o casi todos los días
Libros en papel de temas que me interesan (por ejemplo, sobre el Universo, la prehistoria, deportes...)				
Libros de ficción en papel (cuentos o novelas que cuentan historias sobre personajes)				
Cómics en papel (también mangas o novelas gráficas)				
Revistas en papel				
Libros en la Tablet o E-book				
En Internet, para buscar cosas que me interesan (por ejemplo: la letra de una canción, una receta de cocina, noticias, horarios)				
En internet, para comunicarme con otras personas (por ejemplo: WhatsApp, Instagram, Discord, Skype)				
En internet, para recibir y mandar emails (correos electrónicos) a mis amigos/as o familiares				

Frecuencia lectora académica

¿Cuántas veces realizas las siguientes actividades fuera del colegio? Esta vez, te preguntamos sobre lo que lees en papel o en el ordenador (o tablet) porque te lo han mandado en el colegio como deberes o como una tarea para realizar en casa.

<i>Leo porque me lo mandan mis profesores...</i>	Nunca o casi nunca	Una o dos veces al mes	Una o dos veces a la semana	Todos o casi todos los días
Libros de ficción en papel (cuentos, comics o novelas que cuentan historias sobre personajes)				
Libros de texto en papel (los de las asignaturas)				
Fichas de actividades que hemos hecho en clase				
Ejercicios de mi libreta				
Libros de texto (los de las asignaturas) en la Tablet o E-book				
En internet, para buscar información para hacer los deberes (por ejemplo, utilizar el diccionario online o páginas como Wikipedia)				
En internet, para buscar información que me ayude a entender mejor un tema (por ejemplo, explicaciones en páginas educativas o Youtube)				
En internet, para recibir y mandar emails (correos electrónicos) a profesores o compañeros/as de clase				

