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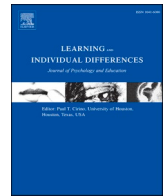
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Developmental leisure reading profiles and their association with reading skills across Grades 1–9

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ABSTRACT

This study examined the developmental profiles of different leisure reading habits and their association with reading fluency and comprehension in 2525 Finnish students from Grade 1 to 9. Four profiles were identified based on the reading frequency of different materials: Comics readers, Online readers, Book readers and Non-readers. Profile differences in leisure reading emerged early, although leisure reading levels changed. Boys were over-represented in the Comics readers and Non-readers, while girls were over-represented in the Online readers and Book readers. Book readers showed the highest level of reading skills, though Comics readers were also above-average readers. Among Online readers, girls had above average skills in reading while boys had below-average skills. Non-readers, especially boys, had the poorest reading skills. The study highlights the emergence of early onset individual differences in leisure reading habits and an association between different kinds of active leisure reading and reading development across grades.

The educational relevance and implications statement: Leisure reading is important as it can contribute to the evolution of a positive or negative cycle of reading development. Our study aimed to identify different leisure reading habits and their development and how these habits connect to reading skills. Our study revealed that there are different leisure reading profiles and that differences in these profiles emerge early. Our results indicate that although active book reading is associated with the best reading skills, other kinds of active reading also connect to above-average reading skills. Passivity in leisure reading is related to the poorest skills in reading. On the basis of these results, besides book reading, the reading of lighter materials like magazines, newspapers and comics, deserves to be encouraged. This kind of reading is connected to above-average skills and is popular especially among boys, who are at higher risk of ending up as passive leisure readers. Additionally, it might be important to target the reading motivation actions of children before they reach primary school age in the home and kindergarten settings to enhance the adoption of beneficial leisure reading habits before these are established.

1. Introduction

There is established evidence that more frequent leisure reading is related to better skills in reading (Mol & Bus, 2011; Schiefele et al., 2012; Stanovich, 1986). As the association between leisure reading and reading skills seems to be reciprocal (Torppa et al., 2020; van Bergen et al., 2020), potentially contributing to an evolving positive or negative cycle for reading development, it is of interest to examine how leisure reading habits develop. Leisure reading can encompass a wide range of

materials, including books, magazines, comics and online texts. Most of the studies on leisure reading have focused on book reading, although the textual environment of today is versatile. While some studies have also included leisure reading materials other than books, they usually examined only the correlations between the different types of reading materials and reading skills, like Torppa et al. (2020), that used the same data as this study, and McGeown et al. (2015, 2016). Correlations provide information on linear associations between each type of reading material and reading skills, but they do not take into account the

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individual variation and possible subgroups in leisure reading habits. As people read various types of materials at differing amounts, focusing separately on each type cannot fully reveal the associations between the variable leisure reading activities and reading skills of individuals and their development over time. To examine if the leisure reading profiles of those reading different materials are associated with reading skills, a person-oriented approach is necessary. Analyses using a person-oriented focus take into account the potential for heterogeneity among individuals and seek to identify groups that show different combinations, profiles or patterns of values in different variables (Bergman & Andersson, 2010). Regarding leisure reading, such analysis means identifying individuals who exhibit different patterns with respect to types of materials they typically or most frequently read.

Few studies have identified leisure reading profiles and associated the profiles with reading skills (Leino et al., 2004; Organization for Economic Co-operation and Development [OECD], 2002; Pfof et al., 2013; Sirén et al., 2018). In the present study, we extend the prior studies by using longitudinal data across Grades 1 to 9 (from age seven to 15) to examine both leisure reading and reading skills. This approach enables us to study the change or stability of leisure reading habits and analyse whether the individuals with different developmental leisure reading profiles differ in reading skill development.

By utilising longitudinal data with frequencies of time spent in reading of different reading materials, our study provides a more comprehensive understanding of the development of leisure reading. In addition, we broaden the scope of prior person-oriented studies by including the measures of reading fluency in the analyses and delving deeper into the relation between leisure reading and reading comprehension by utilising PISA reading tasks (OECD, 2019). The latter tasks allow us to examine the associations of leisure reading profiles and the various elements of reading comprehension, including retrieval, integration, interpretation and evaluation of information. Finally, we study possible gender effects based on literature indicating that both reading skills (e.g. OECD, 2013, 2016) and leisure reading (e.g. McGeown et al., 2016; Mol & Jolles, 2014; Nippold et al., 2005) are reported to have gender differences.

1.1. Development of leisure reading habits

Leisure reading has been reported to remain either at a stable level or increase during the first school years (Kirby et al., 2011; Teravainen-Goff & Clark, 2019) and then decline towards adolescence (Clark & Teravainen, 2017; Kush & Watkins, 1996; McKenna et al., 1995; Miyamoto et al., 2020). On average, leisure reading material preferences seem to change during childhood and adolescence; younger children read more comics (McGeown et al., 2016) and books (Teravainen-Goff & Clark, 2019), whereas adolescents read more online materials (McGeown et al., 2016; Pitcher et al., 2007; Teravainen-Goff & Clark, 2019).

In their longitudinal study, Lee et al. (2010) reported significant correlations between earlier and later leisure reading assessments using a five-year interval in three age groups of children and adolescents, suggesting significant individual stability across time. However, the correlations between subsequent assessments were not high, thus leaving room for changes over time. Some studies have suggested that changes in leisure reading might not be similar for all children, and steeper reading motivation declines have been reported among poor readers (McKenna et al., 1995) and boys (Miyamoto et al., 2020). However, an open question remains: are leisure reading preferences manifested through developmentally distinct profiles across age (e.g., stable or changing trajectories)? While it might be unlikely for changes to be highly similar for all individuals, this question sparks our exploration into the potential diversity of trajectories and sheds light on the need for a comprehensive investigation.

1.2. Associations between leisure reading and reading skills

In previous studies concerning the association between leisure reading and reading skills, the focus has typically been on book reading. There is robust evidence indicating that a higher frequency of reported leisure reading of books is associated with better reading fluency (Torppa et al., 2020; Mol & Bus, 2011; van Bergen et al., 2018) and reading comprehension (Torppa et al., 2020; Leino et al., 2017; McGeown et al., 2015, 2016; Pfof et al., 2013; Spear-Swerling et al., 2010). Book reading has also been shown to predict improvements in reading comprehension over time (Torppa et al., 2020; Pfof et al., 2013), with books comprising the only reading material that is associated with higher level, inferential reading comprehension (Duncan et al., 2015).

In addition to books, it is likewise important to consider other types of leisure reading materials to represent better the authentic leisure time reading experiences of children and youth. Pfof et al. (2013) reported that in addition to leisure reading of novels, reading of expository books correlates significantly, albeit weakly, with reading comprehension. Reading of magazines and newspapers has also been shown in some studies to correlate—although weaker—with reading comprehension (Torppa et al., 2020; Pfof et al., 2013). When it comes to comics, the results are inconsistent. In findings by Pfof et al. (2013) on 13-year-old adolescents and by McGeown et al. (2016) on children aged 8–10, no significant correlation was found between reading comprehension and reading of comics. However, in the study by Torppa et al. (2020) on adolescents aged 12–15 years, in which newspapers and comics reading were used as a combined category, a significant correlation was found with reading comprehension.

The results regarding the association between online reading and (print) reading comprehension are also inconsistent. Some studies have reported a negative association between reading comprehension and online reading (Torppa et al., 2020; McGeown et al., 2016; Pfof et al., 2013), whereas others have found a positive association (Jackson et al., 2011; OECD, 2010; Smith & Smith, 2010). In their person-oriented cross-sectional study on the leisure reading profiles of adolescents, Sirén et al. (2018) reported that the students who engaged particularly actively in online reading had average reading comprehension. However, it is possible that the association between online leisure reading and reading skills may not be linear. In the context of the PISA reading assessment (OECD, 2011), very frequent online reading was reported to be associated with poor reading comprehension, but moderate levels of online reading were associated with good reading comprehension.

It can be hypothesised that reading different types of materials has different associations with reading comprehension, because text types differ in the levels of processing they demand from the reader depending on, for example, the length and quality of the text. Preferring to read particular materials habitually could then eventually have an influence on the developing skills of the individual. According to the ‘shallowing hypothesis’, most online reading materials demand only shallow processing as these tend to have rather low linguistic qualities compared to traditional print reading; this is why they may correlate negatively with reading skills (Annisette & Lafreniere, 2017; Carr, 2010). It is important to note, however, that the context being in an online or digital format may not be the key issue but rather the type of the material being read online or in digital format. In Pfof et al.'s (2013) study, the findings varied according to what kind of material was being read online or in digital format. Spending a lot of time reading e-mails, blogs, online forum posts and chats had a negative correlation with the development of reading comprehension. By contrast, using online encyclopaedias was not correlated with reading comprehension. These kinds of results have been corroborated by similar findings by McGeown et al. (2016) and Wu and Peng (2017).

1.3. Person-oriented studies examining the relation between leisure reading and reading skills

Previous studies on the association between leisure reading and reading skills have mainly been variable-oriented. To our knowledge, only four previous studies have examined the leisure reading profiles of individuals and their connection to reading skills (Leino et al., 2004; OECD, 2002; Pfof et al., 2013; Sirén et al., 2018). The studies by Leino et al. (2004) and OECD (2002) used data from the PISA study collected in 2000, which did not include online reading (OECD, 2002) or the online reading habits differed significantly from those typical of current online environments (Leino et al., 2004). Hence, we focus on the findings of the two more recent studies by Sirén et al. (2018) and Pfof et al. (2013) which are relevant to the present study.

Pfof et al. (2013) used latent profile analysis (LPA) to identify leisure reading subgroups among Grade 7 students (age 13) and found five subgroups. Highly engaged readers (3.6 %) read all kinds of texts (print and online) in high quantities and frequently. Online readers (19.4 %) read classic print media but especially frequent was their use of new media like chats, blogs and e-mail. Moderate print and online readers (34.4 %) read all kinds of materials but not as much as the highly engaged readers. Traditional print readers (18.5 %) frequently read fiction and nonfiction books, in particular comics, but they did only very little online reading. Print-avoidant readers (24.1 %) read the least, especially classic print media, and with regard to online media, they especially read blogs and chats.

Using a cluster analysis of the literacy assessment data of 15-year-olds in the Finnish PISA, Sirén et al. (2018) identified seven groups based on leisure reading: active fiction book readers (8 %), newspaper and fiction book readers (18 %), moderately active versified media users (8 %), book avoiding magazines and news readers (16 %), online readers (11 %), comic readers (25 %) and non-readers (14 %).

Both Pfof et al. (2013) and Sirén et al. (2018) compared the reading comprehension scores of their identified leisure reading groups. In both studies, the adolescents who were active fiction book readers were also good comprehenders, whereas the non-active readers were poor comprehenders. Groups that engaged in moderate and diverse reading (including both print and online reading) had moderately good or average reading comprehension. Regarding the groups for which online reading was particularly voluminous, results were mixed. In the study by Pfof et al. (2013), online readers showed poor reading comprehension skills, whereas in the study by Sirén et al. (2018), online readers demonstrated average reading comprehension skills.

1.4. Gender differences in leisure reading and reading skills

Both reading skills and reading habits are reported to show gender differences. Better reading skills are documented for girls than for boys (e.g. Manu et al., 2020, 2023; OECD, 2016; Quinn & Wagner, 2015). Boys are also repeatedly found to read less (Mol & Jolles, 2014; Nippold et al., 2005). When it comes to different reading materials, girls more often read fiction (Coles & Hall, 2002; McGeown et al., 2015, 2016) and online materials (Duncan et al., 2015), while boys more often read comics (Coles & Hall, 2002; Duncan et al., 2015; McGeown et al., 2016; Spear-Swerling et al., 2010), newspapers and expository books (Coles & Hall, 2002; McGeown et al., 2016; Spear-Swerling et al., 2010).

As boys and girls prefer different genres and their reading skills are different, it is possible that a connection between the choice of preferred reading material and skill level is due to the gender differences in skills and not the reading materials themselves. Therefore, when examining the association between leisure reading and reading skills, it is important to examine the effect of gender on the results.

1.5. The present study

This study aims to identify different developmental profiles of leisure

reading based on the reading frequency of different reading materials in Grades 1–9 (from age seven to 15) and whether these profiles are related to the development of reading fluency and comprehension skills across the grades by taking into account the possible gender effect.

Our research questions are as follows:

- 1) What kind of developmental leisure reading profiles can be identified based on the frequency of reading different reading materials in Grades 1–9?
 - a. How do the profiles differ in terms of the criterion variables, group sizes, change or stability of reading habits and gender ratio?
- 2) To what extent do the developmental leisure reading profiles differ in reading fluency and comprehension development in Grades 1–9?
 - a. Are the associations of the profile groups with reading skills similar among boys and girls?

2. Method

2.1. Participants

The participants ($n = 2525$) were born in 2000 and followed up from kindergarten to Grade 9. In this study, we included data from seven timepoints collected between Grade 1 (age seven) and Grade 9 (age 15) (i.e. Grades 1–4, 6, 7 and 9). The data is a part of a larger longitudinal follow-up project, The First Steps Study (Lerkkanen et al., 2006–2016), from four municipalities located in different parts of [COUNTRY]. Three of these municipalities included the whole age cohort, and one municipality half of the age cohort. Informed written consent for participation was received from the children's parents and, at later ages, from each participant. The study has been reviewed and approved by the Ethical Board of the University of Jyväskylä in 2006.

2.2. Measures

2.2.1. Leisure reading

Parents reported on the leisure time reading activity of their child in Grades 1–4 (age seven to ten). We used three items to assess the frequency of reading: a) comics or children's magazines, b) children's fiction books and c) expository books. The questions were adapted based on those used previously by Sénéchal et al. (1998). Ratings were given on a five-point Likert scale (1 = *not at all or rarely*, 2 = *once or twice a week*, 3 = *many times a week*, 4 = *once a day*, 5 = *several times a day*). Cronbach's alpha coefficients indicating internal consistency are listed in Table 1.

In Grades 6, 7 and 9 (age 12 to 15), *leisure reading frequency* was assessed via students' self-report, with items tapping reading frequency of different reading materials based on a survey of adolescents' reading materials (Luukka et al., 2008). The items were: a) expository books, b) comics, c) teen magazines, d) newspapers, e) tabloids, f) magazines, g) fiction books, children's or adolescent's novels or novels, h) e-mail, i) blogs, j) messages or comments on internet forums, and k) Newsfeed on Facebook. Some reading materials had examples in parentheses. Ratings were given on a five-point Likert scale (1 = *never*, 2 = *monthly*, 3 = *once a week*, 4 = *few times in a week*, 5 = *daily*).

Table 1

Cronbach's alphas for measures of leisure reading, reading fluency and reading comprehension across grades 1–9.

	Gr 1	Gr 2	Gr 3	Gr 4	Gr 6	Gr 7	Gr 9
Leisure reading	0.81	0.79	0.79	0.75			
Reading fluency	0.81	0.78	0.79	0.80	0.77	0.84	0.82
Reading comprehension:	0.69	0.75	0.66	0.67	0.66	0.68	0.63
Allu, Ykä							
Reading comprehension:							0.75
PISA							

2.2.2. Reading fluency

Three group-administered tests were used to assess reading fluency: a sentence reading task, a word-reading fluency task and a word-chain task. Composite scores of the three tasks were computed at each time-point by first calculating the within-age z-score and then computing a mean of the three z-scores. Cronbach's alphas for the reading fluency composite are listed in [Table 1](#).

The word-reading fluency task used in Grades 1–6 (age seven to 12) is a subtest of the nationally normed reading test battery (ALLU; [Lindeman, 2000](#)). Each of the 80 items consisted of a picture with four phonologically similar words attached to it. The child silently read the four words and then drew a line connecting the picture with the word, semantically matching it. The score was the number of correct answers within a 2-minute time limit. In our sample, the Pearson correlation coefficients between subsequent timepoints varied between 0.62 (Grades 4 and 6) and 0.73 (Grades 3 and 4). A similarly structured word reading fluency task with phonologically more difficult words was used in Grades 7 and 9 (age 13 and 15) (YKÄ test, [Lerkkanen et al., 2018](#)).

The Test of Silent Reading Efficiency and Comprehension (TOSREC; [Wagner et al., 2010](#); Finnish version by [Lerkkanen et al., 2008](#)) was used to assess silent reading efficiency in Grades 1–4. Respondents were given 3 min to read 60 sentences (e.g. Strawberries are blue) and verify the truthfulness of as many of the sentences as possible. In Grade 6, a similar task was used, called the Salzburger Lese-Screening Test ([Mayringer & Wimmer, 2003](#)) which is similar to the Woodcock–Johnson sentence verification task ([Woodcock et al., 2001](#)), where respondents were given 2 min to read sentences and verify the truthfulness of as many of the 69 sentences as possible. In Grades 7 and 9, a standardized Finnish reading test for lower secondary school sentence reading task with similar but different items and the same instruction (YKÄ; [Lerkkanen et al., 2018](#)) was used. In YKÄ, the respondents were given 2 min to read 70 sentences and verify the truthfulness of as many of the sentences as possible. The outcome score in all tasks was the amount of correct answers given within the time limit. All three tests had the same aim and same instruction, the items were similar, though not identical, and the number of items varied slightly. Correlations between the different tests were in the same range as the stability correlates within tests, suggesting that the same skill was assessed despite changes in test items. In Grades 1–4, the stability correlations were between 0.60 (between Grades 1 and 4) and 0.73 (between Grades 3 and 4), and between Grades 7 and 9, the stability correlation was 0.69. Between the Grade 4 TOSREC and Grade 6 Salzburg test, the correlation was 0.68, and between the Grade 4 TOSREC and Grade 7 YKÄ test, the correlation was 0.62. The correlation between the Grade 6 Salzburg test and Grade 7 YKÄ test correlation was also 0.62.

The word-chain task ([Nevala & Lyytinen, 2000](#)) was a timed test that required participants to indicate as many word boundaries as they could in the given time limit. There were 10 rows of word chains on a sheet, and the word chains comprised four to six words written together. The task was to silently read the word chains and, while reading them, indicate the word boundaries by drawing a division line between them. The score was the number of correct responses (max. = 40) within the time limit (1 min 25 s in Grades 1 and 2, 1 min 20 s in Grade 3, 1 min 5 s in Grade 4, 1 min in Grades 6 and 7 and 1 min 30 s in Grade 9). In our sample, the Pearson correlation coefficients between subsequent timepoints varied between 0.51 (Grades 1 and 2) and 0.71 (Grades 7 and 9).

2.2.3. Reading comprehension

A group-administered subtest of the nationally normed reading test battery (ALLU; [Lindeman, 2000](#)) was used to assess reading comprehension in Grades 1–6 (age seven to 12). The participants silently read an expository text and then answered 11 multiple-choice questions and one question in which they had to arrange five statements in the correct sequence based on the information from the text. The questions mainly required the retrieval of information or its integration, but some items required making inferences, reflecting on and evaluating information.

One point was allotted for each correct answer (max. = 12). In Grades 7 and 9 (age 13 to 15), a similar standardized test that was developed for lower secondary grade levels (YKÄ; [Lerkkanen et al., 2018](#)) was used. All tests had the same aim, same instruction and the same number of multiple-choice tasks; only the texts and items differed. Each participant completed the task at their own pace, but the maximum time was 45 min. Kuder–Richardson reliabilities reported in the test manual were 0.85 in Grade 1, 0.80 in Grade 2 and 0.75 in Grade 3. Revelle's omega reliabilities were 0.82 in Grade 4, 0.78 in Grade 6, 0.81 in Grade 7 and 0.78 in Grade 9. Cronbach's alphas are listed in [Table 1](#).

Reading comprehension in Grade 9 was also evaluated with PISA reading tasks. The students had 60 min to complete the battery of reading tasks. The tasks included eight texts which students were asked to read and then answer questions. The reading materials consisted of texts, tables, graphs and figures. There were 15 multiple-choice questions and 16 questions that required written responses. Of the questions, 12 required the students to access and retrieve information, 12 to integrate and interpret information and 7 to reflect and evaluate information. The total score was calculated by adding up the item scores (1 point given for each correct response). The maximum score was 31. The Cronbach's alpha reliability coefficient was 0.75.

2.3. Analysis

LPA was used to identify groups with similar leisure reading profiles in Mplus 8.7 ([Muthén & Muthén, 1998–2021](#)). The method is used to identify groups of individuals that share similar characteristics with one another based on their responses to multiple indicators ([Jung & Wickrama, 2008](#)). For the present study, the number of profiles that could be expected was unknown, and so we used an exploratory method to determine the optimal number of profiles ([Muthén & Muthén, 1998–2021](#)). The best-fitting model was identified by testing and comparing six latent profile solutions, each testing a different number of profiles (1 through 6). The optimal number of latent profiles was decided using the Akaike information criterion (AIC), Bayesian information criterion (BIC), adjusted Bayesian information criterion (aBIC), Vuong–Lo–Mendell–Rubin (VLMR) test and adjusted Lo–Mendell–Rubin (LMR) likelihood ratio tests. In addition, the classification quality, entropy value and usefulness and interpretability of the latent classes were considered. To ensure the validity of each profile, we used 500 starting values, as a large set of random starting values is recommended ([Asparouhov & Muthén, 2008](#)).

One-way analysis of variance (ANOVA) was conducted to describe the emergent profiles by comparing them in terms of the criterion variables (leisure reading measures). A two-way ANOVA was also conducted to examine the interaction effect of gender and leisure reading profile membership on reading skills. Finally, due to the statistically significant interaction between the effects of gender and leisure reading profile membership on reading skills, one-way ANOVAs were conducted separately for boys and girls when comparing profiles in reading skills. For post hoc-test, Bonferroni was used for group comparisons in the measures with equal variances, and Dunnett's T3 was employed for those without equal variances. ANOVAs were conducted using SPSS (version 26).

3. Results

3.1. Descriptive statistics

Descriptive statistics of leisure reading, reading fluency and reading comprehension are reported in [Appendix Tables A](#) (total sample) and [B](#) (boys and girls separately).

3.2. Leisure reading profiles across Grades 1–9

LPA was conducted to identify leisure reading profiles across Grades

1–9 (age seven to 15). Six latent profile solutions were tested and compared, each with a different number of profiles (1 through 6; Table 2). The model with four profiles was considered the best-fitting solution because the VLMR and LMR suggested that the four-profile solution was better than the five-profile solution and that the solutions from five profiles onwards were not better than the solutions with fewer profile groups. In addition, the values of aBIC and AIC did not diminish much after the four-profile solution. The average latent class probabilities for most likely latent profile membership were high: 0.90 for profile 1, 0.89 for profile 2, 0.92 for profile 3 and 0.92 for profile 4. ANOVA comparisons of the leisure reading measures between the profiles (Fig. 1, Appendix Table C) suggested that the profiles were distinct, as profiles differed from each other significantly, which provided validation for the existence of the profiles. Fig. 1 and table in Appendix C describe the four identified profiles, and Table 3 summarizes the characteristics of the profiles. Profiles are also presented in additional heatmap figure in Appendix D.

The first profile, Comics readers, included 31 % of the participants (N = 726). The most prominent feature of those belonging to this profile was their frequent reading of comics across Grades 1–9. Those belonging to this profile were also rather active readers of newspapers and tabloids and average readers of online sources, but because comics reading was the most clearly differentiating factor, the profile was named Comics readers. Their reading of fiction books was not frequent; they read fiction books less than Online and Book readers but more than Non-readers.

The second profile, Online readers, included 19 % (N = 443) of the participants. Online readers were particularly active readers of various online texts: blogs, e-mails, internet forums and newsfeed on Facebook. Moreover, they read tabloids, magazines, and teen magazines more often than did members of the other profiles. However, this profile was named “Online readers” because online reading most clearly differentiates it from other profiles. During their primary school years (Grades 1–6), the participants belonging to this profile were also avid readers of fiction books and comics. However, as they grew older (Grades 6–9), their reading of fiction declined, yet they remained more active compared to the Comics readers or Non-readers.

The third profile, Non-readers, included 37 % of the participants (N = 865). They were characterized by the least active leisure reading compared to the other profiles across Grades 1–9. In Grades 1–4, they rarely read any fiction books but did not report a total absence of leisure reading; they read comics and children’s magazines on a weekly basis. As the members of this profile group progressed through Grades 6 to 9, their reading habits became even more limited and they never, or at most only monthly, read fiction books, magazines, expository books, comics (with the exception of the 6th grade) or blogs. Their reading frequency of tabloids and online reading was at a slightly higher level, especially reading newsfeed on Facebook.

The fourth profile, Book readers, encompassed 14 % of the participants (N = 337). Even though the participants belonging to this profile were engaging with various types of reading materials in addition to books, we named this profile as “Book readers” to highlight the book reading was the most clearly differentiating factor for this group. Across

Grades 1–9, the participants belonging to this profile read books frequently, on average many times per week. Across the grades, these participants did not experience as sharp a decrease in the frequency of fiction book reading as did participants of the other profiles. In addition to fiction books, they were more often reading expository books in Grades 1–4. In Grades 6–9, they were the most active readers of fiction books and expository books. They also read comics and teen magazines quite often. Their frequency of reading online was average, but they were the least active profile in reading the newsfeed on Facebook.

From the developmental point of view, among all profiles, the frequency of reading of all reading material types increased between Grades 1 and 4, except for expository book reading among Non-readers. From Grade 6 to 9 leisure reading frequency declined among all profiles for fiction books, comics and teen magazines. In addition, most of the profiles showed a decrease in the reading frequency of expository books, magazines and newsfeed on Facebook. The reading frequency of tabloids increased among all profiles between Grades 6 and 9, and most of the profiles showed no changes in reading frequency of newspapers and e-mails. Reading of blogs and internet forums distinguished between the profiles; among some profiles, the frequency of their reading increased, while among some profiles, this frequency decreased.

The profiles’ order in the frequency of reading different reading materials remained the same (with the exception of Internet forums) across the school years, suggesting that despite the general changes that concerned all profiles, the profiles differed from one another across the years from Grade 1 to 9 in a stable fashion.

3.3. Are the associations of the profile groups with reading skills similar among boys and girls?

The number of boys and girls differed in the leisure reading profiles ($\chi^2(3) = 715.724, p < .001$). Girls were over-represented in the profiles of Online readers and Book readers, whereas the boys were over-represented in the profiles of Comics readers and Non-readers (Table 4). Therefore, we first examined the gender \times profile interaction effect on reading skills. To this end, two-way ANOVAs were conducted separately for each grade for reading fluency and comprehension.

There was statistically significant gender \times profile interaction effects on reading fluency on four grade levels: Grade 2 ($F(3) = 2.862, p = .036$), Grade 3 ($F(3) = 2.633, p = .048$), Grade 4 ($F(3) = 3.395, p = .017$) and Grade 9 ($F(3) = 4.207, p = .006$). For reading comprehension, there were statistically significant gender \times profile interaction effects on six grade levels (all except for Grade 7): Grade 1 ($F(3) = 3.904, p = .009$), Grade 2 ($F(3) = 3.771, p = .01$), Grade 3 ($F(3) = 3.390, p = .017$), Grade 4 ($F(3) = 5.811, p = .001$), Grade 6 ($F(3) = 4.424, p = .004$) and Grade 9 ($F(3) = 4.169, p = .006$). For PISA reading, there was also significant gender \times profile interaction effect ($F(3) = 7.049, p = .000$). These results indicated that in most grades the association between profile membership and reading skills was different for boys and girls. To better understand what the interactions mean, we next compared the developmental leisure reading profiles in reading skills separately among boys and girls.

Table 2
Fit indicators for latent profile analysis.

No. of profiles	BIC	aBIC	AIC	Entropy	LMR	VLMR	n (profile 1)	n (profile 2)	n (profile 3)	n (profile 4)	n (profile 5)	n (profile 6)
1	209,845.26	209,559.31	209,325.86				2371					
2	204,195.99	203,763.89	203,411.12	0.82	0	0	1507	864				
3	201,240.11	200,661.85	200,189.77	0.82	0.00	0.00	1038	749	584			
4	199,614.14	198,889.74	198,298.34	0.83	0.03	0.03	726	443	865	337		
5	198,665.00	197,794.45	197,083.73	0.84	0.19	0.19	808	714	395	245	209	
6	197,827.81	196,811.10	195,981.07	0.82	0.32	0.32	508	728	312	242	400	181

Note. BIC = Bayesian information criterion; aBIC = adjusted BIC; AIC = Akaike information criterion; LMR = Lo–Mendell–Rubin adjusted likelihood ratio test; VLMR = Vuong–Lo–Mendell–Rubin likelihood ratio test.

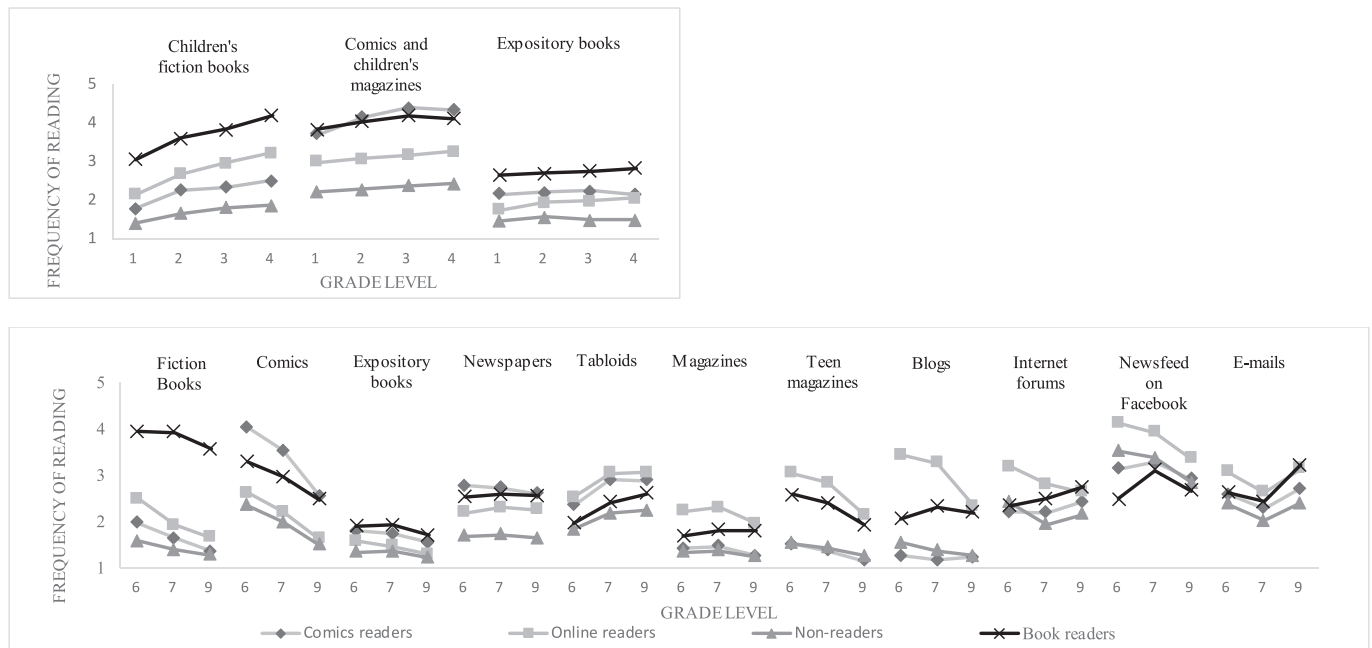


Fig. 1. Profile differences in frequency of reading different reading materials: parental reports in Grades 1–4 and self-reports from Grades 6–9. Note. Upper panel: Values in vertical axis (gr 1–4): 1 = Not at all or rarely, 2 = Once or twice a week, 3 = Many times a week, 4 = Once a day, 5 = Many times a day. Lower panel (gr. 6–9): Values in vertical axis: 1 = Never, 2 = Monthly, 3 = Once a week, 4 = Few times a week, 5 = Daily.

Table 3
The summary of findings about leisure reading profiles and gender ratio.

	Most prominent features: Active in the reading of...	Gender ratio	
		Girls	Boys
Comics readers	Comics, newspapers, tabloids	17.8 %	82.2 %
Online readers	Blogs, internet forums, e-mails, newsfeed on Facebook; magazines; fiction books	88.0 %	11.6 %
Non-readers	Low activity in all kinds of reading	40.2 %	59.8 %
Book readers	Fiction books, expository books, newspapers, comics	80.3 %	19.7 %

Note. C = Comics readers, O = Online readers, N = Non-readers, B = Book readers.

3.4. Profiles differences in reading fluency among boys and girls

One-way ANOVAs were carried out to examine, how the profiles differed in reading fluency in grades 1–9. The analysis suggested differences between the developmental leisure reading profiles in reading fluency among boys and girls (Table 5, Fig. 2). Effect sizes were calculated for all comparisons (Appendix Table E), because of the large number of participants, and they confirmed the findings from the ANOVA pairwise comparisons.

These comparisons showed that Book readers were the most fluent readers among boys and girls across grades. Among girls, Book readers were more fluent readers than all other profiles, except in Grades 3 and

Table 4
The prevalence of girls and boys in the developmental leisure reading profiles.

	Comics readers			Online readers			Non-readers			Book readers			
	n	%	Adj. res.	n	%	Adj. res.	n	%	Adj. res.	n	%	Adj. res.	
Girls	129	17.8	−19.6	390	88.0	18.8	347	40.2	−5.7	269	80.3	12.8	100
		11.4			34.4			30.6			23.7		
Boys	597	82.2	19.6	51	11.6	−18.8	516	59.8	5.7	66	19.7	−12.8	100
		48.5			4.1			42.0			4.4		
Total	726	100		441	100		863	100		335	100		

4, in which they did not differ from Online readers. Among boys, Book readers were more fluent readers than Online readers and Non-readers in all grades, but no differences in reading fluency were observed between the Book readers and Comics readers.

Non-readers were the least fluent readers across grades and genders. Among girls, Non-readers were significantly slower readers than all other profiles, except in Grades 4, 6 and 9, when they had similar reading fluency scores as the Comics readers. Among boys, Non-readers were slower readers than all other profiles in Grades 6, 7 and 9, but in Grades 1–4, they did not differ significantly from the Online readers.

Comics and Online readers did not differ from each other in reading fluency, neither among boys nor among girls.

3.5. Profile differences in reading comprehension among boys and girls

One-way ANOVAs were carried out to examine, how the profiles differed in reading comprehension in grades 1–9. The one-way ANOVAs suggested significant differences between the leisure reading profiles in reading comprehension for boys and girls (Table 6, Figs. 3 and 4). Effect sizes were calculated for all comparisons (Appendix Table E), because of the large number of participants, and they confirmed the findings from the ANOVA pairwise comparisons.

3.5.1. National battery (ALLU and YKÄ tests)

The comparisons showed that Book readers had the highest reading comprehension scores among boys and girls across grades. Among girls, Book readers were significantly better comprehenders than Online

Table 5
Profile differences by gender in reading fluency in grades 1–9.

		Comics readers (C)		Online readers (O)		Non-readers (N)		Book readers (B)		F	Pair comparisons <i>p</i> < .05
		<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>		
Grade 1	Girls	0.19 (0.78)	109	0.22 (0.88)	299	-0.19 (0.71)	284	0.47 (0.89)	218	28.01***	B > C, O, N O > N C > N
	Boys	0.13 (0.87)	481	-0.15 (0.88)	40	-0.40 (0.72)	427	0.36 (0.87)	56	37.66***	B > O, N C > N
Grade 2	Girls	0.15 (0.76)	106	0.24 (0.78)	299	-0.21 (0.79)	274	0.48 (0.82)	217	32.60***	B > C, O, N O > N C > N
	Boys	0.11 (0.82)	481	-0.26 (1.01)	38	-0.39 (0.75)	420	0.39 (0.92)	56	37.34***	B > O, N C > N
Grade 3	Girls	0.16 (0.78)	98	0.28 (0.80)	305	-0.16 (0.91)	275	0.44 (0.85)	216	25.14***	B > C, N O > N C > N
	Boys	0.06 (0.76)	480	-0.23 (0.92)	37	-0.42 (0.78)	419	0.37 (0.78)	56	34.09***	B > C, O, N C > N
Grade 4	Girls	0.11 (0.77)	95	0.28 (0.78)	301	-0.14 (0.92)	271	0.46 (0.78)	213	24.50***	B > C, N O > N
	Boys	0.08 (0.77)	479	-0.21 (0.98)	37	-0.44 (0.79)	409	0.36 (0.89)	54	36.73***	B > O, N C > N
Grade 6	Girls	0.21 (0.81)	85	0.26 (0.81)	330	-0.04 (0.77)	256	0.47 (0.77)	191	16.14***	B > O, N O > N
	Boys	-0.01 (0.80)	497	-0.06 (0.72)	34	-0.48 (0.75)	383	0.20 (0.91)	46	30.48***	N < B, C, O
Grade 7	Girls	0.16 (0.80)	78	0.26 (0.87)	322	-0.12 (0.81)	251	0.54 (0.76)	193	24.64***	B > C, O, N O > N C > N
	Boys	-0.01 (0.83)	493	-0.06 (0.84)	31	-0.51 (0.75)	355	0.39 (1.04)	46	33.73***	B > N C > N O > N
Grade 9	Girls	0.15 (0.88)	76	0.33 (0.81)	309	-0.02 (0.76)	235	0.54 (0.73)	191	18.22***	B > C, O, N O > N
	Boys	-0.03 (0.82)	483	-0.24 (0.89)	30	-0.59 (0.78)	348	0.25 (0.98)	45	38.37***	B > N C > N

Note. C = Comics readers, O = Online readers, N = Non-readers, B = Book readers. Pairwise comparisons executed with Bonferroni, but bolded ones with Dunnett's T3 test.

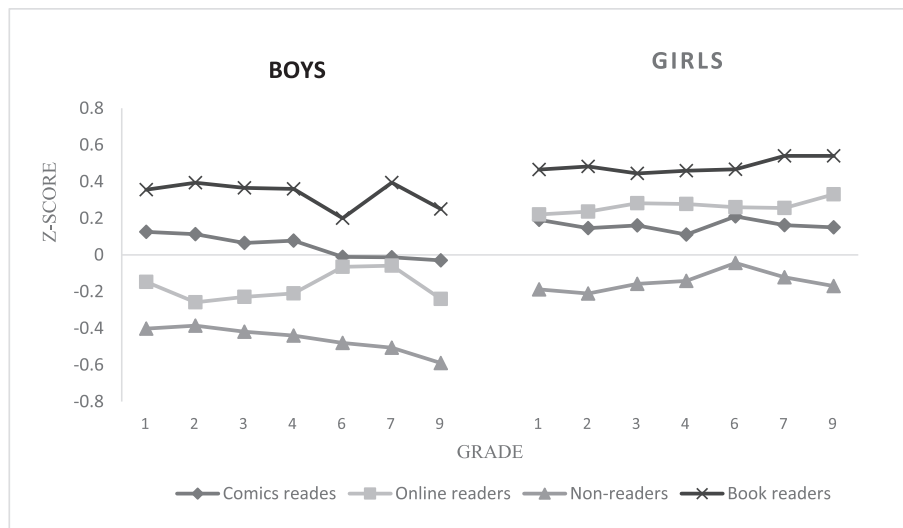


Fig. 2. Developmental leisure reading profile comparisons in reading fluency among boys and girls.

readers, Comics readers (except Grade 3) and Non-readers. Among boys, Book readers were better comprehenders than Online readers and Non-readers in all grades. Among boys, Book readers were better comprehenders than Comics readers in Grade 3 and from Grade 6 onwards.

Non-readers were among the poorest in reading comprehension across grades and genders. Among girls, Non-readers were poorer comprehenders than Online readers until Grade 4 and Book readers in all grades but were usually at the same level as Comics readers (except

Grades 2 and 3). Among boys, Non-readers were poorer comprehenders than Book readers and Comics readers, and Non-readers and Online readers were equally poor in reading comprehension.

For girls, there was no difference in reading comprehension between Comics and Online readers, but among boys, Comics readers were better comprehenders than Online readers in Grades 2, 4, 6 and 9.

Table 6
Profile differences by gender in reading comprehension (Allu, Ykä, PISA) in Grades 1–9.

		Comics readers		Online readers		Non-readers		Book readers		F	Pair comparisons <i>p</i> < .05
		<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>		
Grade 1	Girls	5.60 (2.99)	109	6.07 (2.98)	298	4.75 (2.72)	283	7.34 (3.04)	218	31.29***	B > C, O, N O > N
	Boys	6.19 (3.11)	476	5.15 (3.37)	40	4.11 (2.94)	423	6.84 (3.56)	55	40.99***	B > N C > N
Grade 2	Girls	8.95 (2.32)	105	8.97 (2.50)	292	8.11 (2.62)	271	10.17 (1.93)	212	26.48***	B > C, O, N O > N C > N
	Boys	8.97 (2.46)	476	7.39 (2.63)	38	7.30 (2.85)	411	9.64 (2.58)	55	39.37***	B > O, N C > O, N
Grade 3	Girls	9.54 (1.57)	98	9.48 (1.62)	305	8.96 (1.98)	271	10.09 (1.82)	215	12.15***	B > O, N O > N C > N
	Boys	9.27 (2.09)	479	8.27 (2.63)	37	8.11 (2.50)	418	10.02 (1.80)	56	31.29***	B > C, O, N C > N
Grade 4	Girls	8.47 (2.35)	95	8.54 (2.16)	301	7.87 (2.35)	268	9.69 (2.10)	213	24.80***	B > C, O, N O > N
	Boys	8.47 (2.25)	479	6.95 (1.99)	37	6.78 (2.60)	408	9.35 (2.43)	54	49.37***	B > O, N C > O, N
Grade 6	Girls	7.28 (2.33)	85	7.30 (2.45)	330	6.77 (2.34)	255	8.53 (2.04)	191	19.71***	B > C, O, N
	Boys	7.54 (2.50)	497	6.24 (2.37)	34	5.97 (2.57)	383	8.63 (2.34)	46	38.88***	B > C, O, N C > O, N
Grade 7	Girls	6.85 (2.65)	78	6.71 (2.23)	321	6.20 (2.38)	250	8.43 (2.28)	192	33.73***	B > C, O, N
	Boys	6.67 (2.55)	490	5.61 (1.99)	31	5.50 (2.41)	351	7.95 (2.27)	44	24.51***	B > C, O, N C > N
Grade 9	Girls	7.20 (2.45)	75	7.24 (2.35)	306	6.90 (2.13)	233	8.68 (2.07)	190	23.97***	B > C, O, N
	Boys	7.12 (2.36)	476	5.79 (2.43)	29	5.74 (2.26)	344	8.13 (2.36)	45	32.68***	B > C, O, N C > O, N
Grade 9, PISA total sum	Girls	20.32 (5.35)	70	21.63 (5.80)	277	19.70 (5.66)	214	24.34 (4.23)	171	22.33***	B > C, O, N O > N
	Boys	20.71 (5.64)	421	18.55 (5.67)	22	16.27 (6.48)	296	23.91 (5.50)	33	43.46***	B > C, O, N C > N
Items that require retrieval	Girls	5.00 (1.27)	70	5.13 (1.31)	277	4.86 (1.39)	214	5.62 (1.13)	171	10.26***	B > C, O, N
	Boys	5.06 (1.34)	421	4.45 (1.60)	22	4.13 (1.56)	296	5.55 (1.45)	33	31.26***	B > N C > N
Items that require interpretation	Girls	7.86 (2.78)	70	8.85 (2.81)	277	7.79 (2.74)	214	9.82 (2.49)	171	19.11***	B > C, O, N O > C, N
	Boys	8.58 (2.81)	421	7.64 (2.80)	22	6.82 (2.93)	296	9.61 (2.87)	33	27.12***	B > N C > N
Items that require evaluation	Girls	5.61 (2.17)	70	5.86 (2.38)	277	5.34 (2.33)	214	6.98 (1.68)	171	17.13***	B > C, O, N
	Boys	5.32 (2.33)	421	4.86 (2.49)	22	3.87 (2.50)	296	6.88 (1.93)	33	32.21***	B > C, O, N C > N

Note. C = Comics readers, O = Online readers, N = Non-readers, B = Book readers. *** *p* < .001. Bolded pairwise comparisons executed with Dunnett's T3 test, others with Bonferroni.

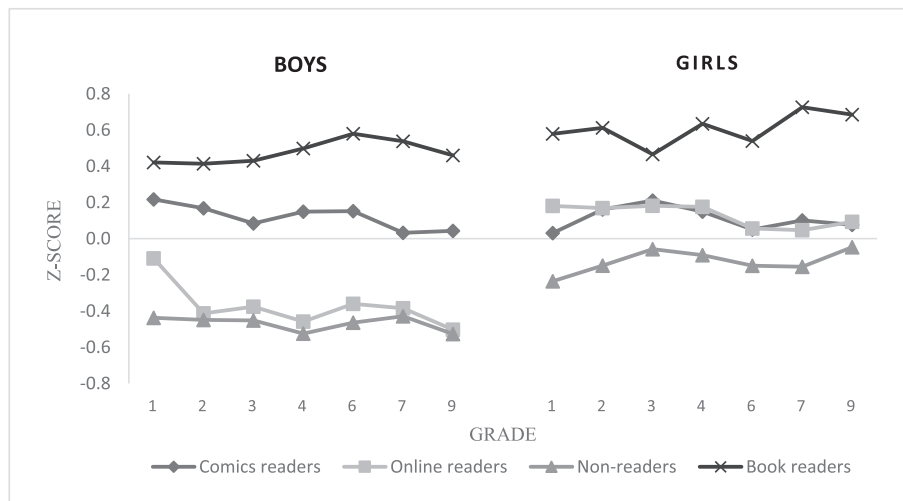


Fig. 3. Developmental leisure reading profile differences in reading comprehension among boys and girls.

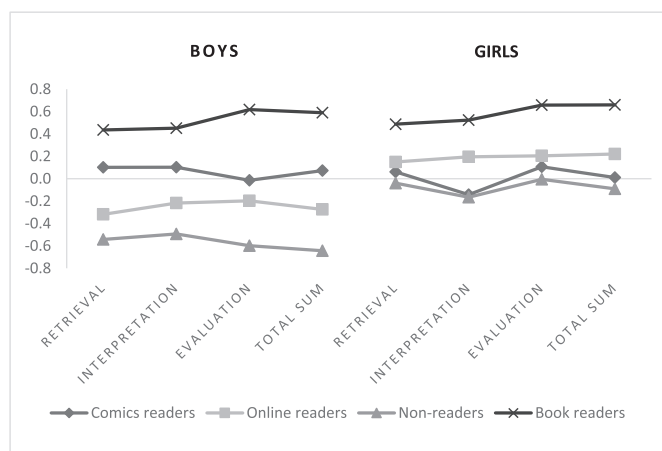


Fig. 4. Developmental leisure reading profile differences in PISA reading among boys and girls.

3.5.2. PISA reading assessment

In the total sum score of PISA reading tasks, Book readers had better scores than the other profiles among both genders. Among girls, Book readers scored better than the other profiles in both the total sum score and all the subscales, with the biggest effect sizes found in comparisons between Book readers and Online readers and Non-readers (Appendix E). Among boys, Book readers scored better than all the other profiles in both the total sum score and the evaluation subscale, but there was no difference between Book readers and Comics readers in the subscales of retrieval and interpretation. According to the effect sizes, the biggest differences among boys were between Book readers and the other profiles in the subscale of evaluation.

Among girls, Non-readers had poorer scores in the PISA total score than did Book readers and Online readers but not poorer than Comics readers. Among boys, Non-readers had poorer PISA total scores than did Book readers and Comics readers but not poorer than Online readers.

Online and Comics readers had similar scores among boys and girls, except for the PISA interpretation subscale among boys where Online readers scored better.

3.6. Gender differences in reading fluency and reading comprehension within the profiles

Lastly, we examined if, there were a statistically significant difference in reading skills between boys and girls within the different profiles. This is, were for example the Non-reader boys statistically significantly poorer in reading comprehension than the Non-reader girls.

We compared genders with ANOVA in reading fluency and reading comprehension within the leisure reading profiles (Appendix Tables F and G). Effect sizes were calculated for all comparisons (Appendix Table H), because of the large number of participants, and they confirmed the findings from ANOVA comparisons.

Within the profiles of Book readers and Comics readers, girls and boys had a similar level of reading fluency. Boys were less fluent readers than girls within the profiles of Online readers in Grades 2, 3, 4 and 9 and within Non-readers in all grades except from Grade 2.

In reading comprehension national batteries, girls and boys had a similar level of reading comprehension within the profiles of Book readers and Comics readers. Boys had poorer reading comprehension skills than girls within the profiles of Online readers in Grades 2, 3 and 4 and within Non-readers in all grades but Grade 1.

In PISA reading comprehension tasks, boys were poorer than girls only within the Non-readers profile.

4. Discussion

We set out to examine the development of leisure reading habits from the early phases of reading acquisition to adolescence between Grades 1 and 9 (age seven to 15). Of interest was to find out whether leisure reading of different types of reading materials forms developmental profiles that are linked to gender differences and have associations with one's reading skills in the domains of reading fluency and comprehension. We included a comprehensive set of types of leisure reading materials in our measurement battery with the aim to capture the development of the actual leisure reading habits of children and adolescents. Furthermore, a person-oriented approach was used to examine leisure reading profiles in order to overcome the caveats of correlational approaches. The results indicated that distinct developmental leisure reading profiles could be identified, which further differed in reading development and showed gender differences.

In line with previous studies that adopted a person-oriented approach (Pfof et al., 2013; Sirén et al., 2018), the present work identified leisure reading profiles reflecting the heterogeneity in development of leisure reading habits. Our longitudinal data allowed us to describe the changes in reading frequency levels across time with respect to different types of reading materials. Changes in time were indeed found in all groups, but the order of the profiles remained the same from Grade 1 onwards. This finding suggests that the individual differences in leisure reading habits have an early onset, and this early emergence of habits is in line with the significant across-time correlations in leisure reading (see also Lee et al., 2010).

Four profiles were identified in the present study. Comics readers, the first profile, mainly consisted of boys and were particularly active in the reading of comics. They also read other lighter print materials. Online readers, the second profile, were mainly girls and were engaging more in online reading (blogs, e-mails, internet forums and newsfeed on Facebook) but also read magazines and tabloids and, to some extent, fiction books. Non-readers, the third group, showed a relatively even gender ratio and were characterized by a passive relation to all kinds of reading. Book readers, the fourth group, were mainly girls and read fiction books frequently and also other materials rather actively. The gender ratios were in line with previous studies for reading preferences (e.g. Coles & Hall, 2002; McGeown et al., 2015, 2016). It is noteworthy that only 4.4 % of all boys belonged to the Book readers profile, which confirms the current worries about the low and waning interest of boys in book reading.

The leisure reading profiles were found to differ on measures of reading fluency and comprehension. Both boys and girls belonging to the Book readers profile had the highest level of reading fluency and comprehension. This profile group stood out especially for their strong skills in the PISA reading comprehension subscale, which demands the evaluation of what has been read. The role of book reading in the development of good reading skills, especially comprehension, seems undeniable, according to this and previous studies (e.g. Torppa et al., 2020; Pfof et al., 2013). The reading of long, coherent texts is likely to benefit the development of reading comprehension more than the reading of shorter, more fragmented texts. However, it should be acknowledged that the development is likely to form a reciprocal cycle where good skills feed more interest in leisure reading; those who became active book readers, were on average skilled readers already in the early grades. As reading skills affect leisure reading and reading motivation (e.g. Erbeli et al., 2020; van Bergen et al., 2020, 2022), supporting reading skills seems critically important for the initiation of a positive cycle where reading skills and habits benefit from each other. As it appears that early-adopted leisure reading habits tend to stay, supporting reading skills and fostering reading habits and motivation from early on seem particularly important.

In addition to book reading, active reading of other reading materials was found to be associated with reading skills as well. Although not quite as proficient readers as the Book readers, Comics readers—both

boys and girls—were above average in reading fluency and comprehension. The reason why reading comics, newspapers, and tabloids is associated with above-average reading skills may be related to the fact that these text types are often coherent, complex, and quite lengthy, although typically not as long as books. Reading these materials demands and likely enhances e.g. the ability to extract a general idea from a text, thus supporting the development of reading comprehension; like Kendeou et al. (2020) suggest, the comprehension skill is a general skill that can develop via various visual narratives, such as comics. Although comics can mean anything from comic strips in newspapers to graphic novels, typical comics consumed among children and adolescents in Finland are comic magazines and comic books, which contain short stories. Some comics do contain quite little print, but an enthusiastic comic reader might then consume plenty of them. Accordingly, such reading, the reading of comics, newspapers and tabloids, deserves to be encouraged. Incorporating comic-style elements into fiction books (which is already being done to some extent) can also motivate children who prefer comics to read books as well. These newer book types may help engage boys better in book reading as this profile included mostly boys.

The Online readers comprised mainly girls, and girls in this profile also had above-average reading skills. The identification of this profile is in line with the study by Sirén et al. (2018), who reported on a similar group in their sample of Finnish 15-year-olds and average reading comprehension skills. Pfost et al. (2013) also identified a similar group among a sample of German 13-year-olds, but those participants had poor reading comprehension skills. These contradictory results may be due to the moderating effect of volume and quality of online reading on the relationship between online reading and reading skills (McGeown et al., 2016; OECD, 2011). In the study by Pfost et al. (2013), this group was active in social online reading, whereas the group in Sirén et al. (2018) was active in various types of online reading, including information seeking and learning. In our study, the items were closer to social online reading but also included blogs, which are rather long texts. In particular, girls within the Online readers profile read various other types of reading materials, which may also explain the average rather than lower reading skills. Thus, our results suggest that this kind of online reading, especially when accompanied by other forms of leisure reading, is not necessarily associated with poor reading skills. To support reading development and motivation, it is beneficial to ensure a balance between different reading materials.

However, contrary to the girls, the boys in the Online readers profile had below-average reading skills. This finding might be due to the fact that even though both boys and girls are identified as belonging to this profile by their active online reading, their reading preferences differed otherwise. Our further analysis revealed that, in Grades 1 to 6, girls in this group read statistically significantly more fiction. We know that fiction reading is connected to good reading skills, and thus it might be the reason behind the different reading results among boys and girls.

A very low level of leisure reading among the Non-readers profile was associated with the poorest reading skills in line with previous studies (e.g. Pfost et al., 2013; Sirén et al., 2018). Girls in this profile were, however, closer to the other profiles than the boys. The disparity between genders is likely due to the higher prevalence of poor readers among boys (e.g. Manu et al., 2021, 2023; OECD, 2016; Psyridou et al., 2021). Boys with the poorest reading skills seem to drift into the Non-readers profile. It can be assumed that poor readers are at a higher risk for not developing active reading habits and need support both to improve their reading skills and interest. Although this group had, on average, the poorest reading skills from first grade onwards, the large size of this group suggests that reading difficulties may not be the only reason for the passive reading habits and that other factors, should be further examined.

Overall, the results indicate that individual differences in leisure reading are relatively stable from the first grade onwards. While the development and level of reading skills have been consistently shown to

contribute to leisure reading habits (Torppa et al., 2020; Erbeli et al., 2020; van Bergen et al., 2020, 2022), it is not the sole factor. Additional factors, such as parental reading habits (Nagel & Verboord, 2012), shared reading experiences and access to books (Sénéchal, 2006; Tremblay et al., 2020), as well as socio-economic status (McGeown et al., 2016) have been found to influence the leisure reading habits of children. Further research is needed to understand the predictors of different leisure reading habits and find ways to support reading motivation and interest effectively.

Even though it is important to encourage children to read books (as they are uniquely important for reading skills), this study also suggest that comics and other “lighter” reading, which is popular especially among boys, might be beneficial too – at least it is connected to above-average skills. This kind of reading should thus be encouraged, especially among boys, who are at higher risk of ending up non-readers and having poorer reading skills. However, the time before learning to read is also important: the early emergence of leisure reading habits suggest that it may be even more beneficial to cultivate these habits during early childhood in the family and day-care settings. By doing so, we could positively impact the development of children's leisure reading habits before these are established rather than attempt to change the habits that have already been adopted.

4.1. Limitations

Our study has several limitations. Firstly, the assessment of leisure reading was based on parental and self-reports. During the follow-up period, the evaluator, scale and types of leisure reading materials included in the questionnaire did undergo some changes. The change of evaluators was based on the view that parents are better evaluators of children's reading amount in the early grades, while children themselves do a better job later grades. The expanding of the set of reading materials in the questionnaire based on the need to take into account that some reading materials are more preferred among adolescents. However, if a similar set of items had been assessed earlier, we would have had more detailed information about the development of the consumption of different reading materials.

Secondly, our study did not include data on Grades 5 and 8. The fifth grade (age 11) is often regarded as a pivotal point for leisure reading, as it is approximately until that age that leisure reading increases and then decreases (e.g. Clark & Teravainen, 2017; Kirby et al., 2011; Kush & Watkins, 1996). Furthermore, we could see in this study that there was a turning point in this development around that age.

Thirdly, reading habits are changing rapidly at the moment as digital entertainment and social media take increasingly bigger shares of children's and adolescent's leisure time. Children in this study were in the first grade (age 7) in 2007 and in the ninth grade (age 15) in 2016. As the popularity of social media had expanded after the 2010s, this study could have captured the first waves of influence of social media use on leisure reading. However, the profiles could look somewhat different if comparable data were collected later. The change in the use of online medias also calls for studies that take account new forms of online reading.

Fourthly, as this study concentrates on two genders, boys and girls, future studies about leisure reading and its connections to reading skills should take account those children and adolescents that do not fall into these categories.

4.2. Conclusions

According to the results of this study, there are distinct leisure reading profiles that start to form early. Moreover, the reading skills of children and youth are associated with different leisure reading habits. Overall, it seems that good reading skills connect to more active and leisure reading focusing on challenging materials, average skills are linked to choosing less challenging reading and poor reading skills tend

to be associated with passivity in leisure reading. Supporting the development of both reading skills and leisure reading habits should be acknowledged as important goals even before school age. To target these actions better, we need more information about the predictors of leisure reading habits that are related to home, other learning contexts, and the child to support positive cycles of development of leisure reading.

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CRediT authorship contribution statement

Emmi Ulvinen: Conceptualization, Methodology, Formal analysis,

Writing - Original Draft preparation

Maria Psyridou: Methodology, Formal analysis, Writing - Original Draft preparation

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Minna Torppa: Conceptualization, Methodology, Formal analysis, Writing - Original Draft preparation

Declaration of competing interest

None.

Appendix

Appendix A

Descriptive statistics for leisure reading, reading fluency and reading comprehension across Grades 1–9.

	N	M	SD	Range	Skewness	Kurtosis
Reading fluency						
Grade 1	2052	0.00	0.86	–2.11–3.48	0.62	0.44
Grade 2	2006	0.00	0.85	–2.47–3.31	0.26	0.23
Grade 3	1995	0.00	0.86	–3.82–2.75	–0.04	0.43
Grade 4	1954	0.00	0.87	–4.01–2.39	–0.17	0.30
Grade 6	1822	0.00	0.84	–3.00–2.74	0.12	–0.07
Grade 7	1770	0.00	0.87	–3.66–2.65	–0.07	0.00
Grade 9	1721	0.00	0.87	–2.60–2.6	–0.09	–0.14
Reading comprehension, Allu & Ykä						
Grade 1	2035	5.50	3.18	0–12	0.00	–0.96
Grade 2	1974	8.52	2.71	0–12	–0.73	–0.20
Grade 3	1988	9.09	2.17	0–12	–1.17	1.72
Grade 4	1950	8.10	2.52	0–12	–0.47	–0.34
Grade 6	1821	7.15	2.55	0–12	–0.20	–0.59
Grade 7	1758	6.59	2.54	0–12	0.05	–0.64
Grade 9	1702	7.02	2.43	0–12	–0.15	–0.57
PISA reading, Grade 9						
Total sum	1512	20.26	6.20	0–32.73	–0.57	–0.04
Items that require retrieval	1512	4.92	1.45	0–8.33	–0.67	0.53
Items that require interpretation	1512	8.28	2.94	0–14.00	–0.31	–0.71
Items that require evaluation	1512	5.35	2.47	0–10.00	–0.31	–0.71
Leisure reading						
Children's fiction books						
Grade 1	1479	1.89	1.13	1–5	1.13	0.31
Grade 2	1454	2.33	1.24	1–5	0.55	–0.80
Grade 3	1356	2.48	1.22	1–5	0.43	–0.83
Grade 4	1282	2.68	1.27	1–5	0.25	–1.04
Comics or children's magazines						
Grade 1	1476	3.04	1.25	1–5	0.03	–1.06
Grade 2	1453	3.28	1.25	1–5	–0.13	–1.06
Grade 3	1359	3.43	1.26	1–5	–0.23	–1.12
Grade 4	1281	3.47	1.22	1–5	–0.34	–0.96
Expository books (f. ex. about animals)						
Grade 1	1471	1.90	0.97	1–5	1.07	0.82
Grade 2	1444	2.00	0.98	1–5	0.98	0.71
Grade 3	1356	2.00	0.98	1–5	0.93	0.48
Grade 4	1282	2.01	1.03	1–5	0.99	0.49
Fiction books						
Grade 6	1793	2.18	1.33	1–5	0.94	–0.37
Grade 7	1727	1.91	1.26	1–5	1.27	0.39
Grade 9	1699	1.69	1.11	1–5	1.72	2.00
Comics						
Grade 6	1766	3.06	1.38	1–5	–0.02	–1.27
Grade 7	1694	2.66	1.35	1–5	0.30	–1.12
Grade 9	1688	1.99	1.21	1–5	1.01	–0.13

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Appendix A (continued)

	N	M	SD	Range	Skewness	Kurtosis
Expository books						
Grade 6	1762	1.59	0.82	1–5	1.63	2.91
Grade 7	1717	1.57	0.86	1–5	1.73	2.94
Grade 9	1700	1.40	0.74	1–5	2.36	6.42
Newspapers						
Grade 6	1795	2.23	1.3	1–5	0.77	–0.62
Grade 7	1724	2.61	1.43	1–5	0.75	–0.63
Grade 9	1696	2.65	1.27	1–5	0.78	–0.55
Tabloids						
Grade 6	1785	2.14	1.29	1–5	0.85	–0.51
Grade 7	1723	2.89	1.46	1–5	0.38	–1.24
Grade 9	1696	2.65	1.44	1–5	0.32	–1.29
Magazines						
Grade 6	1795	1.58	0.92	1–5	1.65	2.13
Grade 7	1719	1.64	0.94	1–5	1.46	1.49
Grade 9	1690	1.46	0.84	1–5	2.05	4.02
Teen magazines						
Grade 6	1757	1.96	1.17	1–5	1.08	0.08
Grade 7	1707	1.81	1.26	1–5	1.26	0.83
Grade 9	1698	1.48	0.79	1–5	1.97	4.21
Blogs						
Grade 6	1772	1.89	1.37	1–5	1.29	0.16
Grade 7	1710	1.80	1.28	1–5	1.43	0.65
Grade 9	1682	1.59	1.04	1–5	1.82	2.42
Internet forums						
Grade 6	1756	2.49	1.51	1–5	0.51	–1.24
Grade 7	1716	2.26	1.43	1–5	0.74	–0.88
Grade 9	1680	2.41	1.42	1–5	0.57	–1.05
Newsfeed on Facebook						
Grade 6	1779	3.38	1.76	1–5	–0.42	–1.62
Grade 7	1717	3.41	1.59	1–5	–0.42	–1.42
Grade 9	1659	2.93	1.59	1–5	0.03	–1.58
E-mails						
Grade 6	1791	2.61	1.29	1–5	0.45	–0.88
Grade 7	1720	2.28	1.27	1–5	0.75	–0.52
Grade 9	1692	2.75	1.3	1–5	0.23	–1.07

Note. Reading fluency measures were calculated as averages of the measures. Reading fluency measures are within-age standardized scores. Reading comprehension was based on different, standardized tests in different grades.

Appendix B

Gender differences in reading fluency, reading comprehension and leisure reading across Grades 1–9.

	Boys			Girls			F	Cohen's d
	N	M	SD	N	M	SD		
Reading fluency								
Grade 1	1069	–0.11	0.85	983	0.12	0.86	36.31***	0.27
Grade 2	1049	–0.11	0.85	957	0.12	0.84	37.83***	0.39
Grade 3	1044	–0.15	0.82	951	0.15	0.88	61.44***	0.48
Grade 4	1025	–0.14	0.84	929	0.15	0.87	58.14***	0.47
Grade 6	960	–0.19	0.82	862	0.21	0.81	111.33***	0.70
Grade 7	925	–0.18	0.85	844	0.20	0.85	88.70***	0.63
Grade 9	906	–0.24	0.86	811	0.26	0.81	151.29***	0.87
Reading comprehension								
Grade 1	1057	5.21	3.26	978	5.80	3.07	17.65***	0.19
Grade 2	1033	8.16	2.82	941	8.90	2.53	37.50***	0.28
Grade 3	1042	8.78	2.38	946	9.43	1.85	45.90***	0.30
Grade 4	1024	7.70	2.58	926	8.54	2.37	54.82***	0.34
Grade 6	960	6.92	2.65	861	7.41	2.40	17.10***	0.19
Grade 7	916	6.25	2.56	841	6.96	2.47	35.26***	0.28
Grade 9	894	6.60	2.44	804	7.48	2.33	57.92***	0.37
PISA reading performance, Grade 9								
Total sum	772	19.08	6.41	732	21.57	5.65	63.76***	0.41
Items that require retrieval	772	4.71	1.52	732	5.15	1.32	36.97***	0.31
Items that require interpretation	772	7.92	3.00	732	8.67	2.82	24.82***	0.26
Items that require evaluation	772	4.82	2.52	732	5.94	2.28	82.60***	0.47
Leisure reading								
Children's fiction books								
Grade 1	772	1.61	0.97	706	2.20	1.22	108.47***	0.08

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Appendix B (continued)

	Boys			Girls			F	Cohen's d
	N	M	SD	N	M	SD		
Grade 2	756	2.01	1.14	697	2.68	1.24	118.57***	0.56
Grade 3	716	2.08	1.10	639	2.92	1.18	185.51***	0.74
Grade 4	676	2.20	1.15	605	3.21	1.18	242.53***	0.87
Comics or children's magazines								
Grade 1	771	3.03	1.29	704	3.06	1.21	0.14	0.02
Grade 2	758	3.33	1.29	694	3.22	1.20	3.23	-0.09
Grade 3	716	3.56	1.30	642	3.28	1.20	17.64***	-0.22
Grade 4	675	3.57	1.25	605	3.35	1.18	10.84**	-0.14
Expository books (f. ex. about animals)								
Grade 1	770	1.91	0.97	700	1.88	0.97	0.58	-0.03
Grade 2	750	1.96	0.97	693	2.03	0.99	1.66	0.07
Grade 3	716	1.97	0.98	639	2.03	0.98	1.41	0.06
Grade 4	677	1.93	0.99	604	2.09	1.07	7.85**	0.16
Fiction books								
Grade 6	947	1.77	1.07	846	2.64	1.44	213.04***	0.69
Grade 7	901	1.53	0.95	825	2.32	1.41	187.95***	0.66
Grade 9	898	1.36	0.80	797	2.05	1.29	182.62***	0.64
Comics								
Grade 6	938	3.40	1.36	828	2.68	1.29	131.55***	-0.54
Grade 7	887	2.98	1.39	806	2.31	1.22	110.03***	-0.51
Grade 9	891	2.17	1.29	793	1.79	1.08	41.48***	-0.32
Expository books								
Grade 6	938	1.67	0.86	824	1.51	0.76	17.35***	-0.20
Grade 7	897	1.70	0.94	819	1.43	0.72	43.61***	-0.32
Grade 9	898	1.49	0.82	798	1.29	0.62	31.21***	-0.82
Newspapers								
Grade 6	947	2.41	1.35	848	2.05	1.22	33.06***	-0.28
Grade 7	898	2.49	1.35	825	2.04	1.20	52.42***	-0.35
Grade 9	892	2.39	1.33	800	1.98	1.15	46.17***	-0.33
Tabloids								
Grade 6	943	2.19	1.33	842	2.09	1.23	2.71	-0.08
Grade 7	896	2.73	1.48	826	2.47	1.37	14.07***	-0.18
Grade 9	894	2.75	1.48	798	2.54	1.39	8.61**	-0.15
Magazines								
Grade 6	949	1.38	0.80	846	1.81	0.99	107.39***	0.48
Grade 7	894	1.45	0.86	824	1.85	0.97	83.64***	0.44
Grade 9	889	1.29	0.74	797	1.64	0.89	74.83***	0.43
Teen magazines								
Grade 6	916	1.36	0.75	841	2.62	1.18	713.13***	1.27
Grade 7	889	1.29	0.69	817	2.39	1.04	664.64***	1.25
Grade 9	895	1.13	0.50	799	1.88	0.87	481.94	1.06
Blogs								
Grade 6	931	1.32	0.83	841	2.51	1.56	414.25***	0.95
Grade 7	888	1.24	0.70	821	2.41	1.48	444.30***	1.01
Grade 9	883	1.28	0.74	795	1.92	1.21	173.06***	0.64
Internet forums								
Grade 6	921	2.28	1.46	835	2.71	1.53	34.88***	0.29
Grade 7	896	2.10	1.41	819	2.44	1.44	24.23***	0.24
Grade 9	887	2.37	1.45	789	2.45	1.37	1.35	0.06
Newsfeed on Facebook								
Grade 6	941	3.28	1.73	838	3.49	1.78	6.41*	0.12
Grade 7	895	3.31	1.63	821	3.51	1.54	6.95**	0.13
Grade 9	872	2.90	1.64	783	2.97	1.54	0.77	0.04
E-mails								
Grade 6	944	2.55	1.31	847	2.68	1.25	5.00*	0.10
Grade 7	895	2.33	1.31	824	2.22	1.22	2.90	-0.09
Grade 9	889	2.63	1.31	799	2.88	1.27	15.84***	0.19

*** $p < .001$.

** $p < .01$.

* $p < .05$.

Appendix C

Descriptive statistics for leisure reading measures (criterion variable) across time: whole sample and profile differences.

Grade	M (SD)	n	Comics readers		Online readers		Non-readers		Book readers		F	Pair comparisons $p < .05$
			M (SD)	nn	M (SD)	nn	M (SD)	nn	M (SD)	nn		
Grades 1–4, Child reads independently...												
Children's fiction books												
1	1.89 (1.13)	1479	1.79 (1.05)	469	2.16 (1.07)	250	1.41 (0.72)	545	3.06 (1.30)	215	149.77***	N < C, O, B B > C, O C < O

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Appendix C (continued)

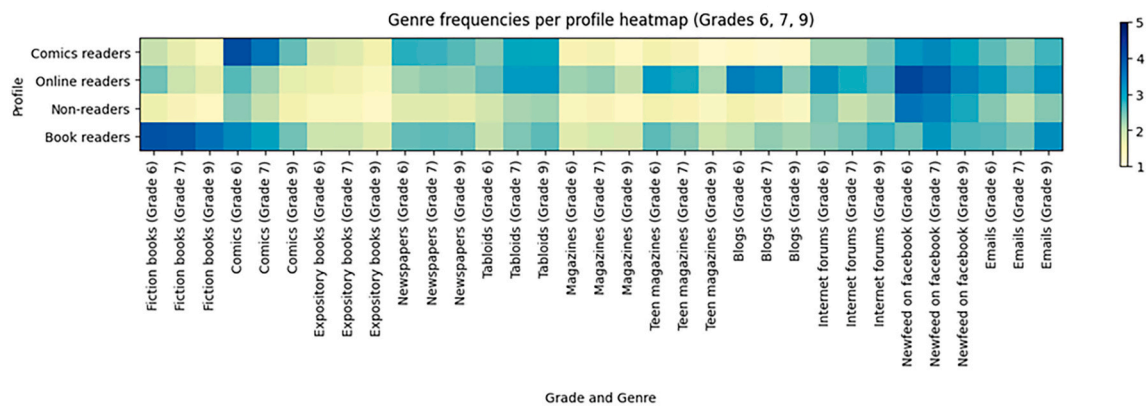
Grade	M (SD)	n	Comics readers		Online readers		Non-readers		Book readers		F	Pair comparisons <i>p</i> < .05
			<i>M</i> (<i>SD</i>)	<i>nn</i>	<i>M</i> (<i>SD</i>)	<i>nn</i>	<i>M</i> (<i>SD</i>)	<i>nn</i>	<i>M</i> (<i>SD</i>)	<i>nn</i>		
2	2.33 (1.24)	1454	2.27 (1.16)	452	2.69 (1.07)	254	1.66 (0.89)	522	3.61 (1.08)	226	195.33***	N < C, O, B B > C, O C < O
3	2.48 (1.22)	1356	2.35 (1.10)	434	2.97 (1.01)	236	1.80 (0.87)	486	3.84 (1.03)	200	219.91***	N < C, O, B B > C, O C < O
4	2.68 (1.27)	1282	2.51 (1.09)	419	3.23 (1.01)	240	1.87 (0.94)	431	4.19 (0.84)	192	272.32***	N < C, O, B B > C, O C < O
Comics or children's magazines												
1	3.04 (1.25)	1476	3.69 (1.10)	467	2.98 (1.06)	249	2.20 (0.97)	545	3.83 (1.08)	215	219.79***	N < C, O, B B > O C > O
2	3.28 (1.25)	1453	4.15 (0.86)	452	3.08 (0.97)	254	2.29 (0.92)	522	4.04 (1.05)	226	385.10***	N < C, O, B B > O C > O
3	3.43 (1.26)	1359	4.40 (0.74)	434	3.17 (0.99)	238	2.37 (0.91)	486	4.19 (0.98)	201	461.19***	N < C, O, B B > O C > O, B
4	3.47 (1.22)	1281	4.34 (0.74)	418	3.27 (1.00)	240	2.43 (0.98)	430	4.11 (0.96)	193	348.56***	N < C, O, B B > O C > O, B
Expository books (f. ex. about animals)												
1	1.90 (0.97)	1471	2.16 (0.99)	467	1.73 (0.76)	246	1.45 (0.69)	545	2.65 (1.11)	213	116.39***	N < C, O, B B > C, O C > O
2	2.00 (0.98)	1444	2.20 (0.99)	447	1.94 (0.83)	252	1.55 (0.72)	521	2.69 (1.12)	224	95.48***	N < C, O, B B > C, O C > O
3	2.00 (0.98)	1356	2.24 (1.00)	434	1.97 (0.87)	237	1.49 (0.65)	485	2.76 (1.09)	200	114.07***	N < C, O, B B > C, O C > O
4	2.01 (1.03)	1282	2.15 (1.02)	421	2.05 (1.00)	239	1.49 (0.63)	430	2.82 (1.17)	192	97.97***	N < C, O, B B > C, O
Grades 6–9, Reading frequency of different reading materials:												
Fiction books												
6	2.18 (1.33)	1793	1.96 (1.08)	572	2.48 (1.25)	357	1.56 (0.93)	624	3.94 (1.26)	234	285.29***	B > C, O, N O > C, N C > N
7	1.91 (1.26)	1727	1.63 (0.93)	558	1.92 (1.10)	343	1.37 (0.80)	590	3.91 (1.13)	236	422.15***	B > C, O, N O > C, N C > N
9	1.69 (1.11)	1699	1.35 (0.66)	555	1.65 (0.85)	334	1.27 (0.69)	576	3.55 (1.27)	234	487.51***	B > C, O, N O > C, N
Comics												
6	3.06 (1.38)	1766	4.02 (1.07)	574	2.60 (1.21)	349	2.34 (1.20)	613	3.28 (1.27)	230	226.11***	C > O, N, B B > O, N O > N
7	2.66 (1.35)	1694	3.53 (1.24)	551	2.20 (1.11)	334	1.98 (1.08)	580	2.96 (1.31)	229	187.25***	C > O, N, B B > O, N O > N
9	1.99 (1.21)	1688	2.54 (1.31)	552	1.62 (0.91)	331	1.48 (0.85)	572	2.47 (1.33)	233	113.78***	C > O, N B > O, N
Expository books												
6	1.60 (0.82)	1762	1.78 (0.92)	565	1.56 (0.76)	350	1.34 (0.56)	619	1.90 (0.99)	228	44.10***	B > O, N C > O, N O > N
7	1.57 (0.85)	1717	1.73 (0.93)	554	1.46 (0.77)	343	1.34 (0.63)	589	1.91 (1.08)	231	36.79***	B > C, O, N C > O, N
9	1.40 (0.74)	1700	1.53 (0.82)	555	1.29 (0.65)	336	1.21 (0.49)	576	1.70 (0.97)	233	35.77***	B > O, N C > O, N
Newspapers												
6	2.24 (1.30)	1795	2.76 (1.37)	556	2.19 (1.25)	341	1.68 (0.97)	593	2.53 (1.38)	234	83.28***	C > O, N B > O, N O > N
7	2.27 (1.30)	1724	2.72 (1.35)	556	2.30 (1.26)	342	1.71 (1.00)	586	2.57 (1.37)	235	71.38***	C > O, N B > N O > N
9	2.20 (1.27)	1696	2.60 (1.32)	554	2.24 (1.22)	337	1.64 (0.93)	572	2.55 (1.40)	233	69.00***	C > O, N, B B > O, N O > N
Tabloids												

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Appendix C (continued)

Grade	M (SD)	n	Comics readers		Online readers		Non-readers		Book readers		F	Pair comparisons <i>p</i> < .05
			<i>M</i> (<i>SD</i>)	<i>nn</i>	<i>M</i> (<i>SD</i>)	<i>nn</i>	<i>M</i> (<i>SD</i>)	<i>nn</i>	<i>M</i> (<i>SD</i>)	<i>nn</i>		
6	2.14 (1.29)	1785	2.34 (1.38)	569	2.51 (1.26)	354	1.83 (1.15)	632	1.96 (1.23)	230	29.31***	O > N, B C > N, B
7	2.61 (1.44)	1723	2.89 (1.46)	557	3.04 (1.36)	341	2.16 (1.31)	590	2.40 (1.45)	235	40.84***	O > N, B C > N, B
9	2.65 (1.44)	1696	2.87 (1.46)	550	3.06 (1.38)	336	2.23 (1.34)	577	2.59 (1.46)	233	31.07***	O > N, B C > N B > N
Magazines												
6	1.58 (0.92)	1795	1.41 (0.79)	577	2.21 (1.10)	359	1.34 (0.70)	626	1.68 (0.95)	233	91.16***	O > C, N, B B > C, N
7	1.64 (0.94)	1719	1.46 (0.84)	556	2.29 (1.08)	342	1.37 (0.72)	586	1.80 (0.94)	235	94.17***	O > C, N, B B > C, N
9	1.46 (0.84)	1690	1.25 (0.61)	546	1.95 (1.05)	335	1.24 (0.62)	574	1.79 (0.99)	235	88.24***	O > C, N B > C, N
Teen magazines												
6	1.96 (1.17)	1757	1.50 (0.86)	550	3.04 (1.16)	355	1.52 (0.80)	621	2.58 (1.29)	231	259.94***	O > C, N, B B > C, N
7	1.81 (1.03)	1707	1.36 (0.70)	549	2.83 (1.08)	340	1.42 (0.66)	586	2.39 (1.10)	232	299.49***	O > C, N, B B > C, N
9	1.48 (0.79)	1698	1.14 (0.44)	552	2.13 (0.98)	331	1.26 (0.50)	572	1.92 (0.96)	233	201.86***	O > C, N B > C, N N > C
Blogs												
6	1.89 (1.37)	1772	1.25 (0.68)	568	3.42 (1.49)	355	1.53 (1.05)	620	2.06 (1.38)	229	314.10***	O > C, N, B B > C, N N > C
7	1.80 (1.28)	1710	1.16 (0.49)	554	3.26 (1.39)	337	1.37 (0.84)	586	2.30 (1.50)	233	369.25***	O > C, N, B B > C, N N > C
9	1.59 (1.04)	1682	1.22 (0.65)	548	2.33 (1.29)	334	1.26 (0.61)	568	2.18 (1.35)	232	158.15***	O > C, N B > C, N
Internet forums												
6	2.49 (1.51)	1756	2.20 (1.42)	563	3.18 (1.49)	352	2.40 (1.51)	612	2.34 (1.44)	229	35.06***	O > C, N, B
7	2.26 (1.43)	1716	2.19 (1.43)	553	2.80 (1.48)	342	1.94 (1.30)	588	2.48 (1.42)	233	29.70***	O > C, N B > N C > N
9	2.41 (1.42)	1680	2.42 (1.42)	549	2.62 (1.41)	332	2.15 (1.36)	566	2.74 (1.45)	232	13.29***	B > C, N O > N C > N
Newsfeed on Facebook												
6	3.38 (1.76)	1779	3.13 (1.75)	571	4.12 (1.50)	354	3.51 (1.71)	620	2.48 (1.74)	234	49.98***	O > C, N, B N > C, B C > B
7	3.41 (1.59)	1717	3.27 (1.62)	557	3.92 (1.38)	344	3.36 (1.58)	585	3.10 (1.66)	231	16.94***	O > C, N, B
9	2.93 (1.59)	1659	2.91 (1.63)	543	3.35 (1.52)	325	2.83 (1.57)	559	2.66 (1.56)	232	10.79***	O > C, N, B
E-mails												
6	2.61 (1.29)	1791	2.57 (1.27)	572	3.07 (1.26)	358	2.38 (1.24)	624	2.63 (1.32)	234	23.29***	O > C, N, B C > N
7	2.28 (1.27)	1720	2.28 (1.24)	555	2.62 (1.30)	341	2.02 (1.21)	590	2.42 (1.28)	234	18.57***	O > C, N C > N B > N
9	2.75 (1.30)	1692	2.70 (1.27)	552	3.13 (1.30)	335	2.39 (1.25)	571	3.20 (1.19)	234	35.62***	B > C, N O > C, N C > N

Note. *** *p* < .001. Values in Grades 1–4: 1 = not at all or rarely, 2 = once or twice a week, 3 = many times a week 4 = once a day, 5 = several times a day. Values in Grades 6–9: 1 = never, 2 = monthly, 3 = once a week, 4 = few times in a week, 5 = daily. Bolded pairwise comparisons executed with Dunnett's T3 test, others with Bonferroni.



Appendix D. Profile differences in frequency of reading different reading materials: parental reports in Grades 1–4 and self-reports from Grades 6–9.

Appendix E

The effect sizes for the profile comparisons among boys and girls.

	Effect size											
	Boys						Girls					
	C vs. O	C vs. N	C vs. B	O vs. N	O vs. B	N vs. B	C vs. O	C vs. N	C vs. B	O vs. N	O vs. B	N vs. B
Reading fluency												
Grade 1	-0.32	-0.66	0.26	-0.31	0.58	0.95	0.12	-0.46	0.42	-0.57	0.30	0.86
Grade 2	-0.40	-0.64	0.32	-0.15	0.67	0.93	0.15	-0.38	0.34	-0.51	0.19	0.68
Grade 3	-0.34	-0.62	0.40	-0.22	0.70	1.01	0.15	-0.38	0.34	-0.51	0.19	0.68
Grade 4	-0.33	-0.67	0.34	-0.26	0.61	0.95	0.22	-0.29	0.45	-0.49	0.23	0.70
Grade 6	-0.07	-0.61	0.25	-0.57	0.32	0.82	0.06	-0.32	0.33	-0.38	0.27	0.66
Grade 7	-0.06	-0.63	0.43	-0.57	0.48	0.99	0.12	-0.35	0.49	-0.45	0.34	0.84
Grade 9	-0.25	-0.70	0.31	-0.42	0.52	0.95	0.21	-0.21	0.48	-0.45	0.27	0.75
Reading comprehension												
Grade 1	-0.32	-0.69	0.19	-0.33	0.49	0.84	0.16	-0.30	0.58	-0.46	0.42	0.90
Grade 2	-0.62	-0.63	0.27	-0.03	0.86	0.86	0.01	-0.34	0.57	-0.34	0.54	0.90
Grade 3	-0.42	-0.50	0.38	-0.06	0.78	0.88	-0.04	-0.32	0.32	-0.29	0.35	0.59
Grade 4	-0.72	-0.70	0.38	-0.07	1.08	1.02	0.03	-0.26	0.55	-0.30	0.54	0.82
Grade 6	-0.53	-0.62	0.45	-0.11	1.01	1.08	0.01	-0.22	0.57	-0.22	0.55	0.80
Grade 7	-0.46	-0.47	0.53	-0.05	1.10	1.05	-0.06	-0.26	0.64	-0.22	0.76	0.96

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Appendix E (continued)

	Effect size											
	Boys						Girls					
	C vs. O	C vs. N	C vs. B	O vs. N	O vs. B	N vs. B	C vs. O	C vs. N	C vs. B	O vs. N	O vs. B	N vs. B
Grade 9	-0.30	-0.60	0.43	-0.01	0.53	1.03	0.02	-0.13	0.65	-0.15	0.65	0.85
PISA reading, Grade 9												
Total sum	-0.38	-0.73	0.57	-0.37	0.96	1.27	0.23	-0.11	0.83	-0.34	0.53	0.93
Items that require retrieval	-0.41	-0.64	0.35	-0.20	0.72	0.94	0.10	-0.11	0.52	-0.20	0.40	0.60
Items that require interpretation	-0.34	-0.61	0.36	-0.29	0.69	0.96	0.35	-0.03	0.74	-0.38	0.37	0.78
Items that require evaluation	-0.19	-0.60	0.73	-0.40	0.91	1.35	0.11	-0.12	0.71	-0.22	0.54	0.81

Note. Small (>0.20), medium (>0.50), and large (>0.80) effect sizes with bold. C = Comics readers, O = Online readers, N = Non-readers, B = Book readers.

Appendix F

Gender differences within the profiles in reading fluency in Grades 1–9.

	Comics readers (C)		Online readers (O)		Non-readers (N)		Book readers (B)	
	M (SD)	n	M (SD)	n	M (SD)	n	M (SD)	n
Grade 1								
Girls	0.19 (0.78)	109	0.22 (0.88)	299	-0.19 (0.71)	284	0.47 (0.89)	218
Boys	0.13 (0.87)	481	-0.15 (0.88)	40	-0.40 (0.72)	427	0.36 (0.87)	56
Grade 2								
Girls	0.15 (0.76)	106	0.24 (0.78)	299	-0.21 (0.79)	274	0.48 (0.82)	217
Boys	0.11 (0.82)	481	-0.26 (1.01)	38	-0.39 (0.75)	420	0.39 (0.92)	56
Grade 3								
Girls	0.16 (0.78)	98	0.28 (0.80)	305	-0.16 (0.91)	275	0.44 (0.85)	216
Boys	0.06 (0.76)	480	-0.23 (0.92)	37	-0.42 (0.78)	419	0.37 (0.78)	56
Grade 4								
Girls	0.11 (0.77)	95	0.28 (0.78)	301	-0.14 (0.92)	271	0.46 (0.78)	213
Boys	0.08 (0.77)	479	-0.21 (0.98)	37	-0.44 (0.79)	409	0.36 (0.89)	54
Grade 6								
Girls	0.21 (0.81)	85	0.26 (0.81)	330	-0.04 (0.77)	256	0.47 (0.77)	191
Boys	-0.01 (0.80)	497	-0.06 (0.72)	34	-0.48 (0.75)	383	0.20 (0.91)	46
Grade 7								
Girls	0.16 (0.80)	78	0.26 (0.87)	322	-0.12 (0.81)	251	0.54 (0.76)	193
Boys	-0.01 (0.83)	493	-0.06 (0.84)	31	-0.51 (0.75)	355	0.39 (1.04)	46
Grade 9								
Girls	0.15 (0.88)	76	0.33 (0.81)	309	-0.02 (0.76)	235	0.54 (0.73)	191
Boys	-0.03 (0.82)	483	-0.24 (0.89)	30	-0.59 (0.78)	348	0.25 (0.98)	45

Note. C = Comics readers, O = Online readers, N = Non-readers, B = Book readers. Significant difference [$p < .001$] between genders is marked with bold.

Appendix G

Profile differences by gender in reading comprehension in Grades 1–9.

	Comics readers		Online readers		Non-readers		Book readers	
	M (SD)	n	M (SD)	n	M (SD)	n	M (SD)	n
Grade 1								
Girls	5,60 (2,99)	109	6,07 (2,98)	298	4,75 (2,72)	283	7,34 (3,04)	218
Boys	6,19 (3,11)	476	5,15 (3,37)	40	4,11 (2,94)	423	6,84 (3,56)	55
Grade 2								
Girls	8,95 (2,32)	105	8,97 (2,50)	292	8,11 (2,62)	271	10,17 (1,93)	212
Boys	8,97 (2,46)	476	7,39 (2,63)	38	7,30 (2,85)	411	9,64 (2,58)	55
Grade 3								
Girls	9,54 (1,57)	98	9,48 (1,62)	305	8,96 (1,98)	271	10,09 (1,82)	215
Boys	9,27 (2,09)	479	8,27 (2,63)	37	8,11 (2,50)	418	10,02 (1,80)	56
Grade 4								

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Appendix G (continued)

	Comics readers		Online readers		Non-readers		Book readers	
	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>	<i>M (SD)</i>	<i>n</i>
Girls	8,47 (2,35)	95	8,54 (2,16)	301	7,87 (2,35)	268	9,69 (2,10)	213
Boys	8,47 (2,25)	479	6,95 (1,99)	37	6,78 (2,60)	408	9,35 (2,43)	54
Grade 6								
Girls	7,28 (2,33)	85	7,30 (2,45)	330	6,77 (2,34)	255	8,53 (2,04)	191
Boys	7,54 (2,50)	497	6,24 (2,37)	34	5,97 (2,57)	383	8,63 (2,34)	46
Grade 7								
Girls	6,85 (2,65)	78	6,71 (2,23)	321	6,20 (2,38)	250	8,43 (2,28)	192
Boys	6,67 (2,55)	490	5,61 (1,99)	31	5,50 (2,41)	351	7,95 (2,27)	44
Grade 9								
Girls	7,20 (2,45)	75	7,24 (2,35)	306	6,90 (2,13)	233	8,68 (2,07)	190
Boys	7,12 (2,36)	476	5,79 (2,43)	29	5,74 (2,26)	344	8,13 (2,36)	45
PISA, grade 9, total score								
Girls	20,32 (5,35)	70	21,63 (5,80)	277	19,70 (5,66)	214	24,34 (4,23)	171
Boys	20,71 (5,64)	421	18,55 (5,67)	22	16,27 (6,48)	296	23,91 (5,50)	33
PISA, items that require retrieval								
Girls	5.00 (1.27)	70	5.13 (1.31)	277	4.86 (1.39)	214	5.62 (1.13)	171
Boys	5.06 (1.34)	421	4.45 (1.60)	22	4.13 (1.56)	296	5.55 (1.45)	33
PISA, items that require interpretation								
Girls	7.86 (2.78)	70	8.85 (2.81)	277	7.79 (2.74)	214	9.82 (2.49)	171
Boys	8.58 (2.81)	421	7.64 (2.80)	22	6.82 (2.93)	296	9.61 (2.87)	33
PISA, items that require evaluation								
Girls	5.61 (2.17)	70	5.86 (2.38)	277	5.34 (2.33)	214	6.98 (1.68)	171
Boys	5.32 (2.33)	421	4.86 (2.49)	22	3.87 (2.50)	296	6.88 (1.93)	33

Note. C = Comics readers, O = Online readers, N = Non-readers, B = Book readers. Significant difference [$p < .001$] between genders is marked with boldning.

Appendix H

The effect sizes for the gender comparisons within the profiles.

Effect size				
Boys vs. girls				
	Comics readers	Online readers	Non-readers	Book readers
Reading fluency				
Grade 1	0.07	0.42	0.32	0.12
Grade 2	0.05	0.55	0.23	0.10
Grade 3	0.13	0.59	0.31	0.09
Grade 4	0.04	0.55	0.35	0.12
Grade 6	0.27	0.42	0.58	0.32
Grade 7	0.21	0.37	0.50	0.16
Grade 9	0.21	0.67	0.74	0.34
Reading comprehension				
Grade 1	-0.19	0.29	0.23	0.15
Grade 2	-0.01	0.62	0.30	0.23
Grade 3	-0.42	0.55	0.38	0.04
Grade 4	0.00	0.77	0.44	0.15
Grade 6	-0.11	0.44	0.33	-0.05
Grade 7	0.07	0.52	0.29	0.21
Grade 9	0.03	0.61	0.53	0.25
PISA grade 9	-0.07	0.54	0.56	0.09
PISA, items that require retrieval	0.05	0.47	0.49	0.05
PISA, items that require interpretation	-0.26	0.43	0.34	0.08
PISA, items that require evaluation	0.13	0.41	0.61	0.06

Note. Small (>0.20), medium (>0.50), and large (>0.80) effect sizes with bold. C = Comics readers, O = Online readers, N = Non-readers, B = Book readers.

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