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**The influence of access to eReaders, computers and mobile phones on children's book
reading frequency**

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ACCEPTED MANUSCRIPT

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Abstract

Regular recreational book reading is a practice that confers substantial educative benefit. However, not all book types may be equally beneficial, with paper book reading more strongly associated with literacy benefit than screen-based reading at this stage, and a paucity of research in this area. While children in developed countries are gaining ever-increasing levels of access to devices at home, relatively little is known about the influence of access to devices with eReading capability, such as Kindles, iPads, computers and mobile phones, on young children's reading behaviours, and the extent to which these devices are used for reading purposes when access is available. Young people are gaining increasing access to devices through school-promoted programs; parents face aggressive marketing to stay abreast of educational technologies at home; and schools and libraries are increasingly their eBook collections, often at the expense of paper book collections. Data from the 997 children who participated in the 2016 *Western Australian Study in Children's Book Reading* were analysed to determine children's level of access to devices with eReading capability, and their frequency of use of these devices in relation to their recreational book reading frequency. Respondents were found to generally underutilise devices for reading purposes, even when they were daily book readers. In addition, access to mobile phones was associated with reading infrequency. It was also found that reading frequency was less when children had access to a greater range of these devices.

1. Introduction

1.1 The educative benefits of book reading

The educative benefit of recreational reading is well established. Regular reading for pleasure is associated with a range of literacy advantages (e.g. Clark, 2013; Mol & Bus, 2011; Samuels & Wu, 2001), with students who enjoy reading better readers (OECD, 2011a). The benefits of regular reading also extend beyond literacy, as regular reading is also associated with improved performance in mathematics (e.g. Sullivan & Brown, 2013), cognitive stamina & resistance to decline into old age (e.g. Vermuri & Mormino, 2013; Wilson et al., 2013), and even longevity (Bavishi, Slade & Levy, 2016). In addition, regular reading of fiction books is increasingly associated with the development of empathy and positive interpersonal characteristics (e.g. Comer, Kidd & Castano 2013; Oatley, 2016).

At present, book reading is more consistently associated with literacy benefit than reading of other text types, and “there does not seem to be a uniform influence of all types of reading materials on reading achievement” (Pfof, Dörfler, & Artelt, 2013, p.15). For example, while paper book reading has been found to offer benefit for the development of reading comprehension and vocabulary, reading online emails or social networking sites is associated negatively with reading achievement (e.g. Pfof, Dörfler, & Artelt, 2013). Similarly, the reading of short-form screen-based text, such as typically used in text messages, is not associated with comparable literacy benefit, perhaps as “the type of reading that is occurring while texting is substantially different, in terms of its associations with literacy, from more traditional forms of reading” (Zebroff & Kaufman, 2016, p.1). The equal literacy benefit of listening to audiobooks for young people has not yet been established in the research, with outcomes found to generally be dependent on the characteristics of each research sample, as well as literacy outcomes being assessed (Moore & Cahill, 2016).

Young people with access to reading devices now have multiple mode options for book consumption. When steering children toward reading on paper books, or eBooks, relative benefit needs to be taken into account, and this is not yet fully understood. It would be premature at this stage to say that the reading of eBooks offers equal literacy benefit to the reading of paper books; there is insufficient research at this stage supporting this contention. Much of the research exploring possible literacy benefits of reading eBooks does not do so in comparison to paper books (e.g. as reviewed in Zucker, Moody & McKenna, 2009), so relative advantages cannot be determined (Segal-Drori, Korat & Klein, 2013). In addition, research has tended to focus on the early years of independent reading skill acquisition (Korat & Shamir, 2008; Zucker, Moody & McKenna, 2009) rather than once independent reading skill has been achieved. Studies seeking to determine relative literacy benefit are often hampered by small sample sizes and mixed findings, with diversity in method, context and the specific literacy indicators being investigated making generalisation contentious. There is increasing evidence to suggest that the cognitive processes involved in reading screen-based texts, compared to paper-based texts, may be different (e.g. Giedd, 2012; Liu, 2005; Nicholas et al., 2003), though more research is needed specifically examining comparative literacy benefits of reading identical texts in paper or eBook formats.

1.2 Advantages and disadvantages of eBooks

While eBooks cannot claim at this stage to be more beneficial than paper books for literacy outcomes, they do offer a range of comparable advantages, which could make them attractive to both young and older readers. They offer the possibility of a portable library, greatly increasing the practical volume of books that an individual can travel with and almost instant access. Purchasing or borrowing eBooks is also generally quick and simple once purchasing and borrowing mechanisms are understood. Reading a book on an eReader means that the

range of large print options is greatly increased, and this combined with other features such as text to speech capacities can make eReaders with these affordances very appealing to struggling readers, potentially acting as an assistive technology for children with learning disabilities (e.g. Camardese et al., 2012; Gentry, Chinn & Moulton, 2004). Additional capacities such as dictionaries are available to promote reading comprehension in situ, without the need to refer to other books or devices. They also offer privacy, as it is relatively easy to conceal that nature of the reading material when read on an eReader (MacFadyen, 2011). Arguments about the initial high pricing of eBooks have quietened in recent times, as prices have declined markedly and eBook quality has improved due to the competitive market pressures in this space (D'Souza, 2015). It has also been suggested that due to relatively high availability of devices in homes in developed countries such as the UK, children without paper books in their home could make use of devices to bring eBooks into their home (Mackey & Shane, 2013), responsive to the positive association between books in the home and engagement in recreational reading consistently observed in research (e.g. Author, 2015a).

When compared to paper books, eBooks fall short in some areas. eBooks are not necessarily an environmentally superior alternative to paper books (Allender, 2012), and they are dependent on internet connectivity to enable downloads, which can be an issue in areas where internet connection is unreliable, as well as electricity to maintain their charged state. Due to the differences in eReaders' ability to read certain eBook file types, such as mobi, epub and pdf amongst others, ability to read eBooks in different devices may be limited. This issue with potential transferability can also be compounded by the requisites of Digital Rights Management (DRM) agreements, which can expire or be revoked. The purchase of eBooks is usually not sales in the sense that the purchaser has bought a restricted licence use the eBook within the DRM agreement (Author, 2015b). Reading on internet search enabled devices, such as tablets, also opens up easy opportunity for distraction, allowing engagement in the

practice of media multi-tasking, which has been found to detrimentally impact on student comprehension (e.g. Bowman, Levine, Waite & Gendron, 2010), and concentration (e.g. Ophir, Nass & Wagner, 2009; Sana, Weston & Cepeda, 2013). In addition, students can become over-reliant on support features (Felvegi & Matthews, 2012), such as pop-up dictionaries, to the detriment of skills such as inferential capacities. A certain degree of digital literacy is also required in order to use eReading devices, and while it may be assumed that young people possess the required level of digital literacy, this assumption may be erroneous.

This range of considerations should be taken into account when determining which kinds of books should be stocked in school, public and home libraries, with a view to meeting the needs of young people, however, in order to effectively promote reading, educators such as teachers, parents and librarians also need to understand children's preferred reading modes. Like the research on literacy benefits, there is insufficient research in this area to broadly generalise, however, this has not prevented significant changes being made in some contemporary libraries, based on an assumed youth preference for eBooks. Young Australians' access to computers and devices has grown in recent times, with access increased at school as well as at home, as "the 'Digital Revolution' saw increased ICT resourcing for schools and perhaps as a consequence of the emphasis on ICT capability in the new Australian Curriculum" (Author & Other, 2016). However, it should be noted that increase in access shouldn't be conflated with increase in digital literacy proficiency, or a shift in preference toward reading in digital modes. As such, it is important to investigate if access to devices with eReading capacity enhances or inhibits eReading frequency.

1.3 Challenging the assumption that all young people prefer to read on screens

Understanding children's reading mode preferences is important, as this knowledge can guide resourcing decisions with greater accuracy than supposition based on stereotypes of a

homogenous group of Digital Natives with uniform preferences and digital literacy skills. Young Australians may not be as attracted to eBooks as is assumed. Recent research by publisher Scholastic has found that only 29% of Australian children aged 9-11 had read an eBook at some point in their lives (Scholastic 2016a), which is lower than the frequency for UK children (41%) (Scholastic, 2016b) and US children (Scholastic, 2015) (56%) in the same age range, however it is difficult to relate this infrequency of eBook reading to preference without qualifying for extent of access to this mode of book.

As time progresses, the homogenising notion of all young people as digital natives is increasingly contested, as young people are found to have diverse levels of digital literacy skill. This is seen as paradoxical, as “on the one hand there are claims by Marc Prensky that the Digital Natives use of ICTs are significantly increased from their predecessors; and on the other hand, many of these Digital Natives still require basic digital literacy training and support” (Leonard, Mokwele, Siebrits & Stoltenkamp, 2016, p. 19). This is reflective of findings of the 2013 International Computer and Information Literacy Study computer and information literacy, which “gathered data from almost 60,000 Grade 8 (or equivalent) students in more than 3,300 schools from 21 countries or education systems within countries” (Fraillon, Schulz & Ainley, 2013, p. 16), finding that young people’s computer and information literacy varied considerably across participating countries, with “students’ gender (female compared to male), students’ expected educational attainment, parental educational attainment, parental occupational status, number of books in the home, and ICT home resources” (p. 20), all factors positively associated with computer and information literacy in most countries. As such, assumptions that young people are a homogenous group of highly competent technology users are disproved by research of robust sample size, extending beyond more than one specific geographic location. Even in communities where technological exposure in youth is highest, such as in South Korea, it cannot be assumed that eBooks are preferred, with

research suggesting the children in South Korea may prefer to read paper books due to perceived fatiguing effects of screen-based reading, particularly in relation to eye strain (e.g. Jeong, 2012).

It is foreseeable that being forced to read in a non-preferred mode could have a detrimental impact on young people's willingness to engage in regular reading, subsequently limiting their exposure to its range of educative advantages. This is an issue, as student engagement in reading for pleasure is in decline (e.g. OECD 2011b). Recent US research suggests that the number of children who enjoy reading books for pleasure has declined over the last four years by nearly 10% (Scholastic, 2015). In addition, Australian research suggests that by adolescence, most young people cannot be generally characterised as keen and frequent recreational book readers (e.g. Manuel & Brindley, 2012; Author, 2014b). The majority of young people in developed countries are not regular recreational book readers, and this can detrimentally impact on their literacy outcomes, as children who do not frequently read for enjoyment are not exposed to the same benefit across literacy outcomes, and their literacy skills even regress during periods without educational exposure (e.g. Harris & Butaud, 2016). We also need to determine if access to reading devices is associated with eReading frequency, or the reverse, before increasing access to devices with eReading capability can be promoted as an efficacious intervention to increase reading intervention in isolation.

1.4 Pressures to adopt eBooks

The contention that to be progressive and responsive to the modern era, eBooks should be given primacy is a powerful argument that has been used to justify sweeping changes in school and public libraries that have marked implications for resource allocation and funding. Recent state government funding cuts to paper book resourcing in Western Australian libraries was positioned as being responsive to a need to increase digital services, however

this cut was not justified by circulation numbers, which suggest that eBooks only make up a small portion of items borrowed from the library; in almost all Australian public libraries, eBooks account for less than 5% of loans (APLA, 2015). While this low borrowing rate can be reflective of the fact that in Australia, “on average eBooks make up 5–6% of a public library’s collection” (APLA, 2015, p. 2).

Some schools in both the USA and Australia have removed paper books from their libraries, replacing them with eBooks, with a desire to meet young people’s preferences highlighted as a key motivation (Author, 2014a). A recent survey of school library staff in Australia and New Zealand found that “there was a more significant increase in the take up of eBooks in Australian schools between 2014 (30%) and 2015 (34%) than between 2013 (28%) and 2014 (30%)”, with the impact of this funding allocation on paper book resourcing not known (Softlink, 2015, p. 6). This may be reflective of increased prevalence of Bring Your Own Device policies and 1-to-1 computer to student ratios in both public and private schools in recent times (Janssen & Phillipson, 2015; Author, 2016a), enabling students to read eBooks with greater ease. It may also be responsive to the new Australian Curriculum, which positions ICT as a General Capability to be evidenced across all learning areas from the earliest years of schooling (ACARA, n.d.). Parents may also feel compelled to encourage their children to read on devices, which are increasingly marketed as holistic educational tools. Much of the marketing of iPads and other “Edutainment” media is aimed at parents draws upon commercial efforts to relate technology to improving children’s intellectual capacity, despite a lack of supporting scientific evidence (Nixon & Hateley, 2013, p. 31), and the lack of established comparable benefit of paper and screen reading may not be well-understood

1.5 Purposes of this study

To assist educators and parents to grapple with resourcing decisions, and to ensure that young people can access books in their preferred mode where possible, current and ongoing research in this area is needed. This paper seeks to address two research questions in order to provide further insight into this area:

1. Does access to eReading devices influence children's reading behaviour?
2. Do children with access to eReading devices make use of them for book reading purposes?

2. Method

2.1 Participants and sampling

The research questions were tested as part of a larger set of research questions within the mixed-methods *Western Australian Study in Children's Book Reading* that was conducted from March to June in 2016. The sample consisted of 997 Western Australian children in upper primary school in Years 4 and 6. Schools participating in the final data set were primarily recruited via email after being identified through public and private school lists. School recruitment was controlled to ensure a representative sample, precluding use of random theoretical sampling. As such, the final data set of 24 schools was drawn from diverse socio-economic and geographic contexts. As per Table 1 below, government and non-government schools, rural and metropolitan schools, and public and private schools were included in the sample. The school sample had an average Index of Community Socio-Educational Advantage of 1040.9, close to the overall average in Australia (1000), with further details about the range in Table 1 below.

Table 1. *Characteristics of the 24 participating schools*

School type	<i>n</i>
Public/Government	19
Private	5
<i>School location</i>	
Metropolitan area*	21
Rural**	3
<i>Index of Community Socio-Educational Advantage***</i>	
Highest	1132
Lowest	918
Range	214
Mean	1040.9
*schools within the Perth Statistical Division as defined by the Australian Bureau of Statistics, with Perth being the capital city of Western Australia	
**schools outside the metropolitan area	
***as per 2015 (Australian Curriculum, Assessment and Reporting Authority (ACARA), 2016)	

Respondents were aged eight to twelve years, with an average age of 9.8 years. More respondents were in Year 4 (52.3%) than Year 6 (47.7%). The gender profile comprised of 429 respondents identifying as male, and 566 respondents who identified as female, with two respondents abstaining from allocation to the traditional gender binary. Age was unevenly distributed, as per Table 2 below.

Table 2. Age of the 997 respondents at the time of the survey

Age	Response Percent	Response Count
8	6.3%	63
9	46.0%	458
10	7.0%	70
11	39.8%	396
12	0.9%	9
Missing	0.1%	1
Total		997

2.2 Survey procedure and administration

This study used a within-stage mixed-model approach (Johnson & Onwuegbuzie, 2004), using a purpose-designed survey tool hosted on Survey Monkey and a semi-structured interview tool. However, the research questions addressed in this paper were solely interrogated through quantitative data collected through the survey tool. The study explored a range of research questions within the scope of current literacy interests, with data relevant to this research inquiry only collected in the survey tool, and as such, only this data are reported on herein.

The survey was delivered within a single-stage school visitation by the corresponding author. Once ethics approvals were granted, the study was rigorously piloted at a local school with 100 respondents in Years 4 and 6. The survey items were carefully tested during this piloting phase of the study, to ensure that the young participants fully understood what was meant by each option, to be responsive to the unique challenges presented by the comprehension needs of young respondents (Borgers, De Leeuw & Hox, 2000). The final relevant survey items that were drawn upon for the purposes of sample identification and analysis as per Table 3 below.

This piloting phase had significance for the wording choices of the survey items that this study reports on, as it was discovered that despite pre-pilot cognitive piloting checks with young individuals, some students participating in the pilot struggled comprehending or interpreting the initial wording of the survey questions relating to this area of inquiry. The pilot and post-pilot items have been explicitly highlighted in Table 3 below, where differences exist, providing more detail than typically included in a research paper, to illustrate how crucial rigorous piloting is when undertaking surveys with children.

Table 3. *Final relevant survey items and previous pilot versions for comparative purposes.*

No.	Items
1	Are you a: (options: girl; boy)
2	How old are you right now? (options: 8-12) <i>Pilot item: How old are you?*</i>
3	What is your school year? (options: Year 4; Year 6)
4	How often do you read books in your free time? (options: never; sometimes; often; everyday)
5	Do you have an iPad or a Kindle in your home? (options: yes; no) <i>Pilot item: Do you have an eBook reader (like a Kindle) or tablet (like an iPad) in your home?***</i>
6	If yes***, do you read books on an iPad or Kindle? (options: never; sometimes; often; everyday)
7	Do you have a computer in your home? (options: yes; no)
8	If yes***, do you read books on the computer? (options: never; sometimes; often; everyday)
9	Do you have a mobile phone? (options: yes; no)
10	If yes***, do you read books on the mobile phone? (options: never; sometimes; often; everyday)

**Respondents wanted to round up their age in order to seem older; as such, "right now" was added to the item to provide clarity.*

***This item caused considerable confusion, as surprisingly many students did not know what a tablet or an eReader was; if they owned an iPad or Kindle, they did not necessarily realise that these were tablets and eReaders respectively. As such, the item needed to be amended to include recognisable brands, unfortunately limiting the scope of the inquiry, but increasing the validity of the survey.*

****Skip logics were programmed into the "If yes" questions (6, 8 & 10) so that students without device access were not exposed to questions about use of devices that they did not have.*

2.3 Data analysis procedure

To determine the extent to which children with access to eReading devices make use of them for book reading purposes, simply reporting on overall findings is insufficient. Such

aggregation, although useful to provide a general idea of trends, may mask an actual pattern, which provides concrete evidence to influence policies and actions. Therefore, several statistical procedures were conducted to illuminate these patterns. Firstly, as previously mentioned, determining level of access to the different devices across the cohort offers insight into availability, and by subsequently filtering out respondents without access, lack of access is not the determining factor in lack of use. This is why some of the research data (e.g. Scholastic 2015; Scholastic 2016a; Scholastic 2016b) available in this is of limited use, and the eBook reading frequency data do not take into account access limitations. Secondly, in addition to access, limited reading on devices could be reflective of overall disinterest in reading. For this reason, while whole data findings will be reported, the data for students who self-reported as “every day” readers, who also report device access, will arguably be of the most value, as these data facilitate ascertainment of device use frequency for high frequency readers, with access barriers accounted for.

3. Results

To determine use of eReading devices, first access levels must be determined, so that lack of access does not weigh upon reading frequency results. This was partly achieved through a 2-level-3-factor factorial ANOVA. Spearman’s rho was later performed to determine if device access level is associated with reading frequency. This was later supported further with a Kruskal-Wallis test. Within-group analysis was later conducted through Mann-Whitney *U* tests for each device. Further, the frequency of reading engagement of daily readers was also investigated to provide further insights into how their reading habit is associated with the access to eReading devices. The results of these tests are presented as follows.

3.1 Levels of access to eReading devices

Levels of access to devices with eReading capability are seen in Table 4 below, with computer access almost ubiquitous, and mobile phone access low, at just over a third, reflective of the age of the cohort.

Table 4. *Percentage access to devices with eReader capability in the room*

Device access	Response %	Response Count
Kindle/iPad	84.8	835
Computer	94.5	937
Mobile phone	34.6	343

3.2 Impact of access to eReading devices on reading behaviour in the whole sample

In order to test if the respondents' reading behaviour (i.e., the frequency) is contingent to the access level to eReading devices, a 2 x 2 x 2 factorial between groups analysis of variance (ANOVA) was used to compare reading frequency in general of the groups of respondents: (a) respondents with/without access to iPad/Kindle, (b) respondents with/without access to computers, and (c) respondents with/without access to mobile phones. Descriptive statistics of each group is shown in Appendix 1. Levene's test was used to evaluate the assumption of homogeneity of variance and it was found that the assumption held, $F(7, 970) = 1.34, p = .23$.

The main effect of access to mobile phones was statistically significant, $F(1, 970) = 8.80, p < .05$, with respondents who have no access to mobile phones ($M = 3.12, SD = .84$) demonstrated a higher reading frequency than those who have ($M = 2.87, SD = .92$). Partial eta-squared (η^2) for this effect was .01, which was considered small.

The main effects of access to iPad/Kindle, and computers were both not statistically significant, iPad/Kindle: $F(7, 970) = .10, p = .75$, computers: $F(7, 970) < .001, p = .98$. The interaction effects of the factors were also not statistically significant at $p = .05$. This are summarised in Table 5.

Table 5. Tests of Between-Subjects Effects

Dependent Variable: reading frequency (Item 4)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	16.879 ^a	7	2.411	3.182	.002	.022
Intercept	1245.894	1	1245.894	1644.224	.000	.629
iPad/Kindle	.077	1	.077	.102	.750	.000
computer	.000	1	.000	.000	.982	.000
mobile	6.665	1	6.665	8.795	.003	.009
iPad/Kindle * computer	.256	1	.256	.337	.561	.000
iPad/Kindle * mobile	1.038	1	1.038	1.369	.242	.001
computer * mobile	.344	1	.344	.454	.500	.000
iPad/Kindle * computer * mobile	.067	1	.067	.089	.766	.000
Error	735.008	970	.758			
Total	9753.000	978				
Corrected Total	751.887	977				

a. R^2 Squared = .022 (*Adjusted R*² = .015)

While the factorial ANOVA gives an indication that only access to mobile phone was associated with reading frequency, and factorial interactions are all non-significant, further investigations were required to determine if the number of access to eReading devices was associated with reading frequency. This is particularly important given that more than 50% of the respondents had access to at least one of the three types of devices as shown in Table 4. Spearman's rho test was conducted to investigate if this proposition is statistically significant, and if so, which vector the association points to.

The result of the test showed there was statistically negative significant association between the number of access to eReading devices and reading frequency in general, $r_s = -.09$, $p < .05$, two-tailed, $N = 997$. Although the correlation coefficient was nearing zero, Kruskal-Wallis test further supported this negative association where *mean ranks* were observed to systematically reduce as the number of device access increased, (access to one device: *Mean Rank* = 515.64, $n = 143$; access to two devices: *Mean Rank* = 506.20, $n = 548$; access to three

devices: *Mean Rank* = 453.77, $n = 292$). The difference was statistically significant, $\chi^2 = 8.57$, $df = 2$, $N = 983$, $p < .05$. The result challenges conventional intuitions about the direction of this association, as this finding indicates that as access to eReading devices increases, respondents' general reading frequency decreases. The results from Spearman's rho, Kruskal-Wallis, and the between-groups factorial ANOVA procedures indicated a need for further analysis to examine if the reading frequency among those who had access to each eReading devices actually differs from those who did not. Therefore, Mann-Whitney U was conducted to investigate within-group differences for device access per type.

The results showed a consistent pattern across all three eReading device types, with the general reading frequency's mean rank for those who did not have an access to devices higher than those who had, as shown in Table 6. However, only access to mobile phone was statistically different, (have access: *Mean Rank* = 451.59, $n = 648$; no access: *Mean Rank* = 519.51, $n = 343$), $U = 95,900.50$, $z = -3.76$, $p < .001$.

Table 6. *Reading frequency in general (item 4) and access to eReading devices.*

eReading devices	Access level	Mean rank of reading frequency	Mann-Whitney U test
iPad/Kindle	Yes	490.48	$U = 60,521.00$, $z = -.694$, $p = .488$
	No	507.03	
Computer	Yes	495.88	$U = 25,189.50$, $z = -.296$, $p = .767$
	No	507.01	
Mobile phone	Yes	451.59	$U = 95,900.50$, $z = -3.760$, $p < .001$
	No	519.51	

In general, the respondents made relatively rare use of devices for reading purposes, though as aforementioned, this could be reflective of disengagement in reading.

Table 7. *Percentage frequency of device use for reading book for all students with access to devices*

Reading frequency on devices	iPad/Kindle %	Computer %	Mobile phone %
Never	43.5	69.2	69.8
Sometimes	43	24.4	21.6
Often	9	4	5.2
Every day	4.5	2.4	3.4

Spearman's rho was later run to see if there was an association between the reading pattern in general, and the pattern in reading on devices. The results showed significant positive correlations of reading frequency in general and the frequency across all devices, (iPad/Kindle: $r_s = .22$, $p < .001$, two-tailed, $n = 835$; computer: $r_s = .16$, $p < .001$, two-tailed, $n = 930$; mobile: $r_s = .26$, $p < .001$, two-tailed, $n = 343$).

Despite this apparent general trend, within-subject analysis was conducted to further investigate the reading behaviour of those who used eReading devices with that of their general reading frequency. Wilcoxon signed rank test was performed for each group who had access to eReading devices. The procedure showed that reading frequency on iPad/Kindle was statistically higher (Sum of ranks = 226,591.00, $n = 648$) than that of general reading, $T = 6,995.00$, $z = -21.74$ (corrected for ties), $N - \text{Ties} = 683$, $p < .001$, two-tailed. The same patterns were also observed for computer (Sum of ranks = 347,792.50, $n = 819$), $T = 3,748.50$, $z = -24.92$ (corrected for ties), $N - \text{Ties} = 838$, $p < .001$, two-tailed, and mobile phone (Sum of ranks = 42,197.50, $n = 285$), $T = 580.50$, $z = -14.67$ (corrected for ties), $N - \text{Ties} = 292$, $p < .001$, two-tailed.

While Spearman's rho results indicated a positive correlation of general reading pattern and that of eReading devices, subsequent three patterns from Wilcoxon tests pointed to higher reading habit on digital devices.

3.2 Impact of access to eReading devices on reading behaviour in daily readers

An investigation into the daily readers was therefore undertaken to analyse their reading habit on digital devices. This group of frequent readers is particularly of great interest, as examination of their habits can better illuminate the impact of access to each device on their reading habit, albeit, their reading preference. Table 8 below is useful in determining reading preferences based on frequency at general. As per Table 8, students who read books every day are underutilising devices to read, even when they have access to these devices.

Table 8. Percentage frequency of device use for reading book for daily reading students with access to

Reading frequency on devices	devices		
	iPad/Kindle %	Computer %	Mobile phone %
Never	43.5	62.2	55.8
Sometimes	43.0	28.1	28.3
Often	9.0	5.7	8.0
Every day	4.5	4.0	8.0

The total respondents were later stratified to extract daily readers who had access to all three devices - iPad/Kindle, computer, and mobile phone. This resulted in 93 respondents. A between-group Friedman ANOVA (related-sample test) was performed to investigate if their reading frequency on these three devices was different. The result showed there was a significant difference of the reading frequency across these three devices, $\chi^2_F = 35.43$, $df = 2$, $N = 93$, $p < .001$.

Follow-up pairwise comparisons using Wilcoxon Signed Rank test (with Bonferroni adjusted α of .017) indicated that reading frequency using iPad/Kindle (*Mean Rank* = 2.37) was statistically more than that of computer (*Mean Rank* = 1.83), $T = 258.50$, $z = -4.52$ (corrected for ties), $N - \text{Ties} = 54$, $p < .001$; and mobile phone (*Mean Rank* = 1.81), $T =$

163.00, $z = -4.65$ (corrected for ties), $N - \text{Ties} = 48$, $p < .001$. The difference between the reading frequency on computer and on mobile phone was non-significant, $T = 240.00$, $z = -.50$ (corrected for ties), $N - \text{Ties} = 32$, $p = .57$, and trivial ($r = .05$).

4. Discussion

4.1 *Impact of access to devices on reading behaviour*

This study investigated the reading behaviours of young readers relative to their access to eReading devices. Two types of reading pattern were analysed – reading frequency in general, and reading frequency on eReader devices, namely iPad/Kindle, computer, and mobile phone.

At aggregate level, reading frequency in general was positively associated with respondents' reading pattern on electronic devices. Those who read more in general tended to read more on digital devices than those who did not read frequently, which was anticipated, and reflective of overall reading frequency. However, when access to devices was factored in, it was found that reading frequency in general was not significantly contingent to eReading device access, with the exception of access to a mobile phone. There was evidence that access to a mobile phone is associated with less general reading frequency. This suggests that simply purchasing an eReading device is unlikely to result in increased reading, and that it is premature to suggest that eReaders are a preferred reading mode for children. In addition, it highlights potential issues around recreational time use that may emerge when equipping children with mobile phones, which warrant further investigation.

This finding is also consistent with a general trend that was discovered when general reading frequency was analysed together with the access to eReaders. While it could be assumed that more access to eReaders should improve reading frequency, this study finds the opposite. Our findings suggest that reading in general is less when children are given access to more digital devices, even when the devices in question have eReading capability.

4.2 Utilisation of eReading devices

This study also investigated if children with access to eReaders make full use of them for reading books. While the statistical analyses suggest those who read more in general also reported that they read more on digital devices across all eReader types, the reading frequency at the aggregate level suggests an under-utilisation pattern. This finding may be due to the multiple functions accommodated by many eReading devices, which enable readers to go online, browse and open other applications, enabling them to easily move off-task. Further investigation into the impact of device facilitation of off-task behaviour on reader's mode choices is indicated by this finding.

The daily reader group was found to prefer to read on iPad/Kindle rather than a computer or mobile phone. This was regardless of an aggregate trend which points to less preference for reading on eReading devices. As such, an iPad/Kindle (or perhaps tablet in general) appears to be more appealing to induce habitual reading than the other devices in the study. It also raises questions about ease of use; this preference could possibly be related to digital literacy, with children potentially finding it easier to read a book on these devices. Again, this emerges as an area for future research, as there are very few studies that investigate children's device preferences in relation to reading.

4.3 Limitations

A number of limitations apply to this study. For example, the research tools were designed to collect data on self-report, as this is constrained by respondents' perception and subjectivity. The data are not longitudinal, and as such, are only responsive to respondents' views at a single point in time. The post-pilot revisions that led to a more rigidly defined of eReading devices in response to student's confusion in this area also limited the scope of the findings. A greater range of device choices would have yielded richer data, however the issues that arose

in the pilot suggest that greater complexity in this area could have a detrimental impact on the validity of responses achieved from the young sample. In addition, the results are no doubt responsive to geographic, cultural and other contextual limitations. Future research using a qualitative approach could investigate children's perception of the relative advantages and disadvantages of reading modes, with closer investigation of the reasons for their mode choices. Once this qualitative research has been undertaken to provide a basis for quantitative investigation, a survey with greater depth in this area could be constructed. This research provides a strong basis for arguing the importance and relevance of this future research.

5. Conclusions

Our findings suggest that access to eReading devices does not appear to increase reading frequency, and in the case of mobile phone access, may in fact be associated with infrequency. As such the findings in this study contest a conceptualisation of young people as a homogenous group of Digital Natives that prefer to read screens, as previously explored. It is very likely that access to the digital devices, if left unsupervised, may lead to alternative recreational pursuits, rather than instilling a more frequent reading habit, though further research is needed in this area to determine if this is the case.

Further research is also needed to understand more about young people's attitudes toward recreational reading on devices. It would be particularly useful to further investigate why daily readers appear to be underutilising devices. While we might speculate that this may be due to a preference for paper books, a range of other factors could contribute, such as variable digital literacy inhibiting capacity for interacting with devices, lack of knowledge about how to access free online libraries, issues with WiFi connectivity, or a number of other factors.

In addition, in light of these findings, before children are encouraged to read on devices instead of paper books, further research into whether both modes offer equal literacy benefit needs to be conducted.

In spite of these findings, further analyses in this study reveal a promising trend, which can help parents or guardians to encourage reading habit among the early readers where paper book access is limited. Though still underutilising them, of the three device possibilities, daily readers preferred to read on an iPad/Kindle, suggesting that this may be the most appropriate device choice of those studied to mitigate access issues and promote reading frequency.

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Appendix 1

2 x 2 x 2 ANOVA

Descriptive Statistics

Dependent Variable: reading frequency (item 4)

Do you have an iPad or a Kindle in your home?	Do you have a computer in your home?	Do you have a mobile phone?	Mean	Std. Deviation	N	
Yes	Yes	Yes	2.8938	.91889	292	
		No	3.1022	.84524	499	
		Total	3.0253	.87836	791	
	No	Yes	Yes	2.7500	1.16496	8
			No	3.0690	.88362	29
			Total	3.0000	.94281	37
		Total	Yes	2.8900	.92416	300
			No	3.1004	.84656	528
			Total	3.0242	.88075	828
No	Yes	Yes	2.7273	.91079	33	
		No	3.1919	.80403	99	
		Total	3.0758	.85267	132	
	No	Yes	Yes	2.6667	1.03280	6
			No	3.4167	.79296	12
			Total	3.1667	.92355	18
		Total	Yes	2.7179	.91619	39
			No	3.2162	.80233	111
			Total	3.0867	.85872	150
Total	Yes	Yes	2.8769	.91806	325	
		No	3.1171	.83857	598	
		Total	3.0325	.87445	923	
	No	Yes	Yes	2.7143	1.06904	14
			No	3.1707	.86320	41
			Total	3.0545	.93131	55
		Total	Yes	2.8702	.92354	339
			No	3.1205	.83958	639
			Total	3.0337	.87726	978

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Highlights

- Children underutilised devices for recreational book reading, even when daily book readers.
- Reading frequency was less when children had access to mobile phones.
- Reading in general was less when children were given access to more digital devices.

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