How do you read?

Perceived differences in reading fiction from e-readers and printed books

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Version 1

Abstract

Introduction: Different parties raise concerns about how digital innovations in reading influence reading behaviour and the individual development. Earlier research indicates that reading is a concept that has been undergoing changes throughout history. **Objective:** Thus, this thesis investigates the dynamics of reading when reading fiction from e-readers compared to printed books. Six concepts have been picked to research more closely: Fluency, Reading Speed, Goals, Haptics, Immersion, and Enjoyment. **Method:** An online survey was sent out for participants to fill in. Scales are based on existing research and have been adjusted after conducting a factor analysis. Hypothesis testing was done, followed by a simple linear regression for each concept measured. **Results:** Results of hypothesis testing are significant and lead to rejecting the null hypotheses. However, the results of all linear regressions have been statistically insignificant, so nothing can be said about the directions and sizes of the relationships based on this study. **Conclusion:** There are differences in reading fiction from an e-reader compared to a printed book. The reading device does not influence any of the six concepts alone. This study fails to make concrete arguments supporting or rejecting any existing theory. **Limitations:** Though there are several limitations to this study, the biggest limitation is the sample that is not representative of second generation digital natives as the targeted group. Results should therefore be treated with caution. **Future Research:** Future research could try to set up more accurate models that explain the concepts investigated in this study. Overall, reading fiction in relation to emerging technologies is severely understudied, so any new piece of knowledge would contribute to the body of literature on the topic.

Keywords: reading, fiction, printed books, e-readers, digital natives

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1. Introduction

> My favourite thing about reading a good book is when I a*ctually forget* that I'm reading it. When I devour words without really being aware of it. When I'm so lost in the world I'm reading about that I forget I'm *not actually there*. I hear the voices instead of reading them, I feel the emotions instead of imagining them, I know characters so well that I forget that they're only words on paper.
>
> I love and hate, I cry and laugh at *paper and ink*. This is the weirdest and the most beautiful thing I have *ever* experienced (Awesome Librarians, 2023).

Many readers might recognize themselves in what Instagram user @awesomelibrarians is describing. Reading can be an activity that lets the reader sink into a fictional world and make the real world disappear. It can wake emotions, it can make people feel like they belong and sent them on adventurous quests. Unsurprisingly, reading therefore is a topic that admittedly has been studied a lot. However, it looks as if interest in the area has declined recently as less studies have been published, especially in the context of new media. In a 2017 literature review, the authors have included merely 36 articles from the years 1992 to 2017 that lived up to their expected standards and even those few articles lack important aspects according to the researchers (Singer & Alexander, 2017). They identify that one often missing factor is a definition of the term reading. While most people probably have an intuitive understanding of what it means, current literature concerned with (digital) reading has also proposed many distinguishable definitions. Thus, for this study, it is crucial to define what is meant by the term 'reading'. Hillesund et al. (2022) define reading "as a mental act of meaning-making that is partly grounded in a multitude of sensorimotor and social experiences" (p. 3). Following this definition, reading is more than the simple understanding of words (Singer & Alexander, 2017). Rather, this study also understands reading as an activity that is done for pleasure (Schwabe et al., 2021) with the exemplary goal of escaping reality (Green et al., 2004; Thissen et al., 2021). This is directly related to what the Instagram user has described in their post. Hillesund (2010) agrees that reading is an action done with purpose but also adds that the execution of it is dependent on the goal and technology with which it is read. Summarised this means that reading is an activity with the goal

of experiencing something positive, that stimulates the brain, but the meaning-making is dependent on the reader, their (cultural) environment and the reading device used. This is definition of 'reading' that the thesis will use.

Using the proposed definition therefore makes it necessary to look into how certain dynamics of reading change when this is executed through different media, namely printed books and e-readers. What this thesis can do as a first step is to pose and answer different questions to establish if there is a valid reason to be concerned about the effects that digital reading has. Studies so far have focused mostly on differences in comprehension between reading a physical and digital book (Singer & Alexander, 2017), on reading from computer screens compared to reading from printed books (Hillesund, 2010; Jabr, 2013; Mangen, 2016) and on differences in the educational and scholarly setting (Evans, 2017; Jabr, 2013; Mangen, 2016; Singer & Alexander, 2017), but not on reading fiction simply for pleasure. Therefore, the main research question addressed by this thesis is:

RQ: What are the dynamics between reading a fictional text from an e-reader or a printed book?

In order to investigate this question, several hypotheses are being posed:

HA1: Perceived reading speed and the perceived level of comprehension differ when reading fiction on an e-reader compared to a printed book.

HA2: Readers perceive their handling of the reading device differently when reading fiction on an e-reader compared to a printed book.

HA3: The goal of immersive imaginary reading is not the same when reading on an e-reader compared to a printed book.

HA4: The level of perceived immersion differs when reading fiction on an e-reader compared to a printed book.

HA5: Perceived media enjoyment differs when reading fiction on an e-reader compared to a printed book.

In the following paragraph, different findings of research in the field are introduced which build the basis for hypotheses that are being posed. By finding answers to the sub questions, this thesis hopes to be able to make a solid statement for the main research question that could hopefully help to better understand the relationship between reading fiction and the device used for this. The paper goes on by explaining the methods used for this study and its results before discussing those. The thesis will end with concluding the findings.

2. Theoretical Framework

2.1. Fiction

Investigating conducted research makes clear that there are many areas that have barely been touched upon. One of those areas is reading fiction on different devices. Previous studies have investigated reading on different devices in the educational and scholarly setting (Evans, 2017; Jabr, 2013; Mangen, 2016; Singer & Alexander, 2017) already rather extensively, but the topic of reading fiction so far has been neglected, especially in the context of how it differs per reading device. Oatley (2012) defines that fiction is a "narrative about human (or human-like) agents' intentions in their interactions with others, and how these intentions meet vicissitudes" (p.1). That makes the main purpose of fiction entertainment and puts focus on waking the consumer's emotions (Oatley, 2012). Reading fictional works specifically is said to positively contribute to the enhancement of an individual's social skills and imagination (Samur et al., 2021). Scholars have proven that readers of fictional works score higher in empathy (Green et al., 2004; Hammond et al., 2023; Oatley, 2012; Oatley & Johnson-Laird, 2014) and sympathy (Busselle & Bilandzic, 2009; Mangen, 2016). Essentially this means that readers of fiction have found to be better in understanding and relating to others' emotions and intentions (Oatley & Johnson-Laird, 2014; Van der Kleij et al., 2022). Research has further suggested that expert readers, so readers that are trained in reading because they read a lot, score better on social abilities, compared to non-fiction readers (Fåhraeus, 2020; Oatley & Johnson-Laird, 2014). Reading fiction can therefore be essential to individuals' developments.

2.2. Reading as a dynamic process

Talking about different reading devices, especially literary circles show themselves concerned about the use of digital media for reading. Digital screens, unlimited access, and the more limited attention span of digital natives change the way people read texts. Printed books and paper flyers are not the only options for reading anymore. In modern times, people have many different options to access texts, for instance via laptops, tablets, or smartphones. In fact, e-readers are the digital equivalent to printed books. Though the market revenue of e-readers worldwide is expected to drop by 2027 (Research and Markets, 2022), the number of e-book readers is anticipated to rise in the same timeframe (Statista Digital Marketing Insights, 2023). Criticism that comes with developments of these kinds of human-technology interactions is nothing new. Throughout history different developments in reading have always been criticised. The understanding of reading nowadays is highly distinctive from the one people had in the past (Hillesund, 2010). This illustrates that reading is not a static concept, but rather a term of which humankind's understanding that has developed over time and will continue to do so. Nonetheless, concerns should be taken seriously and researched in order to understand in which direction this development will go.

2.3. Why is it important how people read?

As mentioned in chapter 2.2., there are several voices stating their concerns about the digital developments in reading. One of those voices comes from Maryanne Wolf who lays out some potential dangers digital reading brings with itself. In her book "Proust and the Squid" (2007), she states, for instance, that reading is nothing humans are doing naturally. Rather, reading must be learned in an early age, children need to develop the relevant brain connections in order to do so (Jabr, 2013), they must develop a 'reading brain' (Wolf, 2007). The more trained a reader is, the faster the processes of making meaning, reflection, and forming an opinion occur (Hillesund et al., 2022; Jabr, 2013). Furthermore, when reading print readers also store the read information differently in their brain, compared to when reading something in a digital environment. When information is stored that way, the reader builds a personal library from which they can retrieve information at any time. Reading digitally is said to hinder the development of these processes, the brain capacity gets

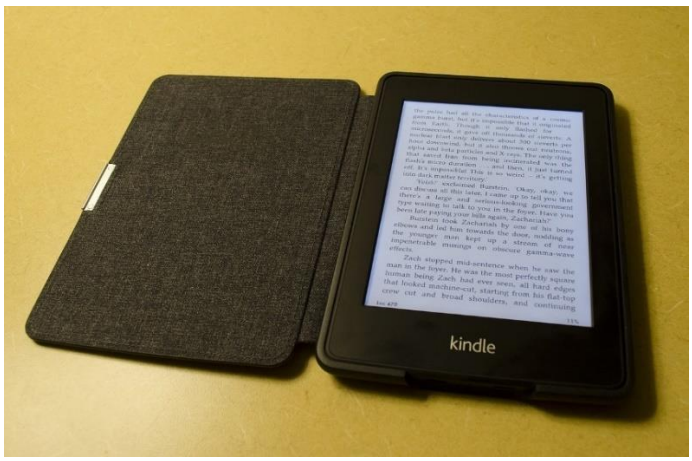
underdeveloped (Jabr, 2013; Wolf, 2007). This fear is especially true for younger generations that are just learning how to read and other so-called 'incompetent' readers (Hillesund et al., 2022; Wolf, 2007), those are people that suffer from impairments that influence their reading ability. According to Wolf (2007), the rise of digital reading might therefore lead to (negative) consequences in brain development.

2.4. Books and e-readers

In order to be able to investigate possible dynamics between printed books and e-readers, this paper needs to explain how these terms are used. Printed books are defined as "a set of written, printed, or blank sheets bound together between a front and back cover" and "a long written or printed literary composition" (Merriam-Webster, n.d.). Similarly, the online dictionary Merriam-Webster defines an e-book as "a book composed in or converted to digital format for display on a computer screen or handheld device" (n.d.). When talking about a digital device, this thesis refers to specific e-book readers, such as Amazon's Kindle, the Tolino e-reader, PocketBook, or Kobo Libra. E-readers are designed to be as similar as possible to printed books, as their only purpose is literally to allow the user to read texts on them (Hillesund, 2010; Schwabe et al., 2021). This is mirrored in the technological affordances of the device, for instance the visibility on the screen is aimed to behave like paper, so that the reader's eyes get less strained (Hillesund, 2010; Schwabe et al., 2021). Reading on an e-reader therefore is said to be very similar to reading a printed book.

Figure 2.1.

Amazon's Kindle as an example of an e-reader



2.5. Measurable Differences

Though e-readers are designed to behave like printed books, there are some undeniable differences. Early research in the field found that people do actually read slower from screens, while current research indicates that people reading digitally tend to read faster than people reading a printed version of a text. This contrasting development seems to stem from the technical development of devices and the development of the digital reality of people themselves, suggests Jabr (2013). Research has found that reading from a screen persuades the reader to rather scan the text and look for keywords, rather than reading with full focus (Hillesund, 2010; Jabr, 2013; Mangen, 2016). This leads to a more shallow processing of the text and allows distractions to occur easier (Hillesund, 2010; Jabr, 2013; Mangen, 2016; Singer & Alexander, 2017). On the other hand, there are also other voices claiming that reading performances in terms of comprehension and speed do barely depend on the reading medium, but rather on how trained the reader is and this should be taken into account more (Hillesund et al., 2022; Schwabe et al., 2021). Referring to other research, Schwabe et al. (2021) claim that "for skilled readers, there does not seem to be a difference in reading speed on a computer screen or an e-reader compared with reading the same text in print" (p. 4). Overall, there is no consensus about how reading speed and comprehension differ when reading on different media. Because of that, one answer this thesis aims to find is if reading speed and comprehension are in fact influenced by the used reading device.

2.6. Let's get physical

It is rather obvious that e-readers and printed books are not the same in terms of looks, shapes, and weight. While printed books require the reader to flip pages and touch the paper, e-readers merely rely on subtle finger tips to function. Hillesund (2010) and Mangen (2008) claim that this physical handling of a text has often been ignored as basis for reading research. Mangen (2008) further expresses that the handling of a text is crucial to its experience and makes the point that reading is a multi-sensory experience, an action that depends on more than only one sense to be understood. According to her, physical books hold benefits that digital devices cannot deliver equally up until today. In her studies, Mangen (2008; 2016) focuses on the haptics of reading, meaning how the body,

and especially the hands and fingers, are used during reading, meaning the physical interaction with the reading device. This behaviour significantly differs when reading print or digital, even though the body-medium-interaction mostly happens subconsciously. She (2008) argues further that the use of those body parts allows the reader to dive deeper into a story and allow for a richer experience. In her opinion, reading physical books is better in the sense that it allows for more closeness between the reader and the story due to feeling and touching the actual book. Different devices can at the same time be similar and hold very different affordances (Hillesund et al., 2022; Mangen, 2008), though the reader does normally not actively realise how they are handling the reading device when reading (Hillesund et al., 2022). A printed book, for instance, is 'visible and tangible' (Hillesund et al., 2022) and the text is forever printed on the pages in a way that cannot be changed without those changes being obvious, while for digital media the physical appearance of a text can change, it is somewhat 'intangible' (Hillesund et al., 2022; Mangen, 2008). In line with that, it is argued that the handling of a digital text would create a bigger distance between the reader and what they are reading (Hillesund, 2010; Hillesund et al., 2022), because digital devices do barely appeal to the sense of touch. Based on this argumentation, this study aims to find out if readers perceive differences in handling their reading device when reflecting on it.

2.7. Down the rabbit hole

Distance between the reader and a text is argued to be a disadvantage when it comes to immersion (see Chapter 2.6.). Immersion is the extent to which a reader gets transported into a narrative (Busselle & Bilandzic, 2009) and seems to be the goal for many readers (and media consumers in general) (Green et al., 2004). It is somewhat unclear how much the concept of immersion has been studied until now, as different researchers use different terms in order to describe very similar concepts (Fåhraeus, 2020). Other terms used to describe very similar phenomena as immersion are for instance transportation, flow, or narrative engagement (Busselle & Bilandzic, 2009; Fåhraeus, 2020; Pianzola et al., 2021; Thissen et al., 2021). Broadly, all of them refer to the same thing: the identification of the reader with characters in the story and the extent to which the reader feels like being part of it (Busselle & Bilandzic, 2009; Fåhraeus, 2020; Hillesund, 2010; Samur et al., 2021). On top of that,

immersion goes hand in hand with the feeling of being disconnected from the real world (Busselle & Bilandzic, 2009; Fåhraeus, 2020; Green et al., 2004; Hammond et al., 2023; Hillesund, 2010; Samur et al., 2021) and experiencing a feeling of time loss (Busselle & Bilandzic, 2009; Fåhraeus, 2020; Green et al., 2004). Fåhraeus (2020), Hillesund (2010), and Thissen et al. (2021) further argue that expert readers are more likely to experience a high level of immersion, therefore the reading skills of the reader seem to be relevant as well. According to Thissen et al. (2021), immersion is most likely to occur when the reader's skills match the reading challenge. Additionally, the reader should under no circumstance be aware that they are involved in that phenomenon at the time being (Busselle & Bilandzic, 2009; Green et al., 2004: Hammond et al., 2023). They should be focused on the story without realising it. One big threat to immersion is distraction in any way that takes the focus away from following the story (Busselle & Bilandzic, 2009). Given this threat occurs, readers are more likely to respond negatively to the read (Fåhraeus, 2020; Green et al., 2004). Therefore it is important to also assess the fluency of the reading process. If reading is disturbed, immersion is hindered. In conclusion that means that fluency of reading would only allow immersion to occur. Still, immersion is seen to be a dynamic process, meaning that the level of immersion may change over time (Hammond et al., 2023; Hillesund, 2010). When immersion is successful, results for the reader are "enjoyment, persuasion, and social reality construction" (Busselle & Bilandzic, 2009, p. 2). Therefore, the experience of immersion is said to be a generally pleasurable experience (Thissen et al., 2021). Additionally, immersion is said to support the development of so-called social-emotional skills in the long run (Samur et al., 2021). Different studies have already looked at how immersion differs for printed and digital reading. According to Schwabe et al. (2021), the reading medium might be irrelevant once immersion occurs, however, the reading medium might only allow immersion to happen. Hillesund (2010) argues that a reader can practice different kinds of reading that either might promote immersion or not. He further argues that "ways of reading are partly conditioned by text technologies" (p. 1), so there is a relation between text materiality and the kind of reading. Generally, the reading of novels can be considered what Hillesund (2010) calls 'immersive imaginary reading', so being immersed in the fictional world. On the other hand, Hillesund found that digital reading hinders immersion. Curiously though, e-readers pose a contradiction to this. Based on his findings,

Hillesund (2010) concludes that e-readers well allow immersion to happen. Questions resulting from this chapter are if readers read printed books and e-readers with the goal of reaching immersive imaginary reading, if distraction is more likely to occur when using a specific reading device. and if the level of immersion differs per reading device. The thesis aims to investigate this.

2.8. Media enjoyment

Oftentimes, media are also consumed in order to influence the consumer's mood. That is to no surprise when taking into account the claim made by Busselle & Bilandzic (2009) that one result of immersion is 'enjoyment', as mentioned in chapter 2.6. Several studies have looked into the concept of media enjoyment (Busselle & Bilandzic, 2009; Green et al., 2004). Once a consumer enjoys a certain story, their mood might be enlightened and they might aim for the same experience in the future (Green et al., 2004). In their earlier research, Green & Brock (2000) find that enjoyment can specifically be achieved by immersion in a fictional world, as a general result of media consumption. In the reading context specifically, it is claimed that no immersion can reduce media enjoyment (Green et al., 2004), while immersion generally enhances enjoyment (Busselle & Bilandzic, 2009; Samur et al., 2021). Furthermore, Green et al. (2004) explain that enjoyment is not dependent on the genre of the consumed media, but rather that it depends on the degree of immersion and 'transformation', 'connections with characters' and 'making experiences'. When immersed in a story, the reader goes through feeling different emotions. Linking to 'connection with characters', Oatley & Johnson-Laird (2014) go so far and claim that those emotions felt during the reading process are not the character's emotions, but the ones of the reader, woken by feeling empathy with the fictional character. This way, the reader adopts the characters' emotions as their own. Mar et al. (2011) plead that emotions do not only arise in the reader during the reading process, but that reading fiction can influence the reader's emotions still after they finished reading. However, the desired state of immersion and sharing emotions with characters might not be reached when the reader's immersion is disturbed, for example by being a non-fluent reader, poor writing or grammar in text (Green et al., 2004), again referring to the fluency of the reading process. Evans (2017) agrees with this finding. In her study, participants who could read without any distractions reported higher levels of enjoyment.

Curiously, she also found that reading printed books seems to be more associated with reading in a calmer, thus less distracting environment. This might be because e-readers are more easily taken anywhere, for instance into the school bus, an environment that could be considered to be highly distractive (Evans, 2017). Those findings beg the question if media enjoyment differs when reading a printed book compared to an e-reader.

3. Methodology

3.1. Design

In order to yield answers to the research questions, a self-administered online survey was designed. A survey is argued to be a good fit for the descriptive nature of the study conducted. Surveys give flexibility in analyses and make reaching larger sample sizes more realistic than other data collection methods (Babbie, 2015, Ch. 9). Self-administration in the survey makes this method 'cheap and quick' for data collection, while online surveys are also "particularly appropriate for certain targeted groups" (Babbie, 2015, Ch.9), in this case digital natives. Additionally, standardized questionnaires have the advantage of gaining the same replies (in terms of answers to the same questions) from participants. The survey starts off with an informed consent form that participants should agree to. If they agree to the stated terms, they get forwarded to questions about their demographics and general questions about their reading behaviour and what reading devices they favour. Included in the demographics is a question asking if the participant is suffering from any intellectual impairments that might influence their reading behaviour. Responses that say 'Yes' are excluded from the analysis. The same goes for respondents that are not reading their current book in a language they are fluent in, as both of these criteria do not allow the reading process to go smoothly. Further, respondents significantly older than 30 are excluded from the survey, as they are not second generation digital natives (Joiner et al., 2013). For people older than that it is assumed that they feel more uncomfortable using digital devices what might bias their responses. The survey then presents six self-developed scales that are based on existing research. Some items have been directly copied (Item Fluency_1 'Reading this story went smoothly and fluently for me.' (Thissen et al., 2020)), while others have been adapted (Item Haptics_1

‘Holding an e-reader feels unpleasant.’ (adapted from Gerlach & Buxmann, 2011)) or completely made up by the researcher herself (Item Haptics_3 ‘I enjoy flipping the pages of a printed book.’). The participant is supposed to rate the given statements on a 7-point-Likert-scale for getting results in standardized response categories and in ordinal measures (Babbie, 2015, Ch. 5, 6). Once the participant completed the survey they receive a ‘Thank you for participating’-message.

Before analysing the data, a factor analysis is done in order to test the developed scales and if there are ‘predominant patterns’ appearing (Babbie, 2015, Ch. 16). Using null hypothesis testing on the gained data, this research aims to clarify if current theories could be verified on the quantitative scale or if there are no perceivable differences in reading from an e-reader or a printed book (Babbie, 2015, Ch. 2). Regression models follow in order to identify how big the effects of the independent variable are on the dependent variables (Babbie, 2015, Ch. 16), given the results of the null hypothesis testing lead to a rejection of the null hypotheses. With a full multivariate multiple regression model this research can point out the strength of effects that reading fiction from an e-reader compared to a printed book has on several dependent variables.

3.2. Pre-test I

The online survey was pretested among 11 participants (4 females, 7 males) with an age range from 20 to 33 to assure quality and prevent errors (Babbie, 2015, Ch. 9). Pre-testers indicated that the length of the original survey could be slightly reduced. Additionally, some items sounded too similar and for some of them it was difficult to understand how they should be answered. For example, the item ‘Language’ was ‘Are you reading this book in your mother tongue or a language you’re fluent in?’ during pre-testing. The majority of the pre-testers had a preference for the slider in a 7-point-Likert-scale, rather than rating items in a matrix set-up. Based on this, some modifications were made. All six scales are to be answered using the slider on the Likert-scale. The slider was labelled ‘1 – strongly disagree, 4 – neutral, 7 – strongly agree’. Items were rephrased to enable instant understanding and spelling mistakes have been fixed. For instance, the item ‘Language’ has been rephrased to ‘Are you reading this book in a language you’re fluent in?’. To the questions whether participants are having an intellectual impairment that influences their reading ability, the possibility

to reply with ‘Prefer not to answer’ was inserted. Additionally, a control question was added to see whether participants have ever used an e-reader. In line with this, the possibility to answer with ‘Not applicable’ was added to the relevant scales measuring Reading Speed and Haptics. In the original survey, 56 items arranged in six scales were included, as well as demographics and information about the general reading behaviour of the respondents. Using RStudio, Cronbach’s Alpha for all of the scales was tested. Already in the first round, the values of alpha ranged from 0.66 to 0.92, so they would have been overall acceptable. Since pre-testers had indicated that a shorter survey would be preferable, the scales have been shortened in a way that alpha would slightly improve. New alpha values range from 0.79 to 0.9 (see Appendix A) which is very good, according to Tavakol & Dennick (2011). The new survey consists of 36 items in six scales, excluding demographics and questions about reading behaviour (see Appendix B).

3.3. Data collection

For collecting data, participants have been recruited in several different ways, resulting in nonprobability sampling (Babbie, 2015, Ch. 7). The researcher approached people personally on the campus of the University of Twente and via social media (WhatsApp, Instagram, and Facebook). Additionally, posters about the research with a QR-code to the survey have been distributed and hung up in several (mostly cultural) association rooms on the campus (see Appendix C). More participants have been reached by posting the link to the survey in some subreddits (r/SurveyCircle, r/SampleSize, r/takemysurvey) and by the researcher participating in survey exchange groups on Facebook (Dissertation Survey Exchange, Find Participants | Thesis/Dissertation Survey Exchange, Students Questionnaires Survey, Survey Exchange, Survey Exchange / Survey Group / Survey Participants – Dissertation, Thesis). Anyone qualifying to be a second generation digital native (Joiner et al., 2013) was allowed to answer the survey, regardless of their location. The survey was opened at June 1st, 2023 and closed on June 23rd, 2023 when it had 196 responses in total. The received data was downloaded and secured on a separate device.

3.4. Cleaning the data

Using RStudio, the researcher cleaned the data and modified the dataset by quantifying the data (Babbie, 2015, Ch. 14) and recoding reverse coded items (Reading Speed_1 'I think I read fictional e-books on average faster than printed fictional books.', Reading Speed_3 'I feel that it takes me more time to read printed fictional books.', Haptics_8 'I like to not have to flip pages'). After removing unfinished responses, respondents that stated that they had an impairment affecting their ability to read, respondents that are not reading their current book in a language they fluently speak, the sample size was $N = 139$.

3.5. Pre-test II

Before running the actual analysis, an exploratory factor analysis was conducted in order to see if the previously established scales would prove to not overlap with each other. This was a question raised after the first round of pre-testing. According to Babbie (2015, Ch. 16), a factor analysis is "an efficient method of discovering predominant patterns among a large number of variables" (pp. 473). The correlation matrix (Appendix D), the Kaiser Meyer Olkin measure (overall KMO = .83), and Barlett's sphericity test ($p = 0$), computed with RStudio, showed that the items were fitting for a factor analysis (Bartlett, 1954; Kaiser, 1974). Based on the scree plot (Appendix E) and a parallel analysis (Appendix F) suggested that the items would measure six different factors (Cattell, 1966; Horn, 1965). The resulting factor loadings of items determine which items would form a scale together (Babbie, 2015, Ch. 16).

3.6. New factors

Based on the outcome of the factor analysis, some items needed to be redistributed (Table 3.6.). Factor 1 combines the items originally measuring 'Reading Speed' together with three items from the initial 'Haptics'-scale, which are about disliking the handling of an e-reader. Therefore, the results of Factor 1 are not only to be interpreted in terms of reading speed and depth of understanding, but Factor 1 also takes into account individuals' discomfort with handling an e-reader. Factor 2 combines the original five items of 'Enjoyment' with three items from the 'Immersion'-scale. Those items from the 'Immersion'-scale refer to empathy, and the connection the reader forms with characters in the

story. Therefore, Factor 2 does not merely measure enjoyment, but rather the influence reading has on the reader's emotions. This is in fact in line with the argumentation of Green et al. (2004) and Oatley & Johnson-Laird (2014) who state that enjoyment is also dependent on connections with characters. Five of the original eight items of the 'Haptics'-scale combine into Factor 3, which still refers to the handling of the reading device. It is, however, important to be aware that the remaining five items are hinting to advantages of printed books, so Factor 3 does only look at the handling of printed books, rather than actually being able to give a comparison of the perception of the handling of printed books and e-readers. Factor 4 includes all six items from the original 'Goals'-scale. The factor therefore still refers to the goal of reading fiction for escaping reality, as Hillesund (2010) calls it 'immersive imaginary reading'. Factor 5 keeps all five items from the block 'Fluency' together. It still describes how fluent participants perceive their reading process to go. The original scale measuring the concept of immersion has been split. Factor 6 combines items 'Immersion_3', 'Immersion_4', and 'Immersion_6'. Those three items measure the detachment from the real world during the reading process. For that reason, they only measure part of what immersion is defined to be. Factor 6 is lacking the emphatical component, the connection to the characters, as Busselle & Bilandzic (2009) and Fåhraeus (2020) would argue. This needs to be kept in mind when using Factor 6 for making a statement about HA4.

Table 3.6.

Distribution of items onto factors after exploratory factor analysis

Factor and corresponding items	Factor loading
Factor 1 – Perceived reading behaviour	
Reading Speed_1 - I think read fictional e-books on average faster than printed fictional books. (*)	.87
Reading Speed_2 - I think I read printed fictional books on average faster than fictional e-books.	.92

Reading Speed_3 - I feel that it takes me more time to read printed fictional books. (*)	.84
Reading Speed_4 - I feel that it makes me more time to read fictional e-books.	.92
Reading Speed_5 - I feel that I read faster but with a more shallow understanding in fictional printed books.	.47
Reading Speed_6 - I feel that I am able to embrace the story world better when reading a fictional printed book.	.7
Haptics_1 - Holding an e-reader feels unpleasant. (adapted from Gerlach & Buxmann, 2011)	.67
Haptics_2 - Holding an e-reader feels artificial. (adapted from Gerlach & Buxmann, 2011)	.6
Haptics_8 - I like to not have to flip pages. (*)	.52
Factor 2 – Influence on emotions	
Immersion_1 - It was like looking through the eyes of the characters. (adapted from Koppman, 2015)	.53
Immersion_2 - I started to feel the same emotions as the characters. (adapted from Koppman, 2015)	.54
Immersion_5 - Things which normally occupy me disappeared from my thoughts while reading. (Thissen et al., 2020)	.5
Enjoyment_1 - Sometimes I feel like I've almost "become" a character I've read about in fiction. (Miall & Kuiken, 1995)	.43
Enjoyment_2 - Reading put me in a pleasant state. (Thissen et al., 2020)	.55
Enjoyment_3 - I liked reading the story. (Thissen et al., 2020)	.84
Enjoyment_4 - I would have liked to continue reading the story. (Thissen et al., 2020)	.81
Enjoyment_5 - Reading the story made me feel good.	.61

Factor 3 – Advantages of printed books	
Haptics_3 - I enjoy flipping the pages of a printed book.	.9
Haptics_4 - I like the feeling of a printed book.	.92
Haptics_5 - I am irritated when I do not feel the weight of a book.	.49
Haptics_6 - I keep track of my reading process by seeing how thick the stack of pages still to read is.	.72
Haptics_7 - I like the touch of paper.	.88
Factor 4 – Goals (Immersive imaginary reading)	
Goals_1 - Reading literature is a pleasurable way to spend time when I have nothing else to do. (Miall & Kuiken, 1995)	.79
Goals_2 - Reading a story is a wonderful way to relax. (Miall & Kuiken, 1995)	.81
Goals_3 - I find that reading literature is a great help in taking my mind off my own problems. (Miall & Kuiken, 1995)	.69
Goals_4 - I like to become so absorbed in the world of the literary text that I forget my everyday concerns. (Miall & Kuiken, 1995)	.76
Goals_5 - I like to connect to the characters. (based on Green, Brock, & Kaufman, 2004)	.54
Goals_6 - I like making experiences I would usually not make. (based on Green, Brock, & Kaufman, 2004)	.44
Factor 5 – Fluency of reading process	
Fluency_1 - Reading this story went smoothly and fluently for me. (Thissen et al., 2020)	.73
Fluency_2 - I had an immediate connection to the story while reading. (Thissen et al., 2020)	.78
Fluency_3 - I naturally slipped into the story while reading. (Thissen et al., 2020)	.72

Fluency_4 - While I was reading, I intuitively understood the story. (Thissen et al., 2020)	.76
Fluency_5 - I had no problem to follow the story while reading. (Thissen et al., 2020)	.57
Factor 6 – Detachment from real world	
Immersion_3 - While I was reading, I hardly took notice of what was going on around me. (Thissen et al., 2020)	.68
Immersion_4 - I was completely oblivious while reading. (Thissen et al., 2020)	.75
Immersion_6 - I lost the sense of time while reading. (Thissen et al., 2020)	.53

Note: Items marked with (*) are reverse coded.

3.7. Analysis

Based on their factor loading, the items of the scales have been combined in order to get a combined value for the factors that were measured. Null hypothesis testing was done in order to test all stated hypotheses. Reading on an e-reader versus reading a printed book was used as the independent variable. The dependent variables were Factor 1, Factor 2, up to Factor 6 respectively. For each factor a two-sample *t*-test, ultimately a Welch two sample *t*-test, was conducted, as population variances are assumed to not be equal (Welch, 1938). Finally, post hoc (Van den Berg, 2020, Ch. 11) simple linear regressions have been run in order to test the relationship between the variables.

4. Results

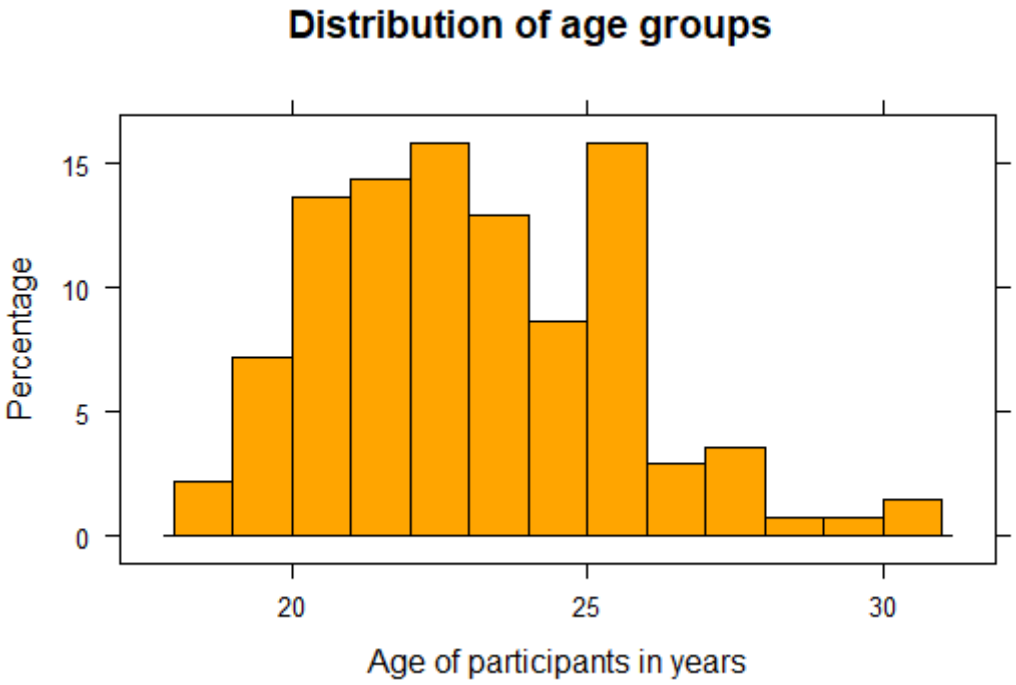
4.1. Demographics

The first action when analysing the obtained data was to look at the demographics. Age of participants ranged from 19 to 31 years (see Figure 4.1.). Of all participants (N = 139) whose data was used 99 (71.22%) of participants are female, 36 (25.9%) male, and three (2.22%) non-binary. One

(0.72%) participant preferred to not answer the question. Of the participants 40 (28.78%) were German, 47 (33.81%) were Dutch, and 52 (37.41%) indicated that they came from other countries all over the world, for instance Denmark, France, South Korea, or the United States.

Figure 4.1.

Distribution of age groups of survey participants in a histogram

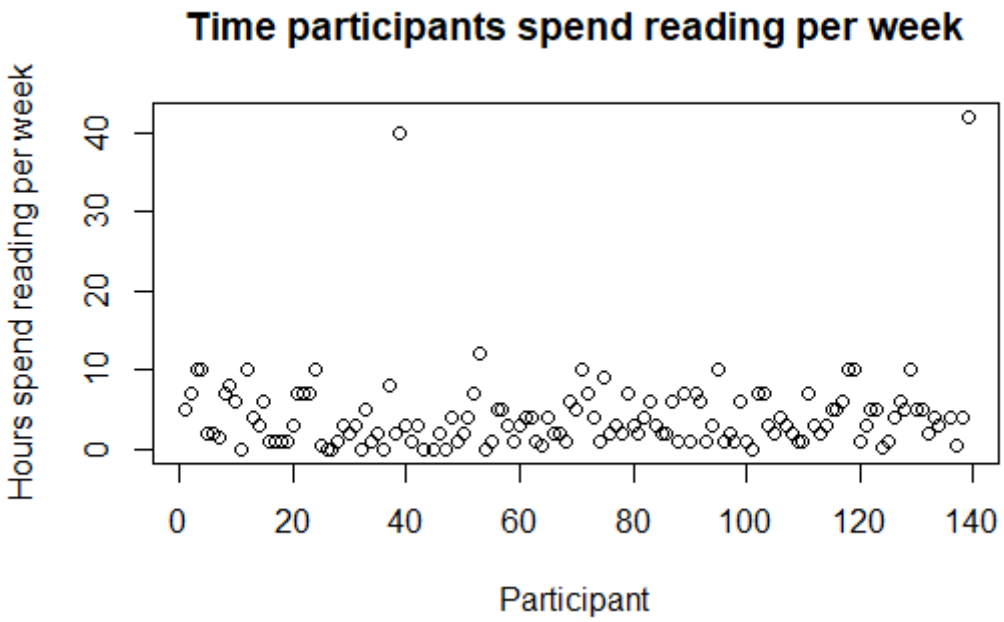


4.2. Reading behaviour

Further, a closer look was paid to the questions about reading behaviour. 103 (74.1%) of the participants indicated that they usually practice reading as a hobby. The values of hours spent reading per week ranged from 0 to 42, where 40 and 42 are extreme outliers (Figure 4.2.). The next highest value is 12 hours per week. With 16.79%, most people (*n* = 23) indicated to spent about one hour per week reading. The mean lied at 4.27 hours per week. Interestingly, 95 participants (68.35%) still expressed that they consider themselves to be an expert reader (Fåhraeus, 2020). Almost half of the participants (*n* = 68, 48.92%) had never used an e-reader. The replies to the item ‘Media - How do you

Figure 4.2.

Time participants spend reading per week on average in a scatterplot



usually consume fictional stories?' clearly indicates that printed books are still the most used medium for reading fiction (*n* = 126, see Appendix G). Interestingly, smartphones rank second highest, while e-readers land on the third rank. When indicating with which medium they feel most comfortable when consuming fiction (Item 'Comfortable'), most participants again chose the printed book (*n* = 120, see Appendix G.). However, here the e-reader ranks on second place, though there is a clear gap between their counts (*n* = 24). In total, about 95.24% of participants that indicated that they usually consume fictional stories as printed books also feel most comfortable with that medium. Similarly, 70.59% of the e-reader users felt most comfortable with using that device for reading.

4.3. Medium of the current read as the independent variable

Before judging their perceived reading experience, participants were asked to state their current read (or their last read in case they were not reading anything at the moment they took the survey) and which medium they were using to consume the story. The predominant genre of current reads were fantasy stories (30.22%), followed by romance (15.1%) and crime/thriller (12.94%). Only 18% of

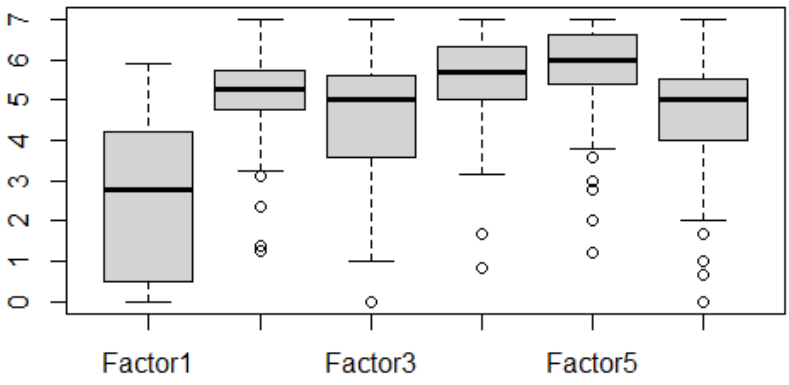
survey respondents currently read an e-book (n = 25). Consequently, 82% read the printed version of the book (n = 114). This independent variable 'Print_Ebook' is dummy coded (1 = printed book, 0 = E-book, M = 0.82, SD = 0.39).

4.4. Descriptive statistics of the factors

Next, the factors have been investigated, looking at the minimum, maximum, median, and standard deviation (Appendix H). As the items for the factors have been measured on a 7-point Likert scale, minimums and maximums could generally range between zero and seven. Overall, Factor 5 shows the highest mean (M = 5.8, SD = 1.05). In general, the means indicating the central tendency of the data (Van den Berg, 2020, Ch. 1) all focus on the same approximate area of a mean between 4 and 5.5 (Factor 4: M = 5.58, SD = 1.04; Factor 2: M = 5.22, SD = 0.97; Factor 6: M = 4.72, SD = 1.36; Factor 3: M = 4.3, SD = 2.02) with Factor 1 being an outlier. It has the lowest mean (M = 2.54, SD = 1.89). The boxplot (Figure 4.4.) shows that Factor 1 has the biggest variance, meaning that the data is most spread for this factor from the mean (Van den Berg, 2020, Ch. 1). Moreover, Factor 2 shows the lowest variance, so participants replies could be said to be more in line with each other for that factor.

Figure 4.4.

Variance of the Factors in a boxplot



4.5. Hypothesis testing

Welch two sample *t*-tests have been conducted in the following step in order to reject the stated hypotheses or not. For Factor 1, it can be said that reading from a printed book compared to an e-reader influences the perceived reading behaviour, $t(149.48) = -10.52$, $p < .001$. Further, the t-test shows that the medium influences the reader's emotions (Factor 2), $t(180.42) = -49.61$, $p < .001$. With a result of $t(147.99) = -19.92$, $p < .001$, Factor 3 is consistent with the original hypothesis that the handling of printed books is preferred compared to the handling of an e-reader. The t-tests for Factor 4 (the goal of immersive imaginary reading) and 5 (the fluency of the reading process) lead to rejection of the null hypothesis as well, $t(174.87) = -50.43$, $p < .001$ and $t(174.74) = -52.61$, $p < .001$ respectively. Lastly, the reading medium also influences the degree to which an individual gets lost in a story (Factor 6), $t(160.01) = -32.53$, $p < .001$. Results therefore show that all null hypotheses could be rejected (Babbie, 2015, Ch. 16), and for this sample it is confirmed that there are differences in reading fiction from an e-reader and a printed book in all researched dimensions.

4.6. The simple linear regression models

Since the null hypotheses could be rejected, seeing the size and direction of the effects the reading device has on the factors is evident. Simple linear regression was used to test if reading fiction from a printed book compared to reading fiction from an e-reader predicts any of the six factors (Factor 1 – 6). In order to keep an easier overview over the different results, several simple linear regressions have been run, rather than a multivariate multiple regression.

4.6.1. Regression model for Factor 1

The fitted regression model for Factor 1 is:

$$Factor\ 1 = 3.2 - 0.805\ x\ Print\_Ebook + e$$

$$e\ \sim\ N(0, 3.49)$$

The output of the regression leads to the assumption that reading a printed book has a negative effect on Factor 1. But a closer look confirms that reading fiction from a printed book did not significantly predict Factor 1 (β = - 0.81, p =.053), as a *p*-value bigger than .05 is said to show statistical

insignificance of the result (Babbie, 2015, Ch. 16). The overall regression was statistically not significant (R^2 = .03, F(1, 137) = 3.81, p = .053). Based on the low value of R^2, it is concluded that reading fiction from a printed book is not a good predictor for Factor 1. The corresponding p-value to the F-statistic further indicates that the stated regression model is not an accurate fit for the data.

4.6.2. Regression Model for Factor 2

The fitted regression model for Factor 2 is:

$$Factor\ 2 = 5.1 + 0.148\ x\ Print\_Ebook + e$$

$$e\ \sim\ N(0, 0.95)$$

This model suggest that reading a printed book as a small positive effect on Factor 2. However, it was found that reading fiction from a printed book did not significantly predict Factor 2 (β = 0.15, p = .49). The overall regression was statistically not significant (R^2 = .003, F(1, 137) = 0.48, p = .49). Based on the low value of R^2, it is concluded that reading fiction from a printed book is not a good predictor for Factor 2. The corresponding p-value to the F-statistic further indicates that the stated regression model is not an accurate fit for the data.

4.6.3. Regression model for Factor 3

The fitted regression model for Factor 3 is:

$$Factor\ 3 = 3.82 + 0.538\ x\ Print\_Ebook + e$$

$$e\ \sim\ N(0, 4.08)$$

The equation for Factor 3 demonstrates that reading a printed book has a positive effect on perceived advantages of reading from the printed media. It was found that reading fiction from a printed book did not significantly predict Factor 3 (β = 0.58, p = .19). The overall regression was statistically not significant (R^2 = .01, F(1, 137) = 1.71, p = .19). Based on the low value of R^2, it is concluded that reading fiction from a printed book is not a good predictor for Factor 3. The

corresponding *p*-value to the *F*-statistic further indicates that the stated regression model is not an accurate fit for the data.

4.6.4. Regression model for Factor 4

The fitted regression model for Factor 4 is:

$$Factor\ 4 = 5.35 + 0.281\ x\ Print\_Ebook + e$$

$$e\ \sim\ N(0, 1.09)$$

Reading from a printed book indicates a small positive influence on reading for immersive imaginary reading. However, a look at the *p*-value finds that reading fiction from a printed book did not significantly predict Factor 4 (β = 0.28, p = .22). The overall regression was statistically not significant (R^2 = .01, $F(1, 137) = 1.49$, p = .22). Based on the low value of R^2, it is concluded that reading fiction from a printed book is not a good predictor for Factor 4. The corresponding *p*-value to the *F*-statistic further indicates that the stated regression model is not an accurate fit for the data.

4.6.5. Regression model for Factor 5

The fitted regression model for Factor 5 is:

$$Factor\ 5 = 6.04 - 0.294\ x\ Print\_Ebook + e$$

$$e\ \sim\ N(0, 1.09)$$

This equation for Factor 5 pinpoints that reading a printed book influences the perceived fluency of the reading process negatively. Still, it was found that reading fiction from a printed book did not significantly predict Factor 5 (β = - 0.29, p = .2). The overall regression was statistically not significant (R^2 = .01, $F(1, 137) = 1.63$, p = .2). Based on the low value of R^2, it is concluded that reading fiction from a printed book is not a good predictor for Factor 5. The corresponding *p*-value to the *F*-statistic further indicates that the stated regression model is not an accurate fit for the data.

4.6.6. Regression model for Factor 6

The fitted regression model for Factor 6 is:

$$Factor\ 6 = 4.37 + 0.425\ x\ Print\_Ebook + e$$

$$e\ \sim\ N(0, 1.84)$$

Reading a printed book has a positive influence on Factor 6, as the equation suggests. However, it was found that reading fiction from a printed book did not significantly predict Factor 6 (β = 0.42, p = .16). The overall regression was statistically not significant (R^2 = .01, F(1, 137) = 2.01, p = .16). Based on the low value of R^2, it is concluded that reading fiction from a printed book is not a good predictor for Factor 6. The corresponding *p*-value to the *F*-statistic further indicates that the stated regression model is not an accurate fit for the data.

5. Discussion

This chapter will put the findings of the data analysis in context with existing theories and findings introduced in the theoretical framework. One important thing to note is that the hypotheses have been stated before conducting factor analysis. As the factor analysis suggested to rearrange some items, direct comparisons with the setup of the theoretical framework are more difficult, so those implications should be considered with caution. Still, the results clearly show that the reading device has effects on the analysed factors. This is suggested by the outcomes of the conducted *t*-test which were all significant. However, linear modelling did not give any significant results, proposing that the stated models were not a good fit for predicting the dependent variables.

5.1. Hypothesis testing

As pointed out in chapter 4.5., the results of conducting Welch *t*-tests on the collected data propose to reject the null hypotheses. Therefore, it is to conclude that reading fiction on an e-reader versus reading fiction from a printed book has effects on all the measured factors. The posed alternative hypotheses can generally be assumed to be true. This is mostly in line with what is found in the theoretical framework (Chapter 2). Hillesund (2010), Hillesund et al. (2022), Evans (2017), Jabr

(2013), Mangen (2008, 2016), Singer & Alexander (2017), and Thissen et al. (2021) assume and find differences in reading behaviour in their studies, each with their own focus. The following sections, ordered after the posed hypotheses, will discuss results from this research with findings from those authors in greater detail.

5.2. Effects on reading speed and fluency

In paragraph 2.5. it was concluded that there is overall little consensus in how the reading device influences reading speed of the reader. The literature cited indicates that individuals tend to read faster from digital devices (Jabr, 2013), though that might be the result of scanning the text instead of deep reading and leads to a more shallow understanding of what has been read (Hillesund, 2010; Jabr, 2013; Mangen 2016; Singer & Alexander, 2017). Based on this research, it generally can be said that those researchers are right in their assumption that those measurable items do in fact differ based on the reading device. A simple linear regression model suggests that reading printed books has a negative effect on the reading speed, meaning that people do read faster from e-readers. However, the linear model for this assumption did not prove to be statistically significant. For that reason, this paper cannot make an acceptable statement on this matter. It is to assume that more factors than the reading device influence reading speed. This is also what literature suggests. Schwabe et al. (2021) suggest that being an expert reader likely has influence on the reading speed. Furthermore, reading speed measured in time is a sole numerical measurement and might not express much on its own. To conclude on reading speed, this research agrees to current findings that this concept differs per reading device used, however, it cannot add anything meaningful to existing literature, as the analysis failed to take more variables that the reading speed might rely on into account. Adding to reading speed, Hillesund (2010), Jabr (2013), Mangen (2016), and Singer & Alexander (2017) point out that occurring distractions would disturb the reading fluency and therefore lead to slower reading. However, this research also does not find evidence that the fluency of reading is predicted by the reading device. Fluency might moderate reading speed, following the argumentation of the mentioned researchers. That is something this research did not test, so it cannot make a statement about that.

5.3. Effects on perception of the reading device

Chapter 2.6. mostly focuses on research conducted about the handling of printed books compared to digital devices. Mangen (2008) argues that reading is a multi-sensory action that speaks to more than one sense of the reader. Following this argumentation, e-readers are in that sense worse than printed books. Mangen (2008) further states that there are certain affordances that e-readers cannot live up to. The linear model referring to the handling of printed books proved to be statistically not significant, so it cannot be used to support Mangen's claim. However, a survey investigating reasons against reading digital books conducted in Germany (Simon-Kucher & Partners, 2020) could be interpreted to somewhat support Mangen (2008). The two biggest reasons against reading digital books are that the physicality of the book, to be more precise the holding of a printed book, is seen to be important, as well as the beauty of printed books. Those are affordances only the printed book can offer and describes the value and expectations individuals hold to their reading experience. The items 'Media' and 'Comfortable' of this research also clearly indicate that the sample had a big preference for reading printed books (44.37% and 61.54% respectively), only this survey did not ask for the reason. What is further not explained is, if reading a printed book allows for more closeness between the reader and the story and therefore for a bigger likelihood of immersion, as Mangen (2008) suggests.

5.4. Effects on goals of reading

Chapter 2.7. introduced 'immersive imaginary reading' as defined by Hillesund (2010). Immersive imaginary reading is said to the goal of reading fiction. At the same time, Hillesund (2010) found contradictory results the implications of immersive imaginary reading. On one hand, digital reading is said to hinder immersion, while on the other hand, e-readers do allow immersion to happen. A linear model including Factor 4 was supposed to give clarity about this, but failed to show statistical significance. Therefore, a statement about Hillesund's findings cannot be made based on this research. It is to point out that 'digital reading' does not have to happen on an e-reader, so what Hillesund found could be that reading on a smartphone or a laptop would hinder immersion. At the same time, Schwabe et al. (2021) made an observation that could be linked. According to them, the medium

might be irrelevant once immersion happens. Following this thought, immersion and immersive imaginary reading are dependent on more than the reading device used. This suggests that a more complex model could be designed in order to explain immersive imaginary reading and how that depends on the medium and to what extent this concept is influenced by other factors.

5.5. Effects on perceived immersion

In chapter 2.7. immersion has been defined to be the extent to which a reader gets lost in a story, connects to the characters, and forgets the real world around themselves. With using Factor 6 to determine the level of immersion, this study has looked at immersion only partly. Factor 6 merely measures the extent to which the reader forgets the world around themselves, so the degree to which they lose their feeling of time and space. Still, the linear regression did not show any statistical significance, so a statement about how the reading device influences the degree of being lost in a story cannot be made. As argued in section 5.4., immersion might be dependent on more than the reading device. This assumption is backed up by several researchers. Fåhraeus (2020), Hillesund (2010), and Thissen et al. (2021), for instance, express that the reading skills of the reader influence the degree of immersion. Furthermore, Busselle & Bilandzic (2009) point out that distraction hinders immersion, and that immersion is a dynamic process that also happens subconsciously, so the reader should not be aware of being immersed in a story (Green et al., 2004; Hammond et al., 2023). This makes immersion also a difficult concept to measure.

5.6. Effects on perceived media enjoyment

The linear model for Factor 2, influence on emotions, failed to be statistically significant. Because of that it is not possible to draw a conclusion on the effect the reading device has on the reader's emotions, and ultimately enjoyment. However, in chapter 2.8. it is said that the reading device only partly accounts for enjoyment. Another factor enjoyment is strongly dependent on is immersion (Busselle & Bilandzic, 2009; Green & Brock, 2000). The linear model of this research did not take immersion as a moderating variable into account, so the simple linear regression might have been too plain to explain the concept of enjoyment. Green et al. (2004) further suggest that disturbances negatively affect enjoyment, so that could be another moderating variable for enjoyment as well.

Evans' (2017) research supports the idea that a simple linear regression model is not enough to capture the concept of media enjoyment. In her article, Evans concluded that enjoyment is not necessarily dependent on the reading medium, but she finds that how and where the reading medium is used is a stronger predictor of enjoyment.

5.7. Answering the initial research question

The main research question addressed by this thesis is 'What are the dynamics between reading a fictional text from an e-reader or a printed book?'. Several sub-hypotheses could establish that there are, in fact, differences between reading fiction from an e-reader or a printed book. Those differences appear, for instance, in reading speed, general preference of reading devices (advantages and disadvantages of handling a certain device), reading goals, getting lost in a story (immersion), and the influence reading fiction has on the reader's emotions. However, the size of the effects could not be determined. It is probable that (some of) these outcomes correlate with each other, what is something this thesis did not look at.

Nonetheless, other research suggests that the concepts could be very much dynamic processes. Taking the concept of reading speed, for instance. In early research on that matter, it was found that people read slower from digital screens. Nowadays, it is the other way around. People do take less time reading the same text from a screen, compared to reading from paper (Jabr, 2013). Similarly, reading itself is a dynamic process (Hillesund, 2010). The understanding of what reading entails is ever-changing. Reading today is understood differently than it was in the past, so it is likely that reading tomorrow will mean something different than reading today.

5.8. Limitations

This research brings several limitations that makes it important to be critical with the obtained results. First of all, nonprobability sampling was done in order to get participants to fill in the online survey. With nonprobability sampling, the researcher relies simply on available subjects, therefore generalising the data should be done with great caution (Babbie, 2015, Ch. 7). In this case, the sampling method led to a sample that is not representative of the desired target group. Almost ¾ of participants were female, while only ¼ of participants identified themselves as male. Further, 74.1%

of participants indicated that reading was a hobby for them. Due to the nonprobability sampling, it is likely that more people with a general interest in reading filled in the survey, compared to people that have no or little interest in reading. Further, almost half of participants (48.92%) indicated that they had never used an e-reader. For that fact, they were not able to give answers to all items in the questionnaire which influenced their measures. The meaningfulness of the variable 'Print_Ebook' is decreased because of the fact that only 18% of participants (N = 25) rated their reading experience based on reading with an e-reader.

Secondly, a survey is a self-reflective measurement tool, meaning that the participant has to rate themself. Bias in their perception are likely to occur, so obtained data from surveys might not always be completely accurate (Babbie, 2015, Ch. 9).

Thirdly, the factor analysis was done only after gaining all participant data, so that the survey could not be adjusted anymore. Factor analysis proved that the initial scales did not fully fit with the results of the analysis. The meaning of the scales therefore changed. That made drawing conclusions on the hypotheses more difficult. Conclusions on the hypotheses must be interpreted with more caution, as the findings might not include everything from the original definitions.

The last big limitation is that the *a*-value for the linear models has not been adjusted. As regression analysis was done after the findings of the hypothesis testing showed that the null hypotheses could be rejected, the regressions ultimately became post hoc-tests. Not adjusting the *a*-values leads to a higher chance of type I-errors (Van den Berg, 2022, Ch. 11).

5.9. Future Research

The overall findings of this research leave room for proposing directions of future studies. As the most obvious result from this study, it is urged to set up a model that takes into account the relationships of all the dependent variables from this thesis to more accurately define the effects that the reading device has on reading. Although reading on an e-reader and a printed book is said to be similar, Hayles (2014) pleads that printed and digital texts cannot be read and understood in the exact same way. She says that media specific analysis (MSA) is needed in order to correctly understand

texts. When analysing texts, it cannot be only the words that are being analysed but also the medium that presents them. Hayles argues that literature must be understood "as the interplay between form and medium" (2014, p. 3). MSA sees the medium as an 'active shaper' of the message the texts conveys (Hayles & Pulizzi, 2010), meaning that the message of a text could differ per medium. According to MSA, printed books and e-readers should therefore be analysed separately and not be measured in the exact same dimensions. At the same time, as stated before, e-readers are designed to be as similar as possible to printed books, so this begs the question if MSA is actually relevant in this context. In line with this, any research focusing on reading fiction on an e-reader would be useful for investigating this field further. As mentioned in the introduction, research on reading behaviour (especially on digital reading devices) has barely ever been conducted with a focus on reading fiction. Furthermore, long term studies might enable a better understanding of the development of adopting e-readers for reading fiction, and at the same time might deliver hints to Wolf's (2007) argumentation about the 'reading brain'.

6. Conclusion

To conclude, by conducting hypothesis testing this research suggests that there are differences in the way people read fiction on e-readers and printed books in all stated dimensions. However, sizes of effects could not be established using linear regression, therefore no arguments for or against existing theories could be stated. The study underlies several limitations, so the results should be treated carefully. There is a lot of room for future research to investigate how reading fiction develops.

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8. Appendices

8.1. Appendix A – Cronbach's alpha scores for initial scales used in survey

Scale	Amount of items included	CI 95% lower	Cronbach's Alpha	CI 95% upper
Fluency	5	0.61	0.79	0.97
Reading Speed	6	0.74	0.87	1
Goals	6	0.73	0.86	0.99
Haptics	8	0.77	0.88	0.98
Immersion	6	0.81	0.9	0.99
Enjoyment	5	0.65	0.83	1

8.2. Appendix B - Survey

Start of Block: Informed Consent

Q1

Informed consent

Dear participant,

Thank you for taking the time to participate in this survey. Your answers are highly appreciated.

This research is conducted as bachelor thesis project by Imke Meyer, bachelor student at the Faculty of Behavioral Management and Social Sciences at the University of Twente. This study aims to develop a better understanding of the dynamics between reading fictional stories in printed books and digitally on e-readers (e-books).

The survey takes about 10 minutes to complete and will be conducted in English. Please make sure

you feel comfortable enough with this language before proceeding. If you understand these paragraphs well, you will have no problems understanding the questions you will be asked.

Your participation is completely voluntary. Your responses are anonymous and will only be used for the researcher's bachelor thesis. The only questions you have to answer are this informed consent form and the participation requirement checks (age and intellectual impairments), for any other questions you are free to not provide an answer. Also, you may withdraw from the survey at any point, if you feel uncomfortable with the questions. In that case your data will be fully removed.

Any possible risks, such as a data breach, will be minimized by storing the data in a secure location. Further, there are no foreseeable risks associated with this research or participation in this survey. If you have any questions about the research, survey, or the procedure, you may contact me under i.s.meyer@student.utwente.nl.

Before you start the survey, please confirm your agreement to the following:

- Your participation in the study is voluntary.
- You are above 18 years of age.
- You are aware that you may choose to terminate your participation at any time for any reason.

Thank you again for your time and participation.

○ I consent. I will participate in the study. (1)

○ I do not consent. I do not wish to participate. (2)

End of Block: Informed Consent

Start of Block: Demographics

Age What is your age (in years)?

(e.g. 24)

_____

Int Impairments Do you have any diagnosed intellectual impairments that influence your reading, such as dyslexia?

(Please specify in case you do.)

- ○ Yes (1) _____
- ○ No (2)
- ○ Prefer not to say (3)

Gender Which gender do you identify with?

- ○ Male (1)
- ○ Female (2)
- ○ Non-binary / third gender (3)
- ○ Prefer not to say (4)

Country From which country are you originally?

- ○ The Netherlands (1)
- ○ Germany (2)
- ○ Other: (3) _____

Hobby Do you practice reading fiction as a leisure activity?

(A leisure activity in this case means as a hobby.)

○ Yes (1)

○ No (2)

Reading per week How many hours do you approximately spend reading per week?

(Please insert a number here, e.g. 5.)

_____

Expert Reader Do you consider yourself an expert reader?

(An expert reader is someone that reads a lot and is therefore trained in reading (Fåhraeus, 2020), meaning that they normally do not have any problems with comprehending and following the story.)

○ Yes (1)

○ No (2)

E_reader Have you ever read a fictional story on an e-reader?

(Meant are devices such as Amazon's Kindle or the Tolino e-reader.)

- ○ Yes (1)
- ○ No (2)

Media How do you usually consume fictional stories?

(More than one option is possible.)

- ☐ Printed book (1)
- ☐ E-reader (2)
- ☐ Tablet (3)
- ☐ Laptop/Computer (4)
- ☐ Smartphone (5)
- ☐ Audiobook (6)
- ☐ Other: (7) _____

Comfortable I feel most comfortable consuming fictional stories as/on a ...

(More than one option is possible.)

- ○ Printed book (1)
- ○ E-reader (2)
- ○ Tablet (3)
- ○ Laptop/Computer (4)
- ○ Smartphone (5)
- ○ Audiobook (6)
- ○ Other: (7) _____

End of Block: Demographics

Start of Block: Specifics

CR What is the book you are currently reading?

(This study focuses on printed and e-books. Therefore, please insert the book title of the book you have either read as a printed or an e-version. If you are currently not reading anything, insert the last

book you have read and reflect on that during the following questions. If you know the English title of the book please use this.)

_____

Author Who is the author of this book?

_____

Genre To which broader genre does this book belong?

- ○ Crime/Thriller (1)
- ○ Fantasy (2)
- ○ Romance (3)
- ○ Science Fiction (4)
- ○ Horror (5)
- ○ Poetry (6)
- ○ Other: (7) _____

Print_Ebook Are you reading the printed version or the e-book?

- ○ Printed book (1)
- ○ E-book (2)

Language Are you reading this book in a language that you are fluent in?

- ○ Yes (1)
- ○ No (2)

Page Break

Fluency Please rate how much you agree to the following statements regarding the book you are currently reading.

	Strongly Disagree			Neutral			Strongly Agree
	1	2	3	4	5	6	7
Reading this story went smoothly and fluently for me. (Thissen et al., 2020)							
I had an immediate connection to the story while reading. (Thissen et al., 2020)							
I naturally slipped into the story while reading. (Thissen et al., 2020)							
While I was reading, I intuitively understood the story. (Thissen et al., 2020)							
I had no problem to follow the story while reading. (Thissen et al., 2020)							

End of Block: Specifics

Start of Block: RQ2

Reading Speed Please rate how much you agree to the following statements regarding the book you are currently reading.

(In case you have never used an e-reader choose "Not Applicable".)

	Strongly Disagree		Neutral		Strongly Agree		Not Applicable
	1	2	3	4	5	6	7
I think I read fictional e-books on average faster than printed fictional books. (*)							
I think I read printed fictional books on average faster than fictional e-books.							
I feel that it takes me more time to read printed fictional books. (*)							
I feel that it takes me more time to read fictional e-books.							
I feel that I read faster but with a more shallow understanding in fictional printed books.							
I feel that I am able to embrace the story world better when reading a fictional printed book.							

End of Block: RQ2

Start of Block: RQ3

Goals Please rate how much you agree to the following statements regarding the book you are currently reading.

	Strongly Disagree			Neutral			Strongly Agree
	1	2	3	4	5	6	7
Reading literature is a pleasurable way to spend time when I have nothing else to do. (Miall & Kuiken, 1995)							
Reading a story is a wonderful way to relax. (Miall & Kuiken, 1995)							
I find that reading literature is a great help in taking my mind off my own problems. (Miall & Kuiken, 1995)							
I like to become so absorbed in the world of the literary text that I forget my everyday concerns. (Miall & Kuiken, 1995)							
I like to connect to the characters. (based on Green, Brock, & Kaufman, 2004)							
I like making experiences I would usually not make. (based on Green, Brock, & Kaufman, 2004)							

End of Block: RQ3

Start of Block: RQ4

Haptics Please rate how much you agree to the following statements regarding the book you are currently reading.

(In case you have never used an e-reader choose "Not Applicable".)

	Strongly Disagree		Neutral		Strongly Agree		Not Applicable
	1	2	3	4	5	6	7
Holding an e-reader feels unpleasant. (adapted from Gerlach & Buxmann, 2011)							
Holding an e-reader feels artificial. (adapted from Gerlach & Buxmann, 2011)							
I enjoy flipping the pages of a printed book.							
I like the feeling of a printed book.							
I am irritated when I do not feel the weight of a book.							
I keep track of my reading process by seeing how thick the stack of pages still to read is.							
I like the touch of paper.							
I like to not have to flip pages. (*)							

End of Block: RQ4

Start of Block: RQ5

Immersion Please rate how much you agree to the following statements regarding the book you are currently reading.

	Strongly Disagree			Neutral			Strongly Agree
	1	2	3	4	5	6	7
It was like looking through the eyes of the characters. (adapted from Koppman, 2015)							
I started to feel the same emotions as the characters. (adapted from Koppman, 2015)							
While I was reading, I hardly took notice of what was going on around me. (Thissen et al., 2020)							
I was completely oblivious while reading. (Thissen et al., 2020)							
Things which normally occupy me disappeared from my thoughts while reading. (Thissen et al., 2020)							
I lost the sense of time while reading. (Thissen et al., 2020)							

End of Block: RQ5

Start of Block: RQ6

Enjoyment Please rate how much you agree to the following statements regarding the book you are currently reading.

	Strongly Disagree			Neutral			Strongly Agree
	1	2	3	4	5	6	7
Sometimes I feel like I've almost "become" a character I've read about in fiction. (Miall & Kuiken, 1995)							
Reading put me in a pleasant state. (Thissen et al., 2020)							
I liked reading the story. (Thissen et al., 2020)							
I would have liked to continue reading the story. (Thissen et al., 2020)							
Reading the story made me feel good.							

End of Block: RQ6

Start of Block: Extras

Reason_Preference What qualities of your preferred reading medium make you choose it over another reading medium?

_____

Perc_Differences Could you name any differences in how you read and experience a fictional story in a printed book and an e-book?

_____

End of Block: Extras

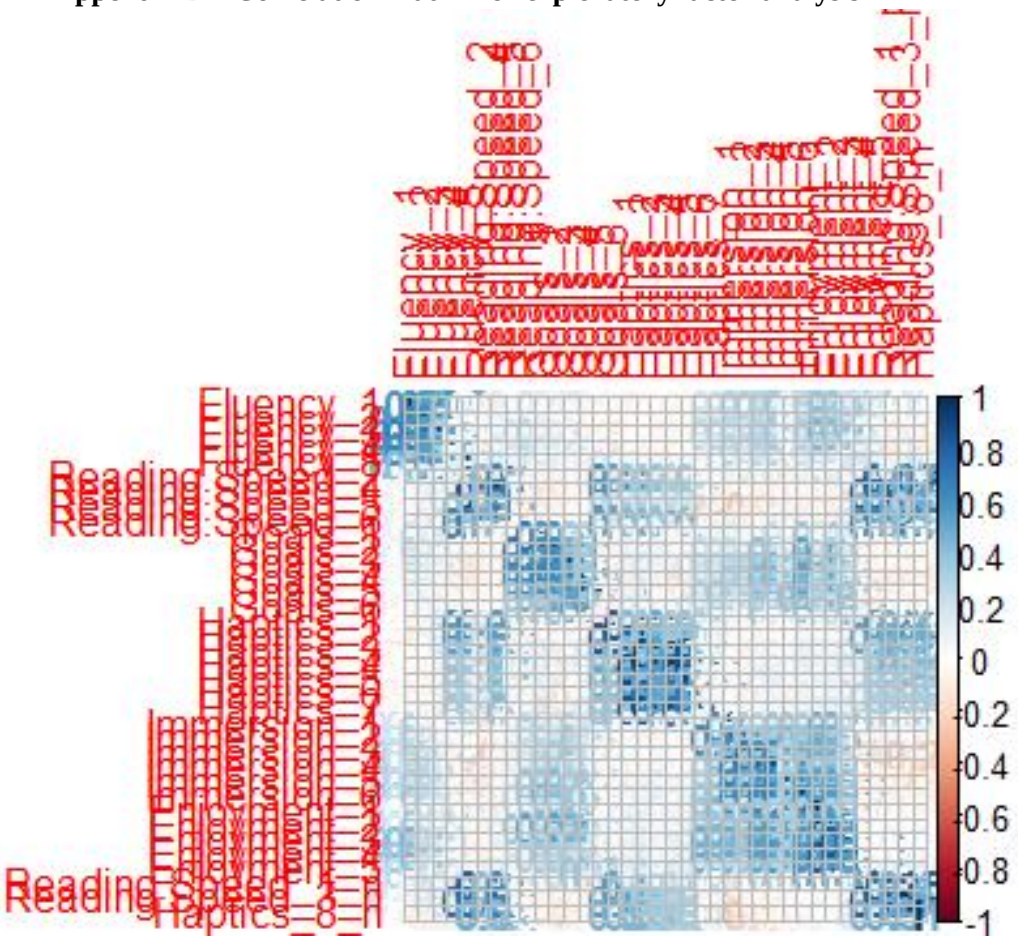
8.3. Appendix C – Poster for participant recruitment

SCAN THE CODE AND FILL IN MY SURVEY ABOUT READING FICTION ON DIFFERENT DEVICES!

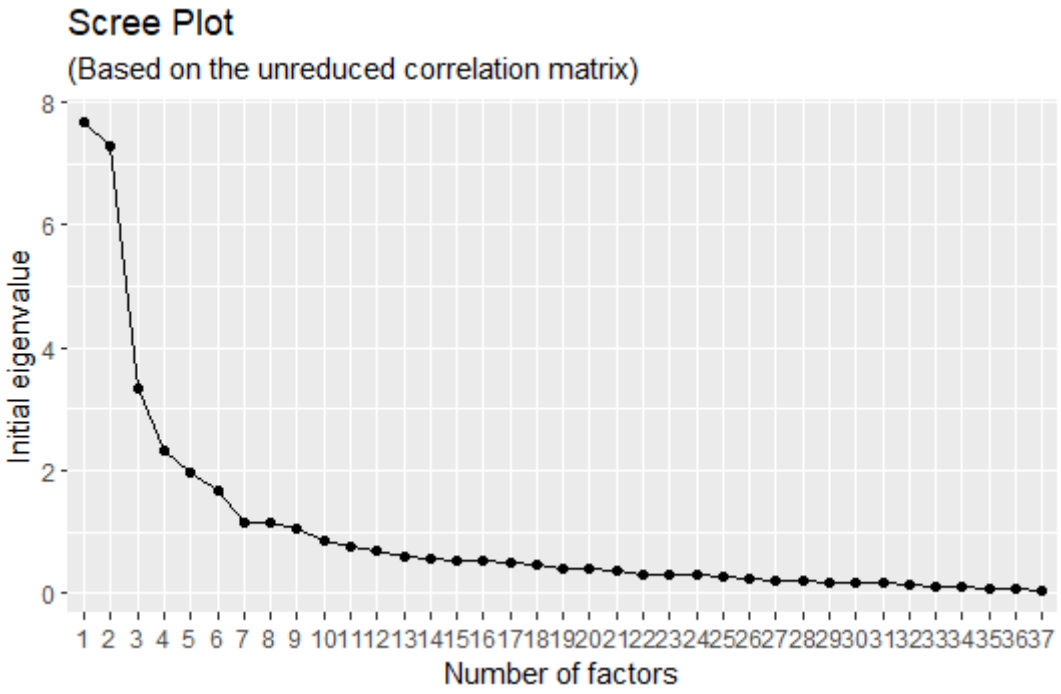
You are between 18 & 30 years old? Then, your input is much appreciated!

THANK YOU!

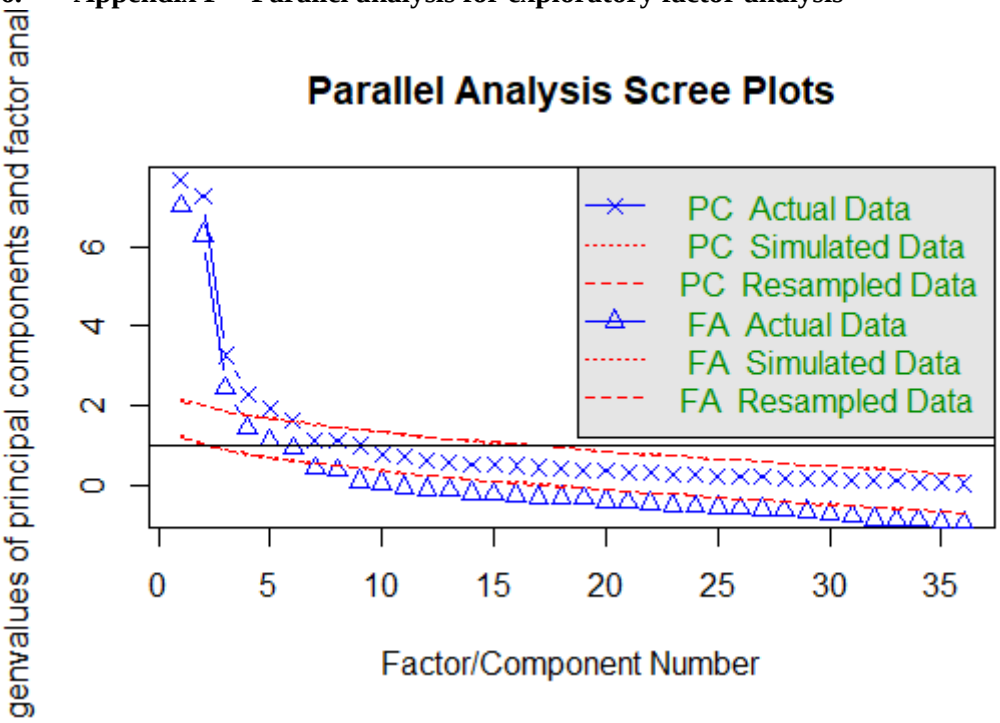
8.4. Appendix D – Correlation matrix for exploratory factor analysis



8.5. Appendix E – Scree plot for exploratory factor analysis



8.6. Appendix F – Parallel analysis for exploratory factor analysis



8.7. Appendix G – Media that are most used for reading and media that participants feel most comfortable with using for reading in the sample

	Media most used		Most comfortable media	
	N	%	*n*	%
Printed book	126	44.37	120	61.54
Smartphone	51	17.96	18	9.23
E-reader	34	11.97	24	12.3
Audiobook	32	11.27	22	11.28
Laptop/Computer	25	8.8	4	2.05
Tablet	16	5.63	7	3.59

8.8. Appendix H – Descriptive statistics of Factors

Factor	Minimum	Maximum	Median	Standard deviation
Factor 1	0	5.89	2.78	1.89
Factor 2	1.25	7	5.25	0.97
Factor 3	0	7	5	2.02
Factor 4	0.83	7	5.67	1.04
Factor 5	1.2	7	6	1.05
Factor 6	o	7	5	1.36