Declaration:

I, Jeanine Margaret Willson declare that the work presented in this thesis is original and my own work. This thesis contains original research undertaken during the Doctor of Philosophy at the Research School of Psychology of The Australian National University. This work has not previously been submitted for a degree or diploma in any University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is noted in the thesis itself.

Signed:__________________________________________________________

Date:___________________________________________________________
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Abstract

Even with a wide variety of media platforms available, young children still spend a large proportion of their leisure time viewing television. It has been argued that time spent viewing displaces time for reading. For television viewing time to displace reading time two assumptions need to be met. The first assumption is that children who are not viewing would read. The second assumption is that there is a ‘zero-sum’ relationship between time for reading and viewing, so that increases in viewing time are systematically associated with reductions in reading time. This study set out to investigate evidence for these assumptions using data from the Longitudinal Study of Australian Children (LSAC). Time use diaries for a typical weekday ($N=3,562$) and a typical weekend day ($N=3,397$) were analysed at 4, 6 and 8 years of age.

Cross-sectional analysis examined viewing and reading behaviour in blocks of time across the day to identify if and when behaviour was consistent with the first assumption of the displacement hypothesis. Reading and viewing behaviour were not consistent with the first assumption during the day. Nonviewers were not more likely to read than viewers. In the evenings, reading and viewing behaviour were partially consistent with the first assumption, nonviewers were consistently more likely to read but viewers were not always less likely to read. Data were also consistent with the second assumption in the evening. Nonviewers consistently read for more time than viewers in the evening.

A rigorous test of the second assumption was then carried out. Cross-sectional analysis, focussed on the evening, showed reading times tended to decrease as viewing times increased. Results were partially consistent with the second assumption of the displacement hypothesis. For lighter viewers, the second assumption did not hold. Time spent reading and viewing did not take up all their available evening time. For the heaviest viewers, time spent reading and viewing took up almost all their available evening time. Consistent with the second assumption, any increase in viewing time would likely be at the cost of reading time. Longitudinal analysis showed that the pattern of viewing for longer times and reading for shorter times evident at 4 years persisted through 6 and 8 years. The associations between viewing and reading time could lead to a downward spiral in reading achievement. The length of time children had available in the evening, maternal education and family involvement had small positive associations with time spent reading. However, the association between time spent viewing and time spent reading was stronger than these associations.
# Table of Contents

Chapter 1: Introduction .................................................................................................................. 5

Chapter 2: Shared Reading, Independent Reading and Television Viewing ................................. 9

  2.1 Introduction .......................................................................................................................... 9

  2.2 Bronfenbrenner’s Ecological Model ....................................................................................... 12

  2.3 Literacy ................................................................................................................................ 15

  2.4 Reading Activities .................................................................................................................. 16

    2.4.1 Shared Reading ................................................................................................................ 16

    2.4.2 Independent Reading ....................................................................................................... 22

  2.5 Associations Between Time Spent in Shared and Independent Reading ........................... 27

  2.6 Television Viewing and Shared and Independent Reading ............................................... 29

    2.6.1 Introduction ..................................................................................................................... 29

    2.6.2 Does Viewing Displace Reading Activities? ................................................................. 29

    2.6.3 Limitations of displacement studies: ............................................................................. 41

  2.7 Summary ............................................................................................................................... 45

Chapter 3: Method .......................................................................................................................... 47

  3.1 Participants ............................................................................................................................. 47

  3.2 Procedure ............................................................................................................................... 48

  3.3 Measures ................................................................................................................................ 50

    3.3.1 Time Use Diaries ............................................................................................................. 50

    3.3.2 Measures: Face-to-Face Interview ................................................................................ 52

  3.4 Data Analysis .......................................................................................................................... 54

    3.4.1 Outliers and Transformations ......................................................................................... 54

    3.4.2 Data Screening ................................................................................................................. 55

    3.4.3 Missing Data ................................................................................................................... 55

Chapter 4: Overall Time Spent Reading and Viewing Television ............................................... 61

  4.1 Introduction ............................................................................................................................. 61

  4.2 Time Spent Reading and Viewing—International Research .............................................. 61

    4.2.1 Reading ........................................................................................................................... 61

    4.2.2 Television Viewing .......................................................................................................... 64

  4.3 Time Spent Reading and Viewing—Australian Research ................................................... 65

    4.3.1 Reading ............................................................................................................................ 66
Chapter 5: Viewing and Reading Patterns Across the Day

5.1 Introduction ........................................................................................................... 93
5.2 Aims ..................................................................................................................... 97
5.3 Method ................................................................................................................ 99
  5.3.1 Participants ..................................................................................................... 99
  5.3.2 Measures ......................................................................................................... 99
  5.3.3 Data Screening and Analyses .......................................................................... 101
5.4 Results ................................................................................................................. 102
  5.4.1 Whole Sample ............................................................................................... 112
  5.4.2 Readers only ................................................................................................. 117
  5.4.3 Balancing reading and viewing across the day .............................................. 118
5.5 Discussion ............................................................................................................ 121
  5.5.1 Viewing and Reading Patterns Over the Day ............................................... 122
7.4.3 Are Changes in Evening Viewing Time Associated with Changes in Evening Reading Time? ................................................................. 183
7.4.4 Do Associations Between Evening Viewing and Reading Persist after Controlling for Child and Family Characteristics? .................. 187

7.5 Discussion .................................................................................. 189
7.5.1 Changes in Evening Viewing and Reading Times with Age ............ 189
7.5.2 Television Viewing and Time Spent Reading ............................... 191
7.5.3 Covariates and Associations Between Evening Viewing and Reading ...... 192

7.6 Conclusion .................................................................................. 193

Chapter 8: Discussion ........................................................................ 195
8.1 Theoretical background of the study .............................................. 195
8.2 Design of the study ....................................................................... 197
8.3 Research Findings ......................................................................... 198
8.3.1 Overview—Average Time Spent Reading and Viewing ............... 198
8.3.2 Viewing and reading behaviour .................................................. 199
8.3.3 Factors affecting associations between viewing and reading times .... 205

8.4 Future Research ........................................................................... 209
8.5 Strengths and Limitations of the Current Study ............................. 211
8.5.1 Strengths ................................................................................. 211
8.5.2 Limitations ................................................................................ 211

8.6 Practical Implications of research .................................................. 213
8.7 Conclusion .................................................................................. 214

References ......................................................................................... 217
Appendix A ......................................................................................... 235
Appendix B ......................................................................................... 236
Appendix C ......................................................................................... 238
Appendix D ......................................................................................... 241
Chapter 1: Introduction

Even before television sets were part of most homes, there was concern that viewing was taking up time that children would normally spend reading (Maccoby, 1951). These concerns are still held today. In a recent column in Spiegel Online, Fleischhauer (2017) laments the lack of book reading at home and is concerned that parents just place their children in front of television, instead of helping them with their homework.

There is a high degree of overlap in the functions reading and viewing fulfil within the young family. They can both be a family activity involving all members in a shared pleasurable activity. Many children’s programs are suitable for a range of ages and are designed to appeal to adults as well as children. In this way viewing is comparable to shared reading, where books appeal to both parents and children. Both activities can be educational. In addition, both activities are fun for children. A recent qualitative study of parent perceptions of screen time for their 5- to 6-year-old children in the United Kingdom described a variety of parent attitudes to the role of television in the family (Thompson et al., 2017). One mother expressed positive views about viewing enabling them to spend relaxation time together as a family:

Yes [down time]…that’s our telly time, we might sit down and watch a nice film or something on the telly that we are all interested in…(p. 475)

In another case, a mother described how she and her children negotiated the competing priorities for reading and screen time:

…if she [her daughter] comes to me and says at ten to seven in the evening that she wants to start watching something…I have to assess what it is…I could say ‘well if you have a wash, brush your teeth, get ready for bed, then you could have that [TV] as your bedtime story.’ And sometimes they are not keen on that because we read together every night and it is so much part of the routine that I think they loathe to miss that, they really like the reading. (p. 475)

These widely differing parent views show the wide contrasts in attitudes to viewing. Winn (2002) describes the variety of ways in which viewing can affect children. She
notes that children do learn from viewing. Some of what they learn is useful, some information they do not take in and some is harmful. This may be why opinions on viewing differ so widely. However, Winn notes that questions about the quality or content of what children view pale in importance beside the concerns about the amount of time children spend viewing. Sociologist, Urie Bronfenbrenner (1979), dramatically poses this question by asking what else children could be doing with the hours they spend viewing.

Like the sorcerer of old, the television set casts its magic spell, freezing speech and action, turning the living into silent statues for as long as the enchantment lasts. The primary danger of the television screen lies...in the behaviour it prevents: the talks, the games, the family festivities, and the arguments through which much of the child’s learning takes place and through which his character is formed. Turning on the television set can turn off the process that transforms children into people. (p. 242)

Similarly, in explaining the decline in reading comprehension, researchers in one study wrote: “we suspect that a displacement process is involved…The absence of reading practice is, in our view, more important than television per se” (p. 446) (Williams, 1986)

There have been many studies that have sought to examine if viewing time displaces time for reading, the displacement hypothesis (Attewell et al., 2003; Ennemoser & Schneider, 2007; Gadberry, 1980; Hofferth, 2010; Neuman, 1988; Shin, 2004; Vandewater et al., 2006). However, studies have been criticised for failing to consider how the methods used to test the hypothesis fit the assumptions that underpin the hypothesis (Mutz et al., 1993). The first of these is that children who are not viewing would engage in more appropriate activities such as reading (Vandewater et al., 2006). The second is that time for viewing and reading is ‘zero-sum’ in nature so that as time spent on viewing increases, time spent on reading decreases systematically (Mutz et al., 2004, Vandewater et al., 2006). This study sought to examine whether there is evidence children’s reading and viewing behaviour is consistent with the assumptions of the displacement hypothesis. This provides an
indirect test of whether displacement is a good description of children’s reading and viewing behaviour.

Chapter 2 describes the evidence for the importance of time spent reading. It describes what is known about whether television viewing displaces reading time and critically examines the limitations of these studies and suggests how work in this area might be strengthened.

Chapter 3 describes the methods and measures used in the current study.

Chapter 4 described reading times and viewing times found in Australian and international research.

Chapter 5 examines the first assumption, that viewers would be less likely to read and nonviewers would be more likely to read. Patterns of reading and viewing are examined in blocks of time over the day to understand how engagement in these activities varies over the day and whether and when patterns are consistent with the first assumption. This chapter then examines whether viewers had lower reading times than nonviewers consistent with the second assumption, first for the whole sample, then for readers only.

Chapter 6 examines the second assumption more rigorously. That is, that viewing and reading is ‘zero-sum’ in nature so that increases in viewing time are systematically associated with decreases in reading time. Increases in levels of evening viewing are examined to see if percentages of non-readers increase as viewing increases and whether reading times decrease systematically as viewing levels increase, first for the whole sample and then for readers only.

Chapter 7 examines whether there are longitudinal associations between time spent viewing in the evening and time spent reading. The analysis examines whether there are associations between reading and viewing times between different children and also within children on different measurement occasions.
Chapter 8 brings together the results of the different analyses in this study and describes the practical implications of these findings for families’ management of reading and viewing behaviour.
Chapter 2: Shared Reading, Independent Reading and Television Viewing

2.1 Introduction

Being able to read is necessary to function effectively as an adult in today’s society. For example, understanding instructions for using technology, understanding how to administer medications and filling out forms are necessary activities that require at least functional levels of reading skill. Reading also has long range benefits for skill attainment. These include school achievement (Mol & Bus, 2011) and higher education ( Heckman & Masterov, 2007). It also has benefits for quality of life ( Heckman & Masterov, 2007), empathy and understanding others (Mar, Oatley, Djikic & Mullin; 2011) and maintenance of cognitive capacities across the life span (Lindstrom et al., 2004).

However, it takes time and effort on the part of children themselves and their families and teachers to learn to read, and not all children become proficient readers. The Australian Bureau of Statistics (ABS) (2013) estimates that, at a population level, 44% of Australian young people and adults do not attain levels of literacy sufficient to function in society. Identifying factors that facilitate or impede the development of reading is important, even in affluent countries like Australia.

Developmental psychologists have shown that the way in which children spend their time early in life influences the development of skills, relationships, views, preferences and behaviour (Huston, Wright, Marquis & Green, 1999; Pagani, Fitzpatrick, Barnett & Dubow, 2010). Further, the more time children spend engaged in an activity, the more they absorb the knowledge and build up the skills associated with that activity (Hofferth & Sandberg, 2001). Skills developed when children are young can be particularly important because they can have long term implications for children’s subsequent development and quality of life. This is because early skill
development supports subsequent skill attainment and means later investments in skill development are more productive (Cunha, Heckman, Lochner & Masterov, 2006). There are wide differences in experiences children have and how young children spend their time prior to and after entering school. These differences contribute to the disparity in academic skills that children possess at school entry and beyond (Feinstein, Budge, Vorhaus & Duckworth, 2008; Hart & Risley, 1995; Lareau, 2003). Research has shown this quite clearly in the area of reading. For example, as Phillips (2011) reported, children from more advantaged families had spent over 400 more hours in literacy activities before they commenced school than children from less advantaged backgrounds. As a result, their reading skills at the start of school were commensurately higher.

Mol and Bus (2011) describe this as the start of a positive causal spiral where children who read more often improve reading skills, comprehension and vocabulary further, which motivates them to spend more time reading. This may also contribute to a widening gap over time in reading outcomes between good and poor readers, the “Matthew effect” (Stanovich, 1986). That is, children rich in reading skills get richer and those with poorer reading skills get poorer.

Children spend time reading at school. One United States study of first-grade classrooms in high and low socioeconomic status (SES) schools estimated children spent about 45 minutes a day with extended text, such as magazines or books (Duke, 2000b). However, there are wide differences in the number of words children read in this time. Stanovich (1986) reports observational studies of group reading sessions conducted over a week in first-grade classrooms. One less skilled reader was observed to read 16 words over this time while a more skilled reader read 1,933 words over the same time. Stanovich notes that this represents an enormous difference in the opportunity to learn new words. This means that leisure reading at home can increase the opportunities for word exposure and provide opportunities for many children to practice and improve reading skills (Mol & Bus, 2011). Mol and Bus note that leisure reading at home is particularly important for less skilled readers and explains more variance in their reading skills (15%) than children with typically developing reading skills (4%).
Family processes may also have a negative impact on reading development. One activity that has been a source of real concern is time spent viewing television, as it may detract from time that could otherwise be spent in reading activities (Ennemoser & Schneider, 2007). Concern that viewing could take time that children would otherwise spend reading has existed for a long time (Himmelweit et al., 1958; Murray, & Kippax, 1978; Mutz et al., 1993; Schramm et al., 1961). The concern is partly fuelled by the large proportion of their leisure time that children devote to television viewing (Regional TAM, OzTAM, Nielsen, 2017). Other forms of screen time may also limit or inhibit time for reading activities. Increases in the availability of computers and mobile technology in the home increase opportunities for children to spend time on screen based media (Vandewater, Rideout, Wartella, Huang & Shim, 2007), possibly at the expense of reading activities.

There is evidence that children’s time for leisure reading has reduced (Barker et al., 2014). Reasons for this include broader societal changes such as increases in the number of mothers who work outside the home (Gershuny, 2000). One consequence of this change is that children may spend more time in child care, before and after school care or other organised activities and may have less time for leisure reading. This suggests that in order to understand how viewing and reading are associated there is a need to look at a broad range of factors that will affect time that is given to reading and viewing activities. Bronfenbrenner’s (1979) ecological model of child development provides a framework with which to identify and organise these factors and understand how they are related.

This review will examine the following topics. First, Bronfenbrenner’s ecological model of child development will be described. This model describes a number of aspects of the child’s environment that influence the time children spend reading and viewing. To clearly understand associations between reading and viewing it is necessary to consider these factors and take account of them in analyses. The next section considers the skills children need to develop to become literate. Using this information, the next sections describe what is known about how time spent in shared and independent reading contribute to the development of literacy. The underlying issue these sections consider is whether it is time spent in reading activities, rather than other factors such as coupling reading with literacy teaching or reading in a particular way, for example dialogic reading, that contributes to reading development.
Demonstrating that “time spent”, on its own, makes a significant contribution to reading development, establishes that displacement of reading time by viewing time is a significant issue. Finally, the literature on displacement of reading time by viewing time is examined. The research examining whether viewing displaces time for reading is reviewed and assumptions underpinning the displacement hypothesis are discussed. New ways to examine assumptions behind the displacement hypothesis are proposed.

2.2 Bronfenbrenner’s Ecological Model

A complex web of personal, economic, social and cultural factors shapes the way in which families balance time spent reading with other activities, such as viewing television, and how time spent on these activities is associated with development. Bronfenbrenner’s ecological model provides a framework for identifying these factors and describing their relationships (Bronfenbrenner, 1979). The model shows the child at the centre of a set of nested systems, represented by concentric circles. Factors with the most proximate influence on child development are placed in the inner circles or levels, with less proximate influences placed on outer circles.

Bronfenbrenner placed the child at the centre of the model, arguing that children both influence and are influenced by their environment. In relation to reading, for example, characteristics such as intelligence, vocabulary, motivation to read and persistence will all influence how easily children learn to read and how much time they spend reading. These factors also influence how time is spent on activities other than reading, for example, sport, music, viewing television or using computers. For example, children with more difficult temperaments (Mullan, 2013), ADHD and learning problems (Acevedo-Polakovich, Lorch, Milich & Ashby, 2006) as well as those with reading difficulties (Rashid, Morris & Sevcik, 2005) have been shown to spend more time viewing television than typically developing children.

The primary environmental influence on the child, at the microsystem level, is the child’s family. Family characteristics, such as the education of the parents and the expectations they have for their child’s academic achievement, will influence the value they place on learning to read. This will be reflected in family processes such as modelling reading, making time to read to children, listening to them read (Mullan,
2010) and the way the family balances reading activities with other activities such as
television viewing (Rutherford, Bittman & Biron, 2010). In addition to identifying
factors that influence attitudes towards media, Bronfenbrenner’s model also argues
that how media are used at the microsystem level can change the pattern of daily
activities in family life (Bronfenbrenner, 1977). For example, more time spent
viewing has been shown to be associated with less time spent on family activities with
positive associations for reading development, such as shared reading (Tomopoulos et
al., 2007).

Other agents at the microsystem level that may influence the development of reading
include schools and neighbourhoods. School bears the primary responsibility for
teaching children to read. The influence of schools goes beyond direct teaching of
literacy skills and includes fostering positive attitudes to reading, the provision of
reading materials and time for independent reading. Each aspect of the microsystem
may influence other aspects of the microsystem and these bidirectional influences
were named mesosystems by Bronfenbrenner (1979).

The exosystem includes systems that impact more remotely on the young child, such
as the parents’ workplace and mass media. Bronfenbrenner distinguishes between the
act of using media, which operates at the microsystem level, and information obtained
from viewing, which he regards as an exosystem variable. For example, magazine
articles, information on the web and television programs on the development of
children, encourage parents to read to children when they are young. Exosystem
variables also influence family choices around how to balance reading and viewing
activities. For example, parents’ workplaces and working conditions will influence
time parents have to spend with children, the amount of stress they experience and the
availability of financial resources. Families with less financial security often face an
accumulation of challenges that mean they have less time or energy to spend with
their children and they may therefore encourage them to spend more time viewing
television as a safe and cheap alternative (Larson & Verma, 1999).

The macrosystem level includes factors that have a broader cultural influence on
children. For example, society and governments influence the cultural value placed
on reading through provision of libraries and economic measures to ensure books are

13
published (Kalb & van Ours, 2013). Jordan (2004) notes that the macrosystem is influential in forming beliefs about viewing and reading. Books, websites and magazine articles extolling the virtues of engaging children in alternative activities to television viewing abound (see for example, Hodges, 2000). Many countries, including Australia, the United States, Canada and the United Kingdom have national screen-free weeks and recommend reading as an alternative to viewing to encourage children’s academic achievement. In addition, popular children’s books such as Roald Dahl’s *Matilda* (1988/1989) and *Charlie and the Chocolate Factory* (1964/2007) and J.K Rowling’s *Harry Potter and the Philosopher's Stone* (1997), portray heavy television viewers as lazy, inept and deceitful. In contrast, characters in these books who value intellect and reading are portrayed as bright, competent and morally virtuous. Such portrayals reinforce children’s views that viewing is, at best, intended for entertainment and escapist functions while reading print material is intended to inform and educate (Beentjes & van der Voort, 1989; Jordan, 2005; Salomon, 1984).

Bronfenbrenner also notes that influences on development are not simple unidirectional processes (Bronfenbrenner, 1977). Interactions in the process of learning to read are bidirectional. For example, learning to read involves not only adult teaching behaviour but also children’s interests and capacity. Children’s interest and capacity, as evidenced by their response to adult teaching will, in turn, influence how adults engage in future teaching interactions (Baker, Scher & Mackler, 1997). Time spent engaged in particular activities, such as family activities involving reading or viewing, will develop preferences that will influence how much time children spend reading or viewing in the future.

Bronfenbrenner (1977) argues that models of child development also need to account for the effects of the physical environment. Aspects of the physical environment that are associated with the process of learning to read include the availability of reading materials (Kalb & van Ours, 2013). The time children spend viewing television is associated with the number of television sets in the home, and their locations, particularly if there is a set in the child’s bedroom (Wiecha et al., 2001).

In later formulations of his model, Bronfenbrenner emphasised the importance of time, as well as context, to understand developmental outcomes. For example, he
noted that the same process may have different developmental outcomes depending on the time in history at which they occur, what he called the chronosystem (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 1998). In relation to reading, the proximal processes that influence the development of reading will change over time. For example, most parents cease to read to children when they learn to read for themselves (Scholastic, 2015). At the same time, children may spend more time reading independently as they become more proficient readers. As they get older, children also gain more control over choices about how they spend their time and how they balance activities, such as reading and viewing television.

2.3 Literacy

Literacy has been described as a continuum rather than a threshold separating those who are literate from those who are not. Five levels of literacy were identified in the ABS 1996 survey of adult literacy and variations in attainment were noted within each of these levels. The survey tested the information processing skills of Australians aged 15-74 years of age on a range of prose documents likely to be found at work, at home and in the community. Those at the lowest level (level 1) found it hard to interpret many of the texts they would encounter in everyday life. The middle level (level 3) represented the level at which people were regarded as functionally literate. People at this level could not only read a variety of material found in everyday life, but they could also interpret the information, including making inferences based on the text and compare and contrast the information in the text. To be regarded as literate, at least a functional level of literacy needed to be demonstrated (ABS, 1996).

Even reaching a basic level of literacy involves the acquisition and integration of a range of skills. Researchers have identified stages that children go through to become literate. Children move from emergent literacy skills, to early reading and then conventional reading (Shaywitz, 2003). Emergent literacy encompasses early literacy skills that are generally demonstrated before children start school. They include understanding book reading conventions, being able to name and write letters, read some simple words and knowing some basic sound-letter correspondences.
(Scarborough & Dobrich, 1994). In the early reading stage, children are learning to decode words. Finally, children learn to recognize words increasingly rapidly, without needing to decode and begin to read with increasing proficiency. Reading outcomes are measured by examining skills such as reading speed, accuracy and comprehension. However, even when children can read independently they cannot be considered functionally literate. It takes many years of teaching and practice for children to learn to read sufficiently well to function in society.

2.4 Reading Activities

2.4.1 Shared Reading

Shared Reading and the Development of Literacy Related Skills

Children need to have a number of cognitive capacities in place before they can learn to read. For example, working memory, processing speed and attention are significant precursors for reading fluency or the ability to read accurately, quickly and with expression. This, in turn, contributes to reading comprehension (Jacobson et al., 2011). It has been suggested that shared reading may support the development of these underlying capacities (Baker et al., 1997). Shared reading refers to reading books to and with children. It may include discussions with children about what is being read. It may also include teaching children formal literacy skills, such as letter naming or word recognition.

Shared reading also contributes to the development of skills that indirectly support reading development (Baker et al., 1997). Shared reading may provide children with background knowledge so they can understand and interpret what they read (Mol & Bus, 2011). It may also foster a love of books so that children have increased motivation to read themselves (Guthrie, Wigfield, Metsala & Cox, 1999). Shared reading has also been shown to develop children’s language skills and vocabulary which contributes to later decoding skills and reading fluency (Sénéchal & LeFevre, 2002). Improved fluency can free up cognitive capacity and improve reading comprehension (Jacobson et al., 2011; Shaywitz, 2003).
Studies have focussed particularly on the association between time spent in shared reading and language development, as language development is generally considered to be the foundation for literacy (Zubrick, Taylor & Christensen, 2015). An early meta-analysis of shared reading studies of children, 3 to 8 years, found that frequency of shared reading was positively associated with language development (Bus, van Ijzendoorn & Pellegrini, 1995).

A number of more recent longitudinal studies have also investigated associations between shared reading and language development. One study of Dutch children, aged 4 to 9 years, asked mothers “how often” literacy interactions occurred (de Jong & Leesman, 2001). These included reading to children, reading books or newspapers or reading environmental print, such as advertising, in the child’s presence. They found that the number of literacy interactions at 4 years of age was positively associated with oral vocabulary at the end of first grade. Sénéchal and LeFevre (2002) assessed children’s exposure to shared reading using the “author/title checklist” method. Parents of two cohorts of Canadian middle and upper-middle class children, 4 to 5 years and 6 to 7 years, were given lists of children’s book authors and titles and asked to indicate which they recognised. The authors found associations between children’s pre-school story book exposure and grade 3 reading achievement, mediated by children’s early receptive language and comprehension skills. In a later study, Sénéchal and LeFevre (2014) used a composite measure that included parent reported frequency of bed-time reading to children, number of children’s books in the home, and the “author/title checklist” method for measuring children’s exposure to books. The composite measure was significantly positively associated with children’s vocabulary score measured by the Peabody Picture Vocabulary Test-Revised (PPVT-R) at the beginning of grade 1. In a recent Australian study, using Longitudinal Study of Australian Children (LSAC) data, 4- to 5-year-olds who were read to on 6 or 7 days per week had higher receptive vocabulary scores, than children of the same age who were read to on 3 to 5 days per week (Kalb & van Ours, 2013).

Some studies have also investigated associations between shared reading and more general cognitive development. Rodriguez et al. (2009) conducted a longitudinal study of 1046 ethnically diverse low-income families in the United States. Mothers reported the frequency of three literacy related activities: reading, story-telling and singing nursery rhymes to the child. They also reported whether shared reading or
story-telling was part of the child’s regular bed-time routine. Children were tested on the Bayley Mental Development Index, one of three component scales of the Bayley Scales of Infant Development-Second Edition, when they were 14, 24 and 36 months of age. Positive associations between the frequency of literacy activities and general cognitive development were found at each age. Kalb and van Ours (2013), using LSAC data, also found positive associations between a general cognitive index measured when children were 4 to 5, 6 to 7 and 8 to 9 years and frequency of shared reading at age 4 to 5.

**Shared Reading and the Development of Literacy**

Time spent in shared reading has also been investigated for associations with “emergent” literacy skills, early reading outcomes and later reading achievement (Scarborough & Dobrich, 1994; Mol & Bus, 2011). A review of 21 studies suggested frequency of shared reading was positively associated with emergent literacy and early reading achievement, although effect sizes were small (Scarborough & Dobrich, 1994). However, in a meta-analysis, Bus, van Ijzendoorn and Pellegrini (1995) argued the same effect size, with shared reading accounting for about 8% of the variance in outcome measures, could be considered a medium to large association. They argued that the association was meaningful because it was greater than one of the most powerful predictors of reading difficulties: the nonword reading deficit which explains about 6% of the differences between children with normally developing reading skills and those experiencing problems with reading (see Rack, Snowling & Olson, 1992 for a review). Bus and colleagues suggested that their meta-analysis provided stronger evidence than the review conducted by Scarborough and Dobrich, as the latter merely counted the number of significant results, and underestimated the overall effect.

Mol and Bus (2011) in a recent meta-analysis of 99 studies investigating children’s exposure to printed material from infancy to early adulthood, have argued that the magnitude of associations between shared reading and early reading skills may have been underestimated in earlier studies. They suggested that parent reports of the frequency of shared reading may be unreliable. Because reading is a socially
desirable activity, parents may inflate reports of the frequency with which they read to their children. An alternative method is use of “author/title checklists” where parents or children mark book titles or authors that they recognised from a list. The lists also contains foils or made up titles or authors, which were subtracted from the final total if they were marked, to discourage guessing. Mol and Bus found that this measure of extent of exposure to print had stronger associations with basic reading skills of preschool and kindergarten children when compared with reading frequency measures.

Associations between shared reading and later reading achievement have also been investigated in a series of longitudinal studies. Sénéchal and LeFevre (2002) found positive associations between story book exposure, measured by the “author title checklist” method, and reading achievement. A recent Australian study using LSAC data also found positive associations between frequency of shared reading and reading achievement (Kalb & van Ours, 2013). With a large, representative sample of 4,000 children, they found that children who were read to on 6 to 7 days per week were rated 6 months higher in reading skill by teachers at ages 4 to 11. In turn, children read to 3-5 days were rated 6 months ahead of children read to 0-2 days per week. Kalb and van Ours found that children who were weaker readers were more likely to be read to than children who were stronger readers. Taking this into account, Kalb and van Ours found relationships between shared reading and reading outcomes were even stronger. This may be one reason why earlier studies found relatively weaker relationships between time spent on shared reading and reading outcomes.

**Contributions of “Time Spent” and the Nature of Shared Reading and Literacy Teaching**

The brief review in the previous two sections has described how positive associations have consistently been found between children’s exposure to shared reading with their families and development of literacy or literacy related skills. However, it is possible that the way in which parents read to children makes more of a contribution to reading development than time spent does, particularly if shared reading is used as a springboard for teaching literacy activities.
Sénéchal and LeFevre (2002) have distinguished formal and informal literacy practices. Formal literacy practices included teaching children the letters of the alphabet and to write and read words. Informal literacy practices included sharing books with children. More formal home learning was associated with reading development while the informal sharing of books was associated with vocabulary growth over the same time period. Another study of 4- to 6-year-olds compared the frequency with which children were read to and more formal literacy activities such as naming and writing letters and reading signs (Levy, Gong, Hessels, Evans & Jared, 2006). The authors found that formal activities were associated with children’s knowledge of print conventions, such as distinguishing printed words from scribbles, reading achievement on the Wide Range Achievement Test (WRAT-3) reading subtest, where children had to name letters and words and, to a lesser extent, phonological sensitivity measured by the Test of Auditory Analysis Skills (TAAS) where children had to say words after deleting syllables or phonemes. There was little association between the frequency of reading to children and knowledge of print conventions, reading achievement and phonological sensitivity.

Taken together these studies show that teaching children literacy skills in the context of sharing books with them may contribute to the development of reading. However, Sénéchal and LeFevre (2002) also provide evidence that time spent reading to children, without formal teaching of literacy skills, contributes in meaningful ways to the development of skills necessary to learn to read.

**Contributions of Child and Family Characteristics to Shared Reading and Reading Development**

Time spent reading is associated with higher reading achievement but families that read more to children may have other characteristics that are associated with higher reading achievement. If this were the case, what seems to be an association between time spent reading together and skill development, might really be based on an association between child or family characteristics and skill development. Family characteristics may be particularly significant for the positive contribution of shared reading as it depends on parent involvement.
Bronfenbrenner’s model of child development provides a framework for systematically identifying these factors and describing their relationships and existing studies have controlled for a range of child and family factors. These have included the child’s age, gender, birth order and whether the child was a special needs child (Kalb & van Ours, 2013; Tomopoulos et al., 2007). Children’s intelligence and receptive language skills have also been controlled (Sénéchal & LeFevre, 2002). Family factors have included the characteristics of parents, such as maternal age, household income, education, parental print exposure, employment status, ethnicity and language spoken in the home (Kalb & van Ours, 2013; Rodriguez et al., 2009; Sénéchal & LeFevre, 2002; Tomopoulos et al., 2007). Family structural variables, such as whether the mother was living with a partner and the number of children, have also been controlled (Kalb & van Ours, 2013; Rodriguez et al., 2009). Finally, studies have also controlled for family environmental variables such as the number of children’s books and the number of televisions in the home (Kalb & van Ours, 2013). In each case, the association between shared reading and reading skill has remained significant, indicating a direct association between exposure to shared reading and children’s reading development (Kalb & van Ours, 2013).

**Summary**

Studies have shown shared reading contributes positively to a range of skills needed to learn to read. These include language and cognitive development, which are preconditions for learning to read. Shared reading also appears to contribute positively to all stages of the development of literacy. Associations did not depend on parents’ formal teaching of literacy skills and endured when a range of child and family variables known to be relevant to reading development were controlled. Importantly, the greater the exposure to shared reading, the greater the benefit to reading development (Kalb & van Ours, 2013).

Positive associations between shared reading and reading development were found in studies using a variety of designs. They were found in both cross-sectional and longitudinal studies and in studies using different ways of measuring shared reading, including diary measures of time spent reading on a selected day, parent reports of
how frequently they read to children each week and checklists assessing parents’ knowledge of the authors and titles of children’s books. Converging results from different study designs provides convincing evidence that time spent in shared reading is positively associated with the development of reading skills in early childhood.

2.4.2 Independent Reading

Introduction

Children take an important step on the road to literacy when they begin to read independently. Independent reading refers to any reading children do themselves. It includes books set for school or homework, and leisure reading, where children read content they have chosen freely and, most likely, for enjoyment. However, even when children can read independently it takes many years of practice before they reach levels of literacy sufficient to function effectively in today’s society. While it seems plausible that the time children spend reading independently would contribute to reading achievement, this has been the subject of debate (Carver & Liebert, 1995).

Independent Reading and Literacy Related Skills

Some studies have found little evidence for the claim that reading is a major cause of increases in vocabulary, a core measure of language proficiency (Zubrick et al., 2015). In one study, fifth graders were repeatedly (up to 10 times in some cases) exposed to words with contextual information to assist them in inferring the words’ meaning. While the students did show evidence of some word learning, gains were not as great as expected. The authors concluded that students do not learn words from reading, easily, or in great quantities (Jenkins, Stein & Wysocki, 1984). Another study examined the effects of a summer reading program where children read relatively easy books for 15 to 30 hours. Results did not show that children gained vocabulary over the time (Carver & Leibert, 1995). The researchers question whether it would be possible for children to gain much vocabulary in this time frame.
However, they also question how much word knowledge children gain from leisure reading, given that children generally choose relatively easy material for free-reading. Instead, they point to instruction in school, and listening, as more likely routes for acquiring vocabulary. These studies did not find positive associations between the children’s exposure to printed words and the development of their vocabulary but interventions were short term and vocabulary was presented only in written form.

However, one study found that reading volume was positively associated with vocabulary, spelling skills, verbal fluency and general knowledge (Cunningham & Stanovich, 1998). Reading volume was measured using a title recognition test to control for possible inflation of reading estimates.

More recently, Mol and Bus (2011) in a meta-analysis of 99 studies with diverse designs found positive associations between estimates of independent reading time and oral language development for children in primary, middle, and high school. The correlations between independent reading and oral language development became stronger as children got older. It seems likely that vocabulary is acquired through being encountered over longer periods of time and in a variety of forms and contexts, including oral and written forms at school and home. This means that words encountered while reading may contribute to vocabulary development, but the effects may only be evident over time.

**Time Spent Reading Independently and Reading Achievement**

American studies of children’s time use during the summer holidays have shown that much of the gap in reading comprehension between upper SES children and low-income or minority children was due to a decline or failure to improve reading skills over the summer holidays (Alexander, Entwisle, & Olson, 2001; Downey, Broh, & von Hippel, 2004). This has led to a series of research studies that have examined whether increasing the time children spent reading over the summer break can remediate this gap.

One study examined the effects of a voluntary summer reading program on children who came from mostly middle to low-income families. Children in grades 3, 4 and 5
read fiction books at a summer school which ran for 2 hours each day during the week, for 6 weeks. Subsequent analysis of the difficulty level of the books read by students showed most of the books were below their level of measured reading ability. Reading these relatively easy books was not found to contribute to improvements in reading level, reading rate or efficiency (Carver & Leibert, 1995). Another study evaluated a reading intervention for children in grades 2 and 3 (77% of whom were from poor families) designed to increase the time the children spent reading over the summer break (Guryan, Kim & Quinn, 2014). Before the intervention began, children were given six reading comprehension lessons and were mailed a book each week, a total of 10 books over the summer. There was no effect of the intervention on the reading comprehension skills of children in grade 2, however girls in grade 3 showed small increases in reading comprehension scores (equivalent to 1.4 months extra schooling).

Other studies that have used summer reading interventions have shown that providing children with books and opportunities to read, even books matched to children’s reading level, was not sufficient to lift reading ability (Kim & White, 2008). In two studies, one with children in fourth grade, and one with children in third, fourth and fifth grade, positive effects on reading development only came about when children were provided with books matched to their reading levels and with enough assistance to help them read successfully (Kim, 2006, Kim & White, 2008).

Other studies, however, have found that time spent reading independently was positively associated with reading achievement, even without additional support. Anderson, Wilson and Fielding (1988) collected daily activity data for 155 fifth grade students on all out-of-school activities. Differences in the number of minutes of reading per day were associated with reading proficiency in fifth grade. Assuming that time spent reading in grades 2 to 5 was similar to time spent reading in grade 5, they found that time spent reading was positively associated with reading skill from second to fifth grade. Stronger evidence of associations between print exposure and reading achievement came from the meta-analysis conducted by Mol & Bus (2011). They found that exposure to books, measured using the title recognition test, was positively associated with the technical reading skills of children, particularly for
children in middle school (grades 5 to 8). Associations were weaker for children in primary school (grades 1 to 4).

The diverse results of these studies may have been partly because the summer reading studies were short-term interventions and in most cases children were reading books below their reading level. In addition, differences in the ages of children involved in these studies may have contributed to the different results. Children in the studies that did not find an association between time spent reading independently and reading achievement were in grade 5 or below. However, Mol and Bus found the strongest associations between print exposure and reading skills for children from grade 5 and above. It has been suggested that time spent reading independently benefits children only when they have reached a certain level of reading development, generally related to their age (Guryan et al., 2014; McIntyre, Rightmyer, Powell, Powers, Petrosko, 2006). Time spent reading independently, without guidance, may only contribute to reading ability when children are reading sufficiently competently. In addition, the summer reading studies were short-term interventions and many of the studies children were reading below their reading level.

**Contributions of Child and Family Characteristics to Independent Reading**

As with shared reading, positive associations between independent reading and reading skill may be explained by factors other than time spent reading. For example, children with high intelligence or good reading skills may both read more and have higher reading achievement and better vocabulary skills. If this is so, apparent associations between time spent reading independently and reading achievement may be due to high intelligence or better reading skills.

Evidence suggests family characteristics and reading achievement are linked. Parent education has been shown to be associated with the beliefs parents hold about their children’s academic skills, the expectations they have for children’s level of academic attainment and their behaviours, such as the number of children’s books they make available in the home. These beliefs and behaviours are, in turn, associated with children’s reading achievement (Davis-Kean, 2005; Halle, Kurtz-Costes & Mahoney, 1997). Family characteristics have also been found to be associated with attitudes to
reading and time spent reading for leisure (Baker et al., 1997). For example, children who had more positive attitudes to reading and who engaged in more leisure reading in fifth-grade were read to, had more encouragement from their families to read, were more likely to have had books bought for them, had more reading materials available at home and had parents who read themselves.

Children’s characteristics have also been found to be associated with reading achievement. Skilled readers have been found to be more likely to read more (Mol & Bus, 2011). Further, the time spent reading has been shown to increase reading skills further (Mol & Bus, 2011). For example, early reading experience has been shown to be positively associated with reading achievement at the end of third grade (Mol & Bus, 2011). Children’s independent reading has also been shown to contribute to increases in reading comprehension between third and fifth grade, even after controlling for third grade reading comprehension (Cunningham & Stanovich, 1998).

Longitudinal studies have also shown positive associations between reading comprehension and word recognition skills in first grade and subsequent print exposure in eleventh grade. Mol and Bus (2011) describe a process whereby a positive start to early reading sets in motion a positive spiral, where good reading skills at an early age encourage children to spend more time reading several years later. More time spent reading may also mean differences in reading achievement between good and poor readers widen over time (Stanovich, 1986).

Children’s characteristics have also been found to be associated with language skills that support reading. However, a study of fourth-, fifth- and sixth-grade children found that independent reading and vocabulary development were associated even after controlling for children’s intelligence and verbal abilities (Cunningham & Stanovich, 1998; see also Mol & Bus, 2011). Cunningham and Stanovich also controlled for decoding ability, as children who can readily decode new words might also read more.

There is also evidence that the benefits of time spent reading will differ from child to child. Mol and Bus (2011) showed associations between time spent reading independently, measured by print exposure, and technical reading skills were stronger for weaker readers than children with typically developing reading skills. Independent reading explained 4% of the variance in basic reading skills in school
children with age appropriate reading skills but 15% of the variance in reading skills of children with weaker reading skills. While, in general, time spent reading makes positive contributions to a range of skills, it is particularly valuable for children who are weaker readers.

To summarise, child and family characteristics are associated with the time children spend reading. Families who value and prioritise reading are more likely to have children who read for leisure. Good readers are more likely to read more. However, benefits of time spent reading do not seem to accrue entirely because these children share their family’s positive reading attitude or have higher reading skill. Importantly, there is evidence that time spent reading benefits the reading skills of weaker readers more than stronger readers.

**Summary**

Studies of time spent reading independently have shown it is positively associated with a range of reading related skills, such as vocabulary development and general knowledge, as well as reading achievement (Mol & Bus, 2011). These associations endured even when characteristics of the child, such as intelligence and decoding ability, were controlled (Mol & Bus, 2011). They were clearest in children who were proficient readers. While effect sizes were small there is evidence that early differences in print exposure grow over time. Children who spend more time reading early make greater gains in language and reading development and go on to read more (Mol & Bus, 2011). This may contribute to widening interindividual differences in reading exposure and outcomes over time (Stanovich, 1986).

**2.5 Associations Between Time Spent in Shared and Independent Reading**

Mol and Bus (2011) suggested that early shared reading might develop children’s language skills and interest in and enjoyment of books and they may, therefore, go on to do more independent reading (see also Baker et al., 1997). However, they have
noted that there are few studies that have examined how sharing books with young children is associated with independent reading later in childhood (see also Cunningham & Zibulsky, 2011).

Neuman (1986) described a strong positive correlation between the frequency of being read to as a young child and leisure reading behaviour in fifth grade. The measure of reading behaviour included parent reports of the number of books their children read in the past month, the average amount of time they spent reading each day and how often children initiated discussions about their reading. Neuman’s study relied on parent recollection of the frequency with which they read to children and parent reports of the amount of independent reading their children did, both of which may be affected by social desirability bias (Mol & Bus, 2011). Shapiro and Whitney (1997) assessed home influences on fourth- and fifth-grade avid and non-avid readers. Avid readers referred to participants who read for an hour a day on average. Non-avid readers referred to participants who recorded no reading for the 3 weeks in which diary data for the study were collected. They found that children who became avid readers were read to on average until they were 8 years old, while children who became non-avid readers were not read to after they were 6 years old. Shapiro and Whitney’s study was small (N=39) and relied on children’s reports of when their parents stopped reading to them, leaving a question mark over the validity of this measure.

The limited evidence provided by these studies supports the description that Mol and Bus (2011) provide of associations between early shared reading and time spent reading independently later in childhood. They suggest that early shared reading sets in motion a ‘positive causal spiral’ where shared reading develops language and comprehension skills. These children read more which further develops their reading and comprehension skills and this may contribute to ever widening differences in print exposure and achievement (Stanovich, 1986). Because reading is enjoyable and relatively effortless these children will choose to read, even when reading competes with other activities for time.
2.6 Television Viewing and Shared and Independent Reading

2.6.1 Introduction

The potential for time spent viewing television to detract from reading time has been widely discussed in both academic (Hancox et al., 2005; Vandewater et al., 2006) and popular (Winn, 1977) literature. Time spent viewing television is suggested to affect children’s reading achievement by displacing time spent in reading activities: the displacement hypothesis (Ennemoser & Schneider, 2007; Hancox et al., 2005; Hofferth, 2010, Shin, 2004).

The displacement hypothesis assumes that time is limited, and that if time devoted to one activity increases, then time devoted to some other activity must decrease (Hofferth & Sandberg, 2001; Robinson, 1988). On this basis, if time spent viewing increases this will reduce the time children have for books and reading and this, in turn, may have consequences for reading attainment and possibly for broader academic achievement (Ennemoser & Schneider, 2007; Hofferth, 2010, Shin, 2004).

2.6.2 Does Viewing Displace Reading Activities?

Very different hypotheses about how time spent viewing and time spent reading may be related have been proposed. On the one hand, there is evidence that viewing can facilitate reading development and time spent reading, the facilitation hypotheses. On the other hand, there is evidence that time spent viewing reduces time spent reading and inhibits reading development (Beentjes & van der Voort, 1989; Ennemoser & Schneider, 2007), the inhibition hypotheses. Some authors have found no evidence of facilitation or inhibition of reading by viewing and suggest that there is insufficient evidence that viewing time affects reading development (Neuman, 1986; Vandewater et al., 2006) or reading related skills such as language (Bittman et al., 2011). These authors point to the home environment, the school environment and children’s own intelligence and motivation as more important influences on the development of
literacy and literacy related skills, rather than loss of reading time to viewing time. Each of these approaches to examining relationships between viewing and reading will be considered in turn.

Facilitation Hypotheses

There is evidence that viewing educational programs is positively associated with the development of literacy related skills, such as vocabulary (Lemish & Rice, 1986; Linebarger & Walker, 2005) and also letter and word recognition (Linebarger, Kosniac, Greenwood, Nii Sai, 2004). There is also evidence that viewing may increase time spent reading directly, for example, by encouraging children to read books associated with televised programs (Beentjes & van der Voort, 1989) or by providing reading practice through reading subtitles (Beentjes & van der Voort, 1989; Kothari, Takeda, Hoshi & Pandey, 2002; McCall & Craig, 2009).

However, while viewing has the potential to facilitate reading in these ways, studies suggest that, in practice, these positive associations are often not realized. The contribution of literacy related programs to the development of reading skills would seem to be small and unlikely to exceed the contribution of teachers and schools (Beentjes & van der Voort, 1989). Further, the amount of educational viewing children do is limited. Viewing educational programming declines rapidly as children get older (Hancox et al., 2005). Even for young children, the amount of educational programming on offer is relatively small and children’s viewing times often exceed the amount of educational programming on offer (Vandewater et al., 2005). An interest in books sparked by television viewing has been shown to redirect reading choices to literary versions of televised programs, rather than increase overall time spent reading (Beentjes & van der Voort, 1989). The use of subtitles in English speaking cultures is limited and there is not a great deal of evidence that children read text shown on television (Beentjes & van der Voort, 1989).
Inhibition Hypotheses

Inhibition hypotheses suggest different mechanisms by which viewing may inhibit reading development. Although not all inhibition hypotheses base their claims on the association between the time children spend viewing and reading, the major hypotheses will be reviewed briefly for completeness. The passivity hypothesis argues that viewing television requires less mental effort than activities such as reading, so that children develop a preference for viewing over reading (Salomon, 1984). The reading depreciation hypothesis makes a similar claim, suggesting viewing is pleasant and entertaining and so children lose their motivation to engage in tasks that may be less instantly gratifying or diverting, such as school work and reading (Beentjes & van der Voort, 1989; Koolstra & van der Voort, 1996). The concentration deterioration hypothesis suggests that exposure to the fast pace and rapid scene changes of many television programs reduces children’s capacity to concentrate on tasks such as reading (Christakis, Ebel, Rivara & Zimmerman, 2004; Gadberry, 1980; Zimmerman & Christakis, 2005). Finally, the displacement hypothesis argues that viewing takes up time that children would otherwise devote to reading (Ennemoser & Schneider, 2007; Gadberry, 1980; Huston et al., 1999; Shin 2004; Wolfe et al., 1984). In its simplest form, the displacement hypothesis proposes that time spent viewing will lead to reductions in time spent reading and this will undermine reading acquisition and achievement over time (Ennemoser & Schneider, 2007; Neuman, 1988).

The displacement hypothesis remains the most popular of the hypotheses used to explain associations between time spent viewing and reading achievement. In the next section, what is known about the displacement of reading time by television viewing time will be described.

Shared Reading

Several cross-sectional studies that have investigated associations between time spent viewing and time spent in shared reading. These studies have used different measures of reading and viewing and have examined children of different ages. Vandewater et
al. (2006) studied a subsample of 1,712 United States children from infancy to 12 years who participated in the child development supplement of the Panel Study of Income Dynamics (PSID) in 1997. The study measured children’s family background, academic achievement and behaviour and also included two 24-hour time use diaries (one weekday and one weekend day) filled out by the child’s caregiver. Using the time use diary data, total time spent viewing television during the week and on weekends was not found to be associated with time spent being read to and reading independently. In contrast, Tomopoulos et al. (2007), in another United States study, found significant negative associations between total media exposure (including television, videos, computer and video games) and the frequency with which pre-schoolers (3 to 5 years) were read to. No association between exposure to child educational media and reading frequency was found. Vandewater et al. (2005), in an earlier study, asked parents to report whether the television was always on in their homes, or on most of the time, regardless of whether anyone was watching. They found 3- to 4-year-olds and 5- to 6-year-olds, in heavy exposure households, were less likely to read and be read to and were also less likely to be able to read.

A handful of longitudinal studies have investigated associations between time spent viewing and time spent in shared reading longitudinally. Ennemoser and Schneider (2007), in a carefully designed study, found kindergarten children who were read to more by their parents viewed less entertainment television, than those who were read to less. Measures of viewing and reading times were based on time use diaries of children’s viewing and other leisure activities, kept by parents for 7 days. Kalb and van Ours (2013), in a study using LSAC data, found that daily viewing hours when children were 4 to 5 years of age, were significantly negatively associated with the number of times during the week that children were read to. Daily viewing hours were measured using a scale that ranged from 1 (Does not watch TV) to 5 (5 or more hours).

A 3-year longitudinal study of low income families of two cohorts of children (2 year olds and 4 year olds) in the United States also found that viewing programs designed to entertain was negatively associated with diary measures of time spent “reading” (including looking at books, reading, being read to or hearing stories) and educational activities (including art, colouring, music, dance, puzzles, games and organised activities) conducted at school or at home (Huston et al., 1999). While this study was
suggestive that viewing and shared reading were negatively associated, because reading and educational activities were combined in the analysis the findings are more difficult to interpret than studies that examined shared reading alone.

Many of the studies reviewed above used methodologies which made their findings hard to interpret. In three studies measures of shared reading were combined with other activities (Huston et al., 1999; Vandewater et al., 2006; Vandewater et al., 2005). This meant that the more circumscribed association between viewing and shared reading remained uncertain. In one study, viewing was measured with other media activities, such as videos and computer games, making the association between television viewing and reading time uncertain (Tomopoulos et al., 2007). Only one of these studies, Ennemoser and Schneider (2007), used the same index for time spent viewing and reading, that is, minutes per day. Kalb and van Ours (2013) for example, compared time spent viewing with the frequency with which parents read to children. In addition, only Ennemoser and Schneider (2007) used time use diaries to estimate both viewing and reading times. Tomopoulos et al. (2007) used a recall diary where parents described all media exposure on the most recent typical day. A methodological comparison of time diary and global estimates of the time 5-year-olds spent viewing, using video to record actual viewing times, showed time use diaries provide accurate estimates of viewing times while global estimates tend to be inflated (Anderson, Field, Collins, Pugzles Lorch & Nathan, 1985). This may have made the recall diaries less valid than ones filled out concurrently and may have meant estimates of media exposure were subject to social desirability bias (Frazis & Stewart, 2012). Finally, age ranges differed across studies. Such differences make it difficult to compare the results of these studies. However, five out of the six studies, including the most methodologically sound studies, found negative associations between a measure of viewing time and a measure of reading time. Taken together, findings from most of the studies that examined associations between shared reading and television viewing converge to suggest that they are negatively associated.

Independent Reading

Investigations of associations between time spent viewing and time spent in independent reading were first carried out in the 1950s and have continued until today. The methodologies used have varied over time.
The early studies were “natural experiments” comparing time use in communities with and without access to television and time use in communities before and after television was introduced to the home. Two early studies suggested that television viewing displaced activities that served needs that were functionally similar to viewing. Activities displaced included movie going, listening to the radio and comic book reading (Himmelweit et al., 1958; Schramm et al., 1961). Himmelweit et al. (1958) found book reading temporarily declined when television was introduced, but recovered when the novelty of viewing diminished, so that viewers read as much as non-viewers. An Australian study found children without television did less reading than children with television (Murray & Kippax, 1978). Mutz et al. (1993) found that after they gained access to television at home, South African children spent less time reading than peers who did not have access to television. In contrast, Schramm et al. (1961) found no relationship between television viewing and book reading. However, children in these studies were often well-established readers by the time television was introduced. For example, Murray and Kippax (1978) compared activities of 8- to 12-year-old viewers and non-viewers while Mutz et al. (1993) examined changes in the time use of fifth- to twelfth-grade children after the introduction of television. The generalizability of these studies to children for whom television was available while they were learning to read is unclear (Koolstra & van der Voort, 1996).

Taking another approach, researchers have examined historical records and compared differences in time use over time. Wartella and Mazzarella (1990), using diary studies from the 1930’s and 1980’s, compared the leisure activities of 14- to 18-year-olds. The early research was a field study of an affluent suburb of New York. Residents, including 795 high school students, kept diaries of leisure time activities for several days. The later study was a diary study using a national sample. Total media use was shown to increase slightly over time. 1930’s youth spent a little over 15 hours a week (38% of their leisure time) with media, including the radio, movies and reading. Listening to the radio was the dominant leisure activity at home. 1980’s youth spent nearly 16 hours a week (51% of their leisure time) with media, of which over 14 hours (46% of their leisure time) was spent viewing television. In contrast, leisure reading decreased over time from nearly 5 hours per week in the 1930’s (12% of total leisure time) to about 1 hour 30 minutes per week (5% of total leisure time) in the 1980’s.
Again, because life circumstances were so different for youth in the 1930’s and the 1980’s, it is difficult to tell to what extent the declines in reading may be due to viewing television or to changes in other leisure time constraints and opportunities.

Some early studies attempted to use experimental techniques to examine viewing and reading. Gadberry (1980) matched pairs (N=30) of middle-class 6-year-old children for sex, age, IQ and viewing amounts. Parents restricted the viewing time of one child in each pair to half the time he or she had been viewing before the study began. The other child had no parental restrictions placed on their viewing. For those in the restricted viewing condition reading time increased significantly. For girls’ the increase was about 12 minutes a day (from 1 to 1.2 hours) while the increase for boys was greater, about 24 minutes (from 0.6 to 1 hour). Reading times of children in the unrestricted viewing condition fell over the same period. Gadberry concluded that viewing time had been restricting reading time but she considered this conclusion tentative because the children were ‘middle-class’ and ‘highly motivated for intellectual accomplishment’ (p. 55). Reducing viewing times might not have increased reading times in less motivated children. In another carefully designed intervention study, 8- to 12-year-old children’s (N=5) viewing time was limited by giving children viewing tokens which could be exchanged for up to 10 hours viewing a week (Wolfe et al., 1984). All children reduced their pre-study viewing times to 10 hours or less during the 3-month intervention. In some cases this reduced the viewing time by more than half. All children increased their reading time, but never by the same length of time as the reduction in viewing. When the intervention ended, viewing time remained low. However, reading times decreased in 2 of the 3 children for whom data were available. In contrast to Gadberry’s study the families involved were considered working class. However, the small number of children studied (5) makes it difficult to know whether the findings can be generalised. These studies suggest that viewing may displace reading, however, both studies had small sample sizes.

To show the changes in reading time were caused by the reduction in viewing time, it is necessary to show that changes in other activities could not have caused the increase in reading times. One way to do this would be to take a baseline measure of viewing and reading times, introduce an intervention to limit viewing time, then end the intervention to see if baseline reading times return. Then, repeat the sequence to
see if the effects of the first intervention on reading times recur. This helps to reduce the likelihood that other factors could have produced the effects on reading time after a single intervention.

Potentially more informative for the situation today are studies of time spent viewing and reading by children who grew up with television viewing as part of their lives. One United States study used data from approximately 70,000 students aged 9, 13 and 17 years of age who participated in the National Assessment of Educational Progress (NAEP) in reading and writing, 1983-1984 (Neuman, 1988). The NAEP measured reading skills and attitudes toward reading and also time spent viewing television and leisure reading. Correlations between leisure reading time and television viewing time were small and non-significant at all three ages. In addition, reading achievement scores were higher for students who viewed from 2 to 4 hours a day, than for those who did not view. Neuman concluded that there was little evidence that leisure reading was being displaced by viewing.

Another large United States study, using diary estimates of viewing and reading for a subsample of 1,712 children from infancy to 12 years, from the 1997 dataset of the PSID, came to a similar conclusion. Time spent viewing television was not associated with amounts of time children spent reading, including being read to and reading independently (Vandewater et al., 2006). In contrast, three studies, also using participants from the PSID, found evidence that time spent viewing reduced the amount of time spent reading. Attewell, Suazo-Garcia & Battle (2003) used data obtained in 1997 and examined children 4 to 13 years of age (N=1,680). Shin (2004) also used data obtained in 1997 and examined 1,203 6 to 13-year-old children. Reading included looking at books for younger children and reading for pleasure for older children. Shin investigated associations between viewing and academic achievement. One of four different structural equation models tested whether viewing was associated with increased mental passivity, which was operationalised as extent of leisure reading time. The model can therefore be used to assess whether time spent viewing was negatively associated with time spent reading. Shin found that the more time children spent watching television, the less time they spent reading for leisure. Correlations were significant but small. Further support was found in Hofferth’s
(2010) study which combined data obtained in 1997 and 2003, for children aged 6 to 12 years of age (N=2,562).

It may be that the different measures of reading and the different ages of children used in PSID studies explain the different results. Vandwater’s (2006) study combined shared and independent reading and examined children from infancy to 12 years. The Attewell et al. (2003) and the Hofferth (2010) study measured only independent reading and sampled school-aged children. It may be that associations between shared reading and viewing differ from those between independent reading and viewing and that associations between reading and viewing activities differ for children of different ages.

Negative associations were also found in a smaller cross-sectional study. Allen, Cipielewski and Stanovich (1992) had 63 American 10-year-olds keep daily activity diaries of non-school time for 15 days. Children spent about 10 minutes per day reading books for pleasure and just under an hour and a half each day watching television. The negative correlation between book reading and viewing time was small to medium, (-.28), similar to that found by Shin.

In a longitudinal study, Koolstra and van der Voort (1996) conducted a panel study of two cohorts of Dutch children, ages 8 to 10 (N₁=522) and 10 to 12 (N₂=528). The children came from a range of socioeconomic backgrounds. Children reported how often they watched each of a list of programs, how many books they had read the previous week during their leisure time and how frequently they read at specified times, such as on vacation. They found a negative association between television viewing at time 1 and book reading 12 months later for both cohorts. Time spent viewing explained between 8% and 18% of later reading behaviour. As Koolstra and van der Voort’s study methodology did not use a direct measure of “time spent”, it is difficult to use their study as evidence for displacement of reading by viewing.

Ennemoser and Schneider (2007) investigated associations between time spent viewing ‘entertainment’ television and time spent reading in two cohorts of German children 6 to 9 years (N₁= 165) and 8 to 11 years (N₂=167). Estimates were based on
diary records of all leisure time activities. Entertainment viewing in first grade, when children were about 6 years, was negatively associated with children’s leisure reading time in third grade, when children were about 8 years. Entertainment viewing when children were about 7 years of age had a small to medium negative association ($r = -0.21$) with time spent reading for leisure when children were about 9 years of age. Ennemoser and Schneider interpreted their findings to mean that viewing television displaced leisure reading and suggested that the effect of the displacement accumulated over time and was reflected in poorer reading achievement.

Two of the four studies examining changes in behaviour with the introduction of television found that when television was introduced children’s reading times decreased, although one of these studies found the reduction in reading time was only temporary. However, the children in these studies were well-established readers when television was introduced. Whether the findings of these studies are applicable to children today is unclear.

The quasi-experimental studies manipulating viewing and reading time provide the clearest evidence for displacement. But the small size of the sample or the restricted social class range makes it uncertain whether their conclusions can be generalised.

The majority of the larger, cross-sectional population studies have shown small negative associations between time spent viewing and time spent reading. While results of these studies converge, strengthening evidence that there are negative associations between the two activities, the cross-sectional nature of their study design precludes any argument that viewing is displacing reading. Evidence from longitudinal studies provides further support for cross-sectional studies. These findings have been interpreted to mean viewing may displace shared reading and reading independently for pleasure.
Child and Family Factors

Studies that have not found associations between time spent viewing and reading have suggested child and family characteristics are more important influences on the time spent in reading activities, than time spent viewing television (Bittman, et al., 2011; Neuman, 1986; Neuman, 1988; Vandewater et al., 2006). This research will now be briefly reviewed.

Neuman (1986) found no evidence that viewing time was associated with the time 10-year-old children spent reading for leisure and instead pointed to the importance of family processes around encouraging children to read and allowing children independence and responsibility and also children’s participation in a diverse range of leisure activities outside the home. In another study, Neuman (1988) used National Assessment data for time spent reading and writing and found little association between viewing and reading time for 9-, 13- and 17-year-olds. Her evidence suggested reading times were more closely associated with enjoyment of reading and self-perceptions of being a good reader than they were with availability of non-viewing time. Vandewater et al. (2006) found negative associations between viewing time and time spent with parents and siblings, but no association with time spent reading. They note that a complex web of characteristics influence reading behaviour, including the child’s own intelligence and motivation, the family environment and parent and teacher support.

In support of these arguments, child and family characteristics have been shown to be associated with viewing and reading times. For example, studies have shown child characteristics are positively associated with time spent viewing. Children diagnosed with learning difficulties, such as ADHD (Acevedo-Polakovich et al., 2006), reading difficulties (Rashid et al., 2005) and language delays (Chonchaiya & Pruksananonda, 2008) have been shown to view more television than typically developing children. Further, language delays are strongly correlated with reading delays. Over 50% of children with language impairments also have reading delays (Hay, Elias, Fielding-
Barnsley, Homel & Freiberg, 2007). In turn, children who are poorer readers spend less time reading in their leisure time (Mol & Bus, 2011; Stanovich, 1986).

Family characteristics have also been shown to be associated with viewing and reading time. Children from more highly educated and higher socioeconomic status families spent more time reading and less time watching television (Bittman & Sipthorp, 2011; Hofferth & Sandberg, 2001; Bianchi & Robinson, 1997). Parents’ education and SES have been shown to be associated with the value families place on viewing and reading activities and the time families have to facilitate these activities. Parents in poorer economic circumstances also provide fewer books for their children (Aber, Bennett, Conley, & Li, 1997). Poorer economic circumstances also mean parents may have less time to read to children or to mediate viewing time (Rutherford et al. 2010).

In addition to these characteristics, dynamic family processes, such as children’s involvement in organized activities outside the home, time for recreational activities with children and family outings were associated with the time children were read to or time spent reading for leisure (Neuman, 1986; Neuman, 1995). Recent studies have focussed on aspects of the home environment which involve interaction between parents and children, such as arts and crafts, musical activities and playing games with children (Foster, Lambert, Abbott-Shim, McCarty & Franze, 2005). These aspects of the home learning environment have been shown to be positively associated with the emergent literacy of 4-year-olds and 5-year-olds (Foster et al., 2005). In addition, a study using LSAC data found children of parents who engaged them more frequently in home activities, when they were 2-3 years old, had higher National Assessment Program-Literacy and Numeracy (NAPLAN) reading achievement scores in year 3 (Yu & Daraganova, 2014). Furthermore, children who spend more time viewing television spend less time with their parents engaged in non-media activities (Vandewater et al., 2006). These dynamic “process” characteristics are, Neuman suggests, at least as important as more “static” characteristics of the family, such as SES, in explaining how families balance viewing and reading activities. Some studies have controlled for child and family factors to examine whether associations between time spent reading and viewing endure. Some studies have
controlled for child characteristics, for example IQ, and have found associations between time spent viewing and time spent reading endured (Ennemoser & Schneider, 2007; Koolstra & van der Voort, 1996).

Studies have also explored associations between viewing and reading activities after controlling for family characteristics such as parent’s education (Tomopoulous et al., 2007) and the families’ SES (Rutherford et al., 2010; Ennemoser & Schneider, 2007; Koolstra & van der Voort, 1996). These studies have found that associations endured when family characteristics were controlled.

One study explored whether gender, IQ and SES moderated associations between viewing and reading. Koolstra and van der Voort (1996), in their longitudinal study of 2 cohorts of children 8- to 10- and 10- to 12- years, measured children’s viewing and reading on three occasions, with 12 months between each measurement occasion. Associations were moderated by gender. There was a significantly stronger negative association between viewing and reading for girls in the period between the second and third measurement occasions than for boys.

A range of child and family characteristics have been shown to be associated both with time spent viewing and time spent reading. However, when these factors are controlled the associations between time spent viewing and time spent reading have been shown to persist.

**2.6.3 Limitations of displacement studies:**

**Methodological Limitations**

A number of criticisms of reading and viewing measures used in studies reviewed in this Chapter, have been made. Widely used frequency measures of time spent reading have been criticised as being unreliable. Frequency measures ask parents of children on how many days of the week they engage in reading activities (see for example, Kalb & van Ours, 2013; Mullis, Martin, Foy, & Drucker, 2012). Because reading is a socially desirable activity, concerns about over-reporting have led to alternative measures being developed (Sénéchal & LeFevre, 2002; Mol & Bus, 2011, Cunningham & Stanovich, 1998). Using “author/title checklists”, parents or children
have marked children’s book titles or authors whom they recognised from a list. Parents were informed the lists also contained foils or made up titles or authors, which were subtracted from the final total if they were marked, to discourage guessing. The “author/title checklist” method is described as an index of exposure to literature, presumed to reflect time spent sharing books with children or reading (Mol & Bus, 2011). Despite the greater validity of these measures and their usefulness for examining associations with reading outcomes, they are difficult to compare with measures of viewing time, which are often measured using total time spent viewing, and cannot be used to examine displacement.

Beentjes and van der Voort (1989) argue that the preferable way to collect data on time spent viewing and reading is through time use diaries that gather information on all activities over a 24-hour time period. Estimates of time spent in only one or two activities in isolation, such as viewing and reading, tend to be inflated (see also Robinson & Martin, 2012). In addition, the diary method allows examination of the relationship between and relative importance of different activities depending on the amount of time devoted to each activity (Robinson, 1988). This also means viewing and reading times can be directly compared.

**Demonstrating displacement**

The displacement hypothesis posits that time spent viewing reduces the time available to children for a range of developmentally important activities. A wide range of activities has been investigated. For example, time spent with parents and siblings (Vandewater et al., 2006), time spent playing, time spent on physical activity (Jenvey, 2007) and time spent sleeping (Brockman et al., 2016).

In its simplest form, the displacement hypothesis proposes a symmetrical, zero-sum association between time spent viewing and time spent on other activities (Mutz et al., 1993). Time spent on one thing cannot be spent on another. The time children have for leisure activities is not unlimited so that time spent viewing will not available for other activities (Hofferth & Sandberg, 2001; Huston et al., 1999, Robinson, 1988).
In the sections on independent reading, consistent findings of negative associations between viewing and reading times from large cross-sectional population studies and two longitudinal studies were presented. The section on shared reading showed there was also evidence for negative associations between time spent viewing and time spent in shared reading. These findings were interpreted by the authors to be consistent with the displacement hypothesis, which remains the most popular of the hypotheses used to explain associations between viewing and reading.

However, negative associations between viewing and reading time, at a population level, do not show that viewing is displacing reading time, that is, it is causing a reduction in time spent reading. While quasi-experimental studies have taken a more rigorous approach to examining associations between viewing and reading time, most studies have relied upon survey or time diary data to show negative associations between time spent viewing and time spent reading (Attewell et al., 2003; Hofferth, 2010; Shin, 2004; Vandewater et al., 2006). In these cases, it cannot be shown that children would read, even if television viewing was not available. Negative associations found in survey or time use diary data may therefore be because children who would never read choose to view more, rather than viewing taking up time that would otherwise be devoted to reading.

To be able to show displacement of reading by viewing, viewing and reading would have to be the only available activities. If there were other activity options, it would not be possible to identify whether viewing or another activity were reducing reading time. Further, time available must be sufficiently constrained for it to be impossible for children to engage in both viewing and reading to the extent they would wish. If more time is available, then viewing is not displacing reading because there is time for both.

In addition to the difficulties in demonstrating displacement, two key assumptions underpinning the displacement hypothesis have also been questioned. (Mutz et al., 1993; Vandewater et al., 2006). First the assumption that time spent on one activity will take time that would have been spent on another activity. In the case of reading this means that television viewing would take up time that could have been spent reading. However, for viewing to take up time for reading, it needs to be shown that
if children were not viewing they would be engaged in “more worthwhile” activities such as reading. However, it is not clear that children would choose to read if they were not viewing (Vandewater et al., 2006).

The other key assumption of the displacement hypothesis, that there is a zero-sum relationship between time spent in different activities, has also been criticised (Mutz et al., 1993; Vandewater et al., 2006). In confined circumstances, such as an experimental laboratory, if only viewing and reading activities were available, choosing to view would mean that time for reading would be reduced. In these limited circumstances it would be possible to say that viewing is displacing reading. The quasi-experimental studies described above, showed that when viewing time was controlled for the period of the study, reading time increased. If the increase in reading time could be closely linked to the decrease in viewing time, this could provide evidence for displacement. One way to do this would be to show that for each reduction in viewing time there was a corresponding increase in reading time.

However, studies of viewing and reading have generally relied on survey or time diary data collected on children’s daily activities where children have a multitude of activity options open to them. Mutz et al. (1993) note that in these cases much time use has gone unmeasured, particularly activities not considered developmentally important such as “hanging out”, daydreaming or “doing nothing” (p. 53). Rather than viewing taking time from developmentally important activities, it may come from these “marginal” activities, in which case children may view a great deal, but still devote time to developmentally important activities such as reading. The limitations imposed on reading time by other non-discretionary activities such as school attendance and sleep have also not been taken into account (Mutz et al., 1993).

Despite the number of studies investigating associations between viewing and reading, to the author’s knowledge, none of these studies have directly examined the assumptions underpinning the displacement hypothesis. Mutz et al. (1993) notes that studies have failed to consider how the methods used to test the hypothesis fit the assumptions that underpin the hypothesis. If the current study finds evidence that these assumptions are valid, this strengthens the case for displacement.
In their most extreme formulations, the two assumptions on which the displacement hypothesis is based lead to a model of displacement in which viewers do not read and readers do not view. However, previous studies on viewing and reading have shown clearly that this model does not capture the complexity of children’s daily activities. Children have the opportunity to engage in a range of activities over a day. However, if it can be shown that a majority of children who are not viewing are choosing to read, this would provide some support for the first assumption of the displacement hypothesis. In addition, if it can be shown that children’s time is constrained so that increases in viewing are matched by corresponding decreases in reading, this would also provide support for the second assumption of the displacement hypothesis. Using 24-hour time use diary data it is possible to examine the choices children make between reading and viewing. It is also possible to closely examine how viewing and reading times are associated. Examining the assumptions that underpin the displacement hypothesis in this way provides an indirect test whether displacement is a good description of children’s activity patterns.

2.7 Summary

The displacement hypothesis is based on two key assumptions, both of which have been questioned. These assumptions can be tested. If they are found to be supported, this suggests that displacement may be a useful formulation through which to examine associations between viewing and reading. and also increases our understanding of when children’s reading activities might be vulnerable to time spent viewing.

The goal of this thesis is to test the two key assumptions on which the displacement hypothesis relies using a design which overcomes many of the measurement problems which limit the interpretability of much existing research on this issue. These assumptions are that if children are not viewing they will be reading and that there is a zero-sum relationship between time spent viewing and time spent reading. The first assumption, that if children were not viewing they would be reading, is examined by investigating whether children who are not viewing at particular times choose to engage in reading activities. The second assumption, that viewing time takes up time
that children would devote to reading, is investigated in two ways. By examining whether children who choose to view do not read (a strong formulation of displacement), or to do less reading than nonviewers (a weaker formulation of displacement). In this way, it is possible to examine whether displacement usefully describes the association between viewing and reading behaviours.

A final chapter examines whether there are associations between viewing and reading over time. If there is evidence that viewing is negatively associated with reading long term, it is possible that the association may be described as a negative causal spiral. If this were the case then as viewing times increase with age, reading times would be expected to decrease.
Chapter 3: Method

3.1 Participants

Participants were children and their families drawn from *Growing up in Australia*, the Longitudinal Study of Australian Children (LSAC). LSAC is a national, broadly representative longitudinal study of over 10,000 Australian children and their families. LSAC aims to understand the cognitive, physical, social, emotional and behavioural development of children. The study commenced in 2004 and is ongoing. It comprises data from two cohorts of children: one born between March 2003 and February 2004 (referred to as the B cohort) and one born between March 1999 and February 2000 (referred to as the K cohort). This study used data from the first three waves of the K cohort when children were 4-5 ($M=4.74$, $SD=2.64$), 6-7 ($M=6.82$, $SD=2.95$) and 8-9 ($M=8.79$, $SD=2.92$) years of age. The ages or waves will be referred to as 4 years, 6 years and 8 years, to simplify their description.

Participant selection in LSAC was carried out in two stages. First, postcodes were stratified by state or territory and then by capital city. Post-codes were selected so that at least 10 children could be sampled in an area and to maximise state/territory and urban non-urban representativeness. Children were identified through the Medicare enrolment database, providing a target population of 500,000. Children were then selected within postcode areas, from a list ordered on the basis of their birth date. A random start point was selected and then children were chosen from the list using a skip interval so that children across the range of birth dates were randomly selected. Only one child per family was eligible to participate in the study. Detailed information about the study design and methodology can be obtained from LSAC Technical Paper No. 1, “Sample Design” (available from the study website, www.aifs.gov.au/growing).

Families (n=9,893) were sent an initial letter, naming the selected child, and inviting them to participate (Appendix A). About 37% (n=3,710) of these families refused to
participate. Reasons given for non-participation included: not interested or too busy (57%), not capable/moving/overseas (9%), husband refused participation (9%), illness or death (8%). In 13% of cases the family could not be traced. The final recruitment sample for the K-cohort was 4,983 children and their families (50% of the mail out sample). The sample contained similar numbers of boys (2,537) and girls (2,446). The initial sample of children and families was selected to be broadly representative of the Australian population, compared to 2001 census data with regard to SES, ethnicity, and Indigenous status. The sample was slightly under representative of families with a non-English speaking background, single-parent families and families who lived in rental properties (Taylor, Christensen, Lawrence, Mitrou & Zubrick, 2013).

The LSAC study was approved by the Australian Institute of Family Studies Ethics Committee. The Ethics committee is registered with the Australian Health Ethics Committee, a subcommittee of the National Health and Medical Research Council (NHMRC). In addition, parents or caregivers gave written permission for children to participate in the study and all interviewers and researchers agreed to abide by the Privacy Act 1988. Access to LSAC data is publicly available on application to the Commonwealth of Australia Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) (Taylor et al., 2013).

### 3.2 Procedure

Participating families were sent a letter informing them when an interviewer would be in their area (Appendix B). They were then contacted by telephone to make an appointment for interview. This was followed by a personal visit to the families by a professional interviewer. Interviewers were given specific training in the administration of LSAC questionnaires. Psychologists provided training for the administration of the Peabody Picture Vocabulary Test (PPVT-III). Families were visited every 2 years.

Data used in the current study were predominantly collected from March to September. Most time use diaries were filled out between March and August with
some in September and November at all ages (Baxter, 2007; Australian Institute of Family Studies, 2013; Australian Institute of Family Studies, 2015).

The study procedure involved:

- An in depth face-to-face interview with the child’s primary carer (parent 1), the child’s biological mother in 97% of cases at first interview (Gray & Smart, 2008).
- A questionnaire with high priority questions completed by parents during the interview.
- Direct assessments of the child carried out by the interviewer near the end of the interview, including administration of tests such as the PPVT-III to assess receptive vocabulary skills (Rothman, 2003).
- Observations about the neighbourhood, child and parents made by the interviewer.
- A questionnaire with low priority questions left with parents to be mailed back after completion.
- A time use diary to be mailed back after completion.

The time use diaries in the LSAC dataset were filled out by the mother in 91% of cases, the father in 7% of cases or other family members or carers in about 2% of cases (Baxter, 2007). Diaries were fairly evenly spread across the days of the week with approximately 10% of diaries for each day. At 4 years the final sample contained more diaries for Saturday (27%) than Sunday (22%). However, at 6 years and 8 years there were very similar numbers of Saturday and Sunday diaries.
3.3 Measures

LSAC collects a wide range of data on child, family and community factors considered to influence children’s development in accordance with Bronfenbrenner’s (1979) ecological model of child development. Only the measures relevant to the current study will be highlighted here:

3.3.1 Time Use Diaries

Parents recorded the study child’s activities on two designated days, one weekday and one weekend day at each age, in 15-minute blocks of time over 24 hours starting at 4 a.m. (Appendix C). The diaries contained descriptions of 21 activities for parents to respond to. Parents also recorded contextual details about the activity including where the child was and who the child was with. Parents also marked whether the diary day was an ordinary day or special in some way, for example, a family celebration or the child was unwell. The activities described in the time use diaries were intended to represent the range of typical activities for a child of the relevant age. They included, for example, sleeping, eating or drinking, watching television, using a computer and being read to or told a story. The activities analysed in the present study, as described in the time use diaries at each wave, are presented in Table 3.1.
Table 3.1
Activities Analysed in the Present Study, as Described in the Time Use Diaries at 4 years, 6 years and 8 years

<table>
<thead>
<tr>
<th>Activities Described in the Time Use Diaries at 4 years</th>
<th>6 years</th>
<th>8 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watching TV, video, DVD, movie</td>
<td>Watching TV video, DVD, movie</td>
<td>Watching TV, video, DVD, movie</td>
</tr>
<tr>
<td>Reading or looking at book by self</td>
<td>Reading or looking at book by self</td>
<td>Reading or looking at book by self</td>
</tr>
<tr>
<td>Read a story, talk/sing, talked/sung to</td>
<td>Being read to, told a story, or sung to</td>
<td>Being read to or told a story</td>
</tr>
</tbody>
</table>

Time use diaries, that collect information on a range of activities across the day, have been found to be have better validity and less subject to social desirability bias than estimates of time spent in single activities (Beentjes & van der Voort, 1989; Robinson & Martin, 2012). They are also more accurate when they are filled out by parents when children are young (Beentjes & van der Voort, 1989). Time use diaries show close correlations with direct observation methods of time use (Anderson et al., 1985; Robinson, 1988).

At 4 years, the measure of shared reading in the time use diaries was phrased “being read a story, talk/sing, talked/sung to” so it was not a pure measure of shared reading. At 6 years it was changed to “being read to, told a story, or sung to” and at 8 years to “being read to or told a story”, so it focussed more clearly on shared reading activities (Table 3.1).

Changes in the measure reflect changes in the nature of activities parents do with children as they change and develop. At 4 years the measure included activities that were intended to support language development as language development is generally considered to be the foundation for literacy (Zubrick, Taylor & Christensen, 2015).
At 6 years, talking to children was dropped, and only the more structured language based activities of reading to children and singing to them were retained. While talking to children is still important at this age, structured discussions intended to teach them new words would probably occur less frequently. By 8 years of age few parents sing to their children, and singing would contribute little to children’s language development by this stage, so this activity was dropped. While these changes to the measure are explicable they have implications for longitudinal measures of changes in shared reading over time. It also needs to be kept in mind that the nature of shared reading will change over time. Parents progress from reading shorter picture books with their children to much longer more complex books presumably as children’s concentration improves and they can listen for longer. This also has implications for examining changes in shared reading times over time. Finally, shared reading declines when children learn to read independently (Scholastic, 2015). This also needs to be kept in mind when examining longitudinal changes in reading time.

At 6 years and 8 years the “independent reading” activity variable was “reading or looking at book by self” so it focussed solely on independent reading activities (Table 3.1). This variable was the same at 6 and 8 years.

3.3.2 Measures: Face-to-Face Interview

Peabody Picture Vocabulary Test-III (PPVT-III)

A shortened form of the PPVT-III was developed for LSAC. Children were shown a page with four black and white line drawings and were asked to choose the picture that best matched the word spoken by the tester. The PPVT-III is a screening test which provides a quick estimate of verbal and scholastic ability (Kalb & van Ours, 2013). The PPVT-III is a well-established test, with good psychometric properties. The reliability estimate for the adapted version of the test was 0.78 (Rothman, 2003). While lower than that for the full test, this was still an acceptable level of reliability (DeVellis, 1991).
Mother’s Education (at 4 years)

Based on answers to questions, Parent 1 (the child’s primary carer) provided in the face-to-face interview, a “mother’s education” variable was created. Answers to three questions were combined to create a Likert scale. These were:

- “What was the highest year of primary or secondary school Parent 1 completed?” (year 12 or equivalent, year 11 or equivalent, year 10 or equivalent, year 9 or equivalent, year 8 or below, never attended school, still at school”);
- “Has Parent 1 completed a trade certificate or any other educational qualification?” (no, no still studying for the first qualification, yes, trade certificate/apprenticeship, Yes, other qualification”);
- “What is the level of the highest qualification that Parent 1 completed?” (Postgraduate degree, Graduate diploma/certificate, Bachelor degree, Advanced diploma/diploma, Certificate, Other”).

A Likert scale from 1 (Less than year 12) to 5 (Completed graduate diploma or post-graduate degree) was created so that higher scores represented higher levels of education.

Family Activities

At all three ages parents were asked, in the face-to-face interview, how frequently they, or someone in the family, did various activities with the study child. Five activities were analysed at 4 and 6 years. These were: drawing or craft activities, playing music or dancing, playing board or card games, involving the child in everyday activities, such as cooking or caring for pets and playing outdoors. Responses ranged from (0=none, 1=1-2 days, 2=3-5 days and 3=6-7 days). Values were summed and a mean score was calculated. Two questions also asked how often the family read to the study child or told the study child a story. In order to provide a measure of the family’s engagement in activities with the child, apart from literacy activities, answers to these questions were excluded from the measure. At 8 years, only three questions were asked: reading to the study child, involving the child in
everyday activities and playing outdoors with the study child. Values for responses to the last two questions were summed and the mean was calculated. Higher values indicated families who engaged in more activities with their children more frequently.

3.4 Data Analysis

3.4.1 Outliers and Transformations

Screening analysis revealed many outliers in the summed variables of television viewing and shared reading.

Television Viewing

Percentages of cases with values of 16 or more 15 minute intervals of viewing were as follows: at 4 years [10% (Weekday), 15% (Weekend)], at 6 years [3% (Weekday), 12% (Weekend)], and at 8 years [4% (Weekday), 16% (Weekend)]. This was equivalent to 4 or more hours of viewing. Inspection of the diaries for these cases revealed that, in many cases, parents recorded that the child was viewing for almost the entire period they were awake and other activities were recorded concurrently with viewing. As these outlier cases returned otherwise valid diaries they were retained for analysis. Log 10 transformations of the television viewing variable normalised the distributions and were used in the analysed in Chapters 5, 6 and 7.

Shared Reading

The measure of shared reading at 4 years contained significant outliers. The phrasing of the variable “read a story, talk/sing, talked/ sung to”, made it likely that parents interpreted this activity to include all instances of talking to the child, however brief, giving rise to some very high totals. The phrasing was later tightened to “being read to, told a story, or sung to” (6 years) and “being read to or told a story” (8 years), so references to talking to the child were omitted. There were far fewer outliers in the data sets for children 6 and 8 years of age. Log 10 transformations of the shared reading variable normalised the distributions.
Independent Reading

At 6 years and 8 years the independent reading measure was “looking at books or reading”. Screening did not find significant outliers in this variable. However, log 10 transformations of this variable were used in the analyses for consistency.

Simultaneous Reading and Viewing

In some instances, children were recorded as being engaged in reading activities and viewing simultaneously. Different approaches have been taken to dealing with time in simultaneous activities. Vandwater et al., (2006) discounted time spent in simultaneous activities. Other authors have used information provided by study participants to count only the time spent in “primary” activities and discount the time spent in “secondary” activities from analysis (Hofferth, 2010; Hofferth & Sandberg, 2001; Huston et al., 1999). In the present case there was no information about which activities were “primary” and which were “secondary”. In addition, the majority of cases with simultaneous viewing and reading, recorded only one 15-minute period of simultaneous time. Examination of these diaries revealed that this often occurred at the end of a period of viewing and the start of a period of reading. It is likely therefore that some of these instances of simultaneous reading and viewing occurred because children transitioned from one activity to another during the 15-minute time period. For this reason, counts of simultaneous activity time were divided in half and half the time attributed to viewing and half the time to reading.

3.4.2 Data Screening

At 6 years, nine diaries were not identified as weekday or weekend diaries. Closer inspection of the pattern of activities described in eight of these diaries meant they could be identified as weekday or weekend diaries. In the last case, it was not possible to determine which day the diary related to, so it was deleted.

3.4.3 Missing Data

Return of time use diaries dropped across the waves, probably due to the time demands involved in filling out the diary. Of the 4,983 families recruited at the first
wave, 3,867 (78%) filled out at least one time use diary. This dropped to 3,446 (69% of the initial recruitment sample at 6 years) and 2,961 (59%) at 8 years. In addition, data could be missing from the time use diaries in one of two ways. Either there was no activity marked for a time period or the parent marked that they were unsure what the child was doing (Baxter, 2007). Missing values between the hours of 10 p.m. and 6 a.m. were given a value of 1 for sleep. Missing values for other activities during this time were given a value of 0 (if the child was sleeping they could not be reading, for example). Each case had 96 data points for a diary day, if the diary had no missing data, and parents recorded only one activity for each time period.

After attributing missing values, cases with more than 12 missing data points (3 hours of missing data out of the 24 hours covered by the diary) were dropped from analysis. Cases were also dropped if the diary did not relate to an ordinary day. Lader, Short and Gershuny (2006) note that the aim of time use surveys is to discover how people spend time on a typical day. As the focus in this study was on associations between reading and viewing behaviour the aim was to examine typical behaviour patterns for these activities. Time use diary analysis also faces the problem that there is also considerable day-to-day variation in many activities so that an individual day may not be representative of children’s long run time use (Frazis & Stewart, 2012). Focussing the analysis on typical days also served to provide a sounder basis for generalising beyond the individual day as more days will reflect similar behaviour patterns to a ‘typical’ study day. Therefore, cases were selected for analysis if parents recorded that the diary related to an ordinary day (see also Huston et al., 1999; Tomopoulos et al., 2007; Zimmerman, Christakis & Meltzoff, 2007).

If parents filled out two weekday or two weekend diaries, one diary was selected at random for exclusion. Cases were also excluded if parents failed to provide key demographic data or parents had failed to record when children went to sleep, as sleep time was necessary to calculate the length of the evening, the proportion of the evening spent viewing and the proportion of available time in the evening spent viewing.

To summarise, in addition to data attrition, cases were excluded as shown in Table 3.2, if:
• the diary did not relate to an ordinary day.
• the diary had more than 3 hours of missing data for one day
• the family had filled out two weekday or two weekend diaries
• the family failed to provide key demographic data
• the family had not recorded when the child went to sleep

In sum, the final sample differed from the recruitment sample because of attrition and case selection (Cuddeback, Wilson, Orme, & Combs-Orme, 2004). The final sample size for each wave for weekdays and weekends is presented in Table 3.2.

It is important to note that, because weekday and weekend diaries were analysed separately, families were not required to have both to be retained for analysis. Weekday and weekend diaries were analysed separately as time use patterns have been found to differ on the two types of day (Vandewater et al., 2006). As a result, it was not necessary to apply weights to correct for the over-representation of weekdays relative to weekend days (Mullan 2014). Where possible analyses used complex samples add on to account for the stratification and clustering design.

Chi square analysis was conducted to see if the participants lost due to attrition and case selection differed from cases retained for analysis on the key demographic and background variables of interest. The following significant differences between the retained and lost cases were found. At 4 years, cases differed significantly on gender; $\chi^2 (1)=5.75, p<.01$ (weekday); $\chi^2 (1)=5.12, p<.05$ (weekend). The percentage of boys was higher in the retained cases [(53% (weekday) and 55% (weekend)] than in the lost cases [(50% (weekday) and 49% (weekend)].

At all ages on weekdays and weekends cases differed significantly on mother’s education: at 4 years, $\chi^2 (1)=60.83, p<.001$ (weekday); $\chi^2 (1)=50.15, p<.001$ (weekend); at 6 years, $\chi^2 (1)=49.96, p<.001$ (weekday); $\chi^2 (1)=18.88, p<.001$ (weekend); at 8 years, $\chi^2 (1)=9.05, p<.001$ (weekday); $\chi^2 (1)=13.40, p<.001$ (weekend). The percentage of children who had mothers with higher education levels (a trade or other qualification, a bachelor’s degree, a graduate diploma or a post
graduate degree) was higher in the retained cases (percentages ranged from 53% to 61% across the different data sets) than the percentage of children with mothers with grade 12 or less in the lost cases (percentages ranged from 41% to 51%).

At 4 years, on weekends, and at 6 and 8 years, on weekdays and weekends, cases differed significantly on PPVT-III scores: at 4 years, $\chi^2 (1)=10.51, p<.001$ (weekend); at 6 years, $\chi^2 (1)=21.41, p<.001$ (weekday); $\chi^2 (1)=40.37, p<.001$ (weekend); at 8 years, $\chi^2 (1)=17.74, p<.001$ (weekday); $\chi^2 (1)=23.18, p<.001$ (weekend). The percentage of children with PPVT-III scores in the top 50% was higher in the retained cases (percentages ranged from 52% to 54% across the different data sets) than in the lost cases (percentages ranged from 39% to 45%).
Table 3.2  
*Number of Cases Lost from Analysis or Moved Between Data Sets*

<table>
<thead>
<tr>
<th>Age and type of Day</th>
<th>Original number of diaries</th>
<th>Not an ordinary day</th>
<th>Over 3 hours of missing data</th>
<th>Duplicates</th>
<th>No demographic data</th>
<th>Cases moved</th>
<th>Missing data for sleep time</th>
<th>Final number of diaries</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>3,562</td>
<td>763</td>
<td>929</td>
<td>20</td>
<td>36</td>
<td></td>
<td>12</td>
<td>1,802</td>
</tr>
<tr>
<td>Weekend</td>
<td>3,397</td>
<td>1,073</td>
<td>528</td>
<td>6</td>
<td>0</td>
<td></td>
<td>14</td>
<td>1,776</td>
</tr>
<tr>
<td>6 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>3,283</td>
<td>901</td>
<td>1,617</td>
<td>4</td>
<td>5</td>
<td>3 (moved to weekend data set)</td>
<td>9</td>
<td>744</td>
</tr>
<tr>
<td>Weekend</td>
<td>3,188</td>
<td>1,159</td>
<td>683</td>
<td>11</td>
<td>10</td>
<td>3 (added from weekday data set)</td>
<td>8</td>
<td>1,320</td>
</tr>
<tr>
<td>8 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>2,801</td>
<td>1,570</td>
<td>857</td>
<td>0</td>
<td>0</td>
<td></td>
<td>9</td>
<td>365</td>
</tr>
<tr>
<td>Weekend</td>
<td>2,784</td>
<td>989</td>
<td>573</td>
<td>1</td>
<td>10</td>
<td></td>
<td>21</td>
<td>1,190</td>
</tr>
</tbody>
</table>
After excluding cases with too much missing data, the amount of missing data was minimal. Results of the chi-square analysis showed that data were not missing completely at random (MCAR). However, if data is missing at random (MAR), then missingness need not affect the generalizability of the results (Singer & Willett, 2003). Further, if data are MAR then the Estimation Maximisation algorithm can be used to estimate missing values. For data to qualify as missing at random, the probability of missingness can depend on any observed data. In this case, independent reading times were more likely to be included in the analysis for mothers with more years of education and children with higher receptive vocabulary scores. These were observed data. However, if particular values of the outcome variable are more likely to be missing because of unobserved data then data is not MAR. For example, if low values of shared or independent reading times were more likely to be missing because social desirability bias meant these parents failed to fill in the diaries in relation to reading times, then data on the outcome variable would not be MAR. In the present case, because time use diaries that account for all activities have been shown to be relatively free of social desirability bias (Beentjes & van der Voort, 1989; Frazis & Stewart, 2012; Robinson & Martin, 2012), there is no reason to think that missing data is not MAR.

In order to run the missing values analysis, values of -2 (don’t know), -3 (refused or not answered) and -4 (section refused) on variables measured during the face-to-face interview, were recoded as system missing. Cases left for analysis were found to have less than 1% of missing data. Using the Estimation Maximisation algorithm in the missing values analysis package in SPSS 22, missing values were estimated. In all cases the summary of estimated means was either identical or almost identical, so the estimated values were accepted and incorporated into the main data set. While the EM algorithm underestimates standard error (Pigott, 2001) the amount of missing data to be imputed was extremely small, so additional analyses such as bootstrapping or multiple imputation were not considered necessary to recover lost residual variability (Enders, 2001). This process was repeated for the 6 years and 8 years data sets. Imputed scores for nominal categorical variables were rounded to the nearest whole number.

Further analyses were conducted using SAS (9.1) and SPSS (25). Detailed descriptions of each analysis are provided in the relevant chapters.
Chapter 4: Overall Time Spent Reading and Viewing Television

4.1 Introduction

This chapter provides a review of overall time spent reading and viewing television in Australian and international studies and in the current study. This provides context for estimates of reading and viewing times in the current sample. It also enables time spent reading and viewing to be compared. Reading and viewing times are also likely to differ systematically on the basis of a number of characteristics of children and families themselves, as Bronfenbrenner (1979) argued. This chapter therefore also reports reading and viewing times on the basis of children’s gender and mother’s education. Finally, this chapter considers variations in viewing and reading by the type of day (weekday or weekend) on which they occur.

4.2 Time Spent Reading and Viewing—International Research

International estimates of the time children spend in reading activities come from large-scale time diary studies or studies using parent estimates of reading. Studies have provided estimates of length of time spent reading or the frequency with which children read. Recent estimates of viewing times come from large scale cross-national studies that have used parent or study participant estimates of viewing times. Earlier estimates of viewing times were provided by time use diary studies.

4.2.1 Reading

A few studies have provided precise estimates of the length of time spent in shared reading, that is, reading with a parent. One study showed 2- to 10- year-olds in the United States spent an average of 21 minutes co-reading print books with parents (Rideout, 2014). Hofferth and Sandberg (2001) drew on a sample of 2,818 children under 12 from the 1997
United States PSID. They found children, 3 to 5 years of age, spent about 1 hour and 26 minutes a week, about 12 minutes per day, reading with their parents.

Precise estimates of independent reading times have been fairly consistent. Rideout (2014), after separating out time spent reading tablets or e-readers, found 2- to 10-year-olds spent about 8 minutes reading print books independently (Rideout, 2014). Using diary data from the United Kingdom Time Use Survey, Mullan (2010) reported reading times for print media of about 11 minutes a day for young people 8 to 18 years.

Earlier research from the United States described reading times similar to the more recent studies. Hofferth and Sandberg (2001) estimated children 6 to 8 years of age spent about 1 hour 9 minutes a week reading independently, about 10 minutes a day. Although it was not explicitly stated that “reading” measured use of print media, given that tablets and e-readers were not widely used until the mid to late 2000’s, it seems likely that this would be the case. Allen et al. (1992) had 63 American 10-year-olds keep daily activity diaries of non-school time for 15 days. On average, children spent about 10 minutes per day reading books for pleasure.

Studies have also examined the frequency with which children read. Measuring reading in this way shows that many children do not read every day or almost every day. A large scale cross national study compared reading frequency in nationally representative samples of 10-year-olds from 49 countries (Mullis et al., 2012). Children were asked how frequently they read and about their attitude to reading, for example, if they would like more time for reading and liked to talk about what they read. Children who said they read every day or almost every day and had a positive attitude toward reading, were categorised as “liking reading”. The study found that only a minority of children were classified as “liking reading”. For example, in Canada, 35% of children were classified as “liking reading”, in New Zealand and Australia percentages were 32% and 30% respectively, while in the United States and the United Kingdom percentages were lower, 27% and 26%, respectively.

Mullan (2010) reported results of the United Kingdom Time Use Survey 2000-2001 for children 8 to 18 years of age and found that only 21% of children reported reading on the diary day. The average reading time for this group was 52 minutes. Mullan also reported results of two studies on the frequency of young people’s reading. In a United Kingdom study, 62% of young people, the majority of whom were 6 to 16 years of age, did no reading
most days. Figures were similar in a United States study, 57% of young people, 5 to 17 years of age, reported doing no reading most days (Mullan, 2010). Similarly, earlier studies have also found large percentages of children who did no reading on the measurement day (Anderson et al., 1988, see also Hofferth & Sandberg, 2001).

It is difficult to compare estimates of reading times found in studies in different countries. Studies vary widely in scope and purpose, from large scale nationally representative studies with large numbers of participants, designed to provide descriptive data about time spent in different activities, to smaller scale academic studies designed to explore a particular issue. Estimates of time spent reading may be very different depending on the type of study. Time spent reading is also measured in a variety of ways in different studies. Some studies measure the frequency or the number of days per week that children are read to or read (Kalb & van Ours, 2013; Mullis et al., 2012). Other studies measure the number of minutes spent reading on a typical day or a designated day (Rideout, 2014; Mullan, 2010) or over a week (Hofferth & Sandberg, 2001). How studies define reading materials also varies widely. One recent study measured time spent reading on tablets and e-readers as well as time spent reading books (Rideout, 2014). However, other studies measure time spent reading print material only (Kalb & van Ours, 2013; Hofferth & Sandberg; 2001). Finally, studies also measure reading times of children at different ages, and average reading times have been shown to decline as children get older (Common Sense Media, 2014).

Studies provided different estimates of shared reading times. Rideout’s estimate of 21 minutes a day was higher than that of Hofferth’s, 12 minutes a day. Rideout’s (2014) study relied on parent estimates of reading times which can be inflated by social desirability bias (Mol & Bus, 2011; Sénéchal & LeFevre, 2002). Studies of independent reading times are quite consistent in showing children read for about 10 minutes a day. These include estimates from time use diary studies which have been shown to be relatively free of social desirability bias (Frazis & Stewart, 2012). Studies also showed wide differences in children’s daily reading times, from no time to nearly an hour for some children. Studies of the frequency with which children read show the majority do not read every day or most days.
4.2.2 Television Viewing

A recent study compared screen-time (including television viewing, video games and computer use) in pre-adolescents (9-11 years) in 12 countries, namely Australia, Brazil, Canada, China, Colombia, Kenya, Finland, India, Portugal, South Africa, United Kingdom and United States (LeBlanc et al., 2015). Average screen times in western countries ranged from about 2 hours 30 minutes per day in Canada to about 3 hours per day in the United States. Australia and Finland had average screen use times that were intermediate between Canada and the United States, around 2 hours 45 minutes while in China average screen time use was a little under 2 hours (LeBlanc et al., 2015). The top category of screen time was capped at 5 hours or more in this study so averages may have been a little higher if the full range of viewing times had been included in the calculation of the mean.

In another recent study, separate measures of time spent viewing television and computer use were used (Bucksch et al., 2015). The study reported trends in viewing times of adolescents aged 11-15 years, from 2002 to 2010 and also enabled comparisons of viewing times in different countries to be made (Bucksch et al., 2015). Switzerland had low viewing times, under 2 hours in 2002 and about an hour and a half in 2010. Viewing times were higher in the United States, close to 3 hours for boys and girls in 2002, but declined to about 2 hours 15 minutes in 2010 on weekdays. Viewing times in Germany were intermediate between those in Switzerland and the United States and fell from around 2 hours 30 minutes in 2002 to about 2 hours in 2010. The authors attribute the decline in viewing times to increases in time spent using computers over the period.

An earlier study of children’s time use in different countries showed that fifth grade students in the United States viewed television for about 2 hours (Larson & Verma, 1999). Similar viewing averages were found for Japanese students, about 2 hours. However, Taiwanese students watched for less time, about an hour and a half. Viewing times for the United States in this study were similar to those found in Bucksch et al.’s (2015) study.

Studies also show that estimates of time spent viewing differ widely between children as well as across cultures. For example, in one study viewing time ranged from 0 to more than 7 hours per day (Bucksch et al., 2015) while in another study it ranged from 0 to 5 or more hours (LeBlanc et al., 2015). LeBlanc et al. (2015) investigated the number of children who spent more than the AAP (2001) recommended 2 hours a day with media. In Canada, 45% of
children fell into this category. Australia, Finland and the United States also had high percentages of children in this category, around 58%.

The large-scale cross-national studies mentioned so far used parent or study participant estimates of viewing times. Studies using time use diaries are commonly seen to provide more accurate measures of viewing times than global estimates (Beentjes & van der Voort, 1989; Robinson & Martin, 2012). Hofferth and Sandberg (2001) used time diary data from a sample of 2,818 children, 0-12 years old, from the 1997 United States PSID. They found children from 3 to 12 years of age viewed television for a little under 2 hours a day. Allen et al. (1992) had 63 US 10-year-olds keep daily activity diaries of non-school time for 15 days. On average, children spent just under an hour and a half each day watching television. Ennemoser and Schneider (2007), in a German longitudinal study using diary measures of viewing times, found children viewed television for a little more than 1 hour at 8 years of age, rising to over an hour and a half by 11 years of age.

In summary, children and young people have been shown, in a variety of studies, to spend considerable lengths of time viewing television. Estimates differ across countries, ranging from about 1 hour and 30 minutes to just over 3 hours, while estimates of around 2 hours a day are common (Bucksch et al., 2015). Estimates based on time use diary data have been broadly consistent with those found in large population based surveys. In some cases, the slightly lower estimates of viewing times found in time use diary studies may have been because younger children were sampled. Substantial differences in viewing times between children have also been shown. In addition, studies show that large numbers of children viewed more than the AAP 2001 recommendation of no more than 2 hours a day for school-aged children (AAP, Committee on Public Education, 2001).

4.3 Time Spent Reading and Viewing—Australian Research

Recent evidence reviewed in this section about the amount of time Australian children spend in reading activities and viewing television comes from two main sources: large-scale population surveys of time use based on parent report and studies conducted using data from the Longitudinal Study of Australian children (LSAC).
4.3.1 Reading

Very few studies were found that estimate the time Australian children spend in shared reading. A 2013 online survey of parents of children from birth to 5 years of age, found children spent just under 4 hours and 30 minutes per week, or just under 40 minutes a day, on average, reading books and sharing stories (Australia Post Let’s Read Survey Summary, 2013). Another study, using data sourced from LSAC, found 4- to 5-year-olds read for about 21 minutes on a school or care day and 32 minutes on a non-school or care day (Mullan, 2013). Reading was either shared reading or looking at books independently. Estimates of time spent reading to children vary widely between children. For example, based on data sourced from LSAC, time sharing books with children about 3 years of age, could range from none to more than an hour a day (Bittman & Sipthorp, 2011).

Similarly, few studies were found estimating the time Australian children spend reading independently. The Australian Communications and Media Authority’s (ACMA) 2007 survey, found Australian children, 8-17 years of age, spent 33 minutes a day, on average, reading, drawing and writing letters (Commonwealth of Australia, ACMA, 2007). Participants were instructed to include time filling out the survey in this activity measure, so estimates of daily reading time would be less than 33 minutes. Estimates of independent reading times sourced from LSAC showed that at 10- to 11-years-of-age, about 16 minutes on a school day, and 20 minutes per day on a non-school day, were spent reading independently (Mullan, 2013).

The length of time spent reading independently also differed across individuals. Using time use diary data sourced from LSAC, one study showed that many 8- to 9-year-old children did no reading on the diary day, while some read for 2-3 hours (Bittman & Sipthorp, 2011). Percentages of non-readers varied by socioeconomic position (SEP): 54% of children in the lowest SEP group did not report reading, while 38% of children in the highest SEP group did not report reading. (Bittman & Sipthorp, 2011).

In summary, shared reading times estimated using time diary data from LSAC (20 minutes to half an hour) (Mullan, 2013) were lower than those from the Australia Post Let’s Read parent survey (2013). It was possible that social desirability bias inflated the parent estimates in the latter study (Mol & Bus, 2011; Sénéchal & LeFevre, 2002). In addition, it was not clear whether the measure of shared reading in the LSAC study was time spent looking at books or
reading together, making it uncertain how comparable the estimates were. The clearest estimates of independent reading times came from LSAC. At 10 to 11 years of age children read for between 16 and 20 minutes a day. LSAC data also showed there were wide differences in children’s daily reading times.

4.3.2 Television Viewing

The most recent estimate of Australian children’s (infants to 12 years) viewing times, showed they spent an average of 1 hour 43 minutes per day viewing broadcast television, free-to-air or subscription channels, in the final quarter of 2016 (Regional TAM, OzTAM, Nielsen, 2017). In addition, children (2 to 12 years old) spent an additional 19 minutes per day watching online video on a personal computer or lap top. The authors note that, even though the trend was for viewing to be spread across multiple devices, television still remained the dominant form of screen media used in Australia. However, recent data also shows that there has been a slow decline in the amount of time spent watching free-to-air and commercial television over the last 12 years (Commonwealth of Australia, ACMA, 2017). Earlier estimates of viewing times from 2013 showed children, up to 14 years of age, spent just under 2 hours a day watching television (Commonwealth of Australia, ACMA, 2015). These estimates were similar to those based on data collected in 2004 for LSAC, which showed 4-year-olds watched 2.3 hours of television on weekdays and 2.2 hours on weekends (Rutherford et al., 2010).

A recent report by parents and carers on the viewing of television programs, movies or DVDs of 2,399 Australian children 14 years and under showed that viewing times of children varied widely (Commonwealth of Australia, ACMA, 2017). While only 4% of children were reported to be non-viewers, nearly 20% of children were reported to watch more than 15 hours a week or over 2 hours a day. The authors of the study note that, because the survey was based on parent report, imperfect recall and social desirability bias may have influenced the results. The Australian Government, as part of its Physical Activity and Sedentary Behaviour Guidelines for children (Australian Government, Department of Health, 2014) laid down recommendations for daily time spent using screen media for entertainment purposes.
Suggested limits were one hour a day for preschool children and 2 hours a day for school-aged children.

In summary, recent large-scale population surveys and time use diary studies suggest that Australian children view for approximately 2 hours a day. Time spent viewing television is still the dominant form of screen media used by children. There is also wide variability between children in the time they spend viewing. A small number of children do not watch any television, while a substantial minority watch more television than the recommended 2 hours a day.

4.4 Summary

A recent Australian estimate of shared reading time was considerably higher than estimates found in two recent United States studies. The Australian estimate may have been inflated by social desirability bias as it relied on parent reports of shared reading times (Mol & Bus, 2011). In addition, it focussed on children under 5 while the United States studies included primary school-aged children and shared reading has been shown to decline when children start to read independently (Scholastic, 2015).

Australian estimates of independent reading times based on LSAC (about 15-20 minutes daily reading time for children 10 to 11 years) were higher than United States and United Kingdom estimates (about 10 minutes a day). Two studies included children younger (Rideout, 2014) and older (Mullan, 2013) than those in the LSAC sample, which may have resulted in different reading times as younger children may do little independent reading and reading times for older children have been shown to decline (Common Sense Media, 2014). However, other international studies of children of comparable ages, using time diary methodology, also found lower reading times (10 minutes a day) than those in the LSAC sample. It is possible that higher estimates were obtained because children filled out LSAC diaries themselves when they were 10 to 11 years old and were free to create their own time estimates of time spent in different activities (Mullan, 2014), which may have meant that estimates of reading times were higher than diaries filled out by parents.

Recent Australian estimates of television viewing times, about 1 hour and 45 minutes, were relatively low by international standards, which commonly showed viewing times around 2
hours, although there were wide differences between countries in viewing times (Bucksch et al., 2015). However, as studies show that television viewing times are declining in Australia (Commonwealth of Australia, ACMA, 2017) and internationally (Bucksch et al., 2015), this may explain why very recent Australian estimates were a little lower compared to earlier international estimates. Australian estimates of television viewing time were closer to time use diary estimates of viewing found in earlier international studies.

Results from Australian and international studies converge to show that viewing times exceed reading times by at least an hour a day. In addition, while there were children who did not view television, there were many more children who did not read on the diary day. Further, of those children who did view, substantial numbers viewed for longer than the recommended 2 hours a day.

4.5 Child and Family Factors and Differences in Reading and Viewing Times

Factors identified in Bronfenbrenner’s (1979) ecological model of child development have been found to be associated with the time children spend viewing and reading. Key factors for which studies have reported differences in viewing and reading times will now be discussed.

4.5.1 Gender

The United Kingdom time use survey of young people, 8 to 18 years, found girls spent significantly more time reading than boys, 13 minutes and 9 minutes per day respectively (Mullan, 2010). One United States study of 3- to 12-year-olds found girls read less than boys during the week, but that their reading times increased with age relative to boys’ reading times, although figures were not provided (Hofferth & Sandberg, 2001). However, another recent study from the United States, using survey data from parents of 2- to 10-year-olds, found girls spent 46 minutes a day reading, while boys spent 34 minutes a day reading (Common Sense Media, 2014). The United Kingdom survey relied on time use diary data,
while the United States study relied on parent estimates of reading time, which may explain the disparity in the estimates reported for girls and boys in these studies.

Gender differences in screen time have also been found in a study comparing screen use (including television, video games and computers) in 12 countries, including Australia, Canada, Finland, the United Kingdom and the United States (LeBlanc et al., 2015). In all countries, 9- to 11-year-old boys had higher average screen time use. The mean difference averaged over all countries was close to an hour a day. However, the study did not measure television viewing time apart from other forms of screen time, so it is not clear if boy’s greater screen time use was due to spending more time using computers than girls (Bucksh et al., 2015). One study examined television viewing separately from other forms of screen use and found that boys viewing times exceeded that of girls when viewing times were first measured when children were 5 to 10 years, however when children were followed up 3 years later, girls viewing times had increased more than that of boys so that viewing times of boys and girls did not differ at 8 to 13 years (Hesketh, Wake, Graham & Waters, 2007). This study also showed electronic game and computer use increased more steeply for boys than for girls between initial testing and follow up.

However, not all studies have found gender differences in viewing times. A review of 68 mostly North American studies of television and video viewing of young people 2 to 18 years, found no association between gender and self- or parent-reported television viewing (Gorely, Marshall & Biddle, 2004). Another United States study also found no difference in viewing times of boys and girls, 2 to 7 years of age (Huston et al., 1999). An Australian study of two cohorts of children, 5- to 6-year-olds and 10- to 12-year-olds, found that time spent viewing television did not differ significantly for boys and girls in either cohort (Bagley, Salmon & Crawford, 2006). This was also the case in an Australian study using data for 6-year-olds and 11-year-olds from the 2001 Children’s Leisure Activity Study and the 2002/3 Health, Eating and Play Study (Hesketh, Crawford & Salmon, 2006).

Small gender differences in reading and television viewing times have been found using LSAC data. Mullan (2013) showed at 4 to 5 years of age, girls read for about 5 minutes more per day than boys on weekends. At 10 to 11 years, girls read for about 6 minutes more per day than boys on weekdays and weekends. In contrast, boys spent more time viewing
television than girls. At 4 to 5 years, boys spent about 14 minutes more time viewing on weekends. At 10 to 11 years boys spent about 9 minutes more time viewing on weekdays. Yu and Baxter (2015) showed that boys were significantly more likely to watch more than 2 hours of television at 4-5 years on weekdays and weekends and at 8-9 years on weekdays.

### 4.5.2 Socioeconomic Position and Mother’s Education Level

Studies using LSAC data (Bittman & Sipthor, 2011; Mullan, 2013) have shown that time spent in reading activities and television viewing differs on the basis of families’ SEP. Lower SEP families were less likely to read to their 2- to 3-year-old children. In low SEP families, 41% and 47% were not read to, compared to 15% and 22% in the highest SEP families, on weekdays and weekends respectively. Low SEP families also read to their children for less time. In low SEP families 16% and 19% were read to for more than an hour, compared to 24% and 30% in high SEP families, on weekdays and weekends respectively. LSAC data also showed similar differences in independent reading behaviour for children 8 to 9 years of age, on the basis of SEP. Children in lower SEP families were less likely to read. In low SEP families 46% and 54% did not read, compared to 24% and 22% in the highest SEP families, on weekdays and weekends respectively. Children in low SEP families also read for less time. In low SEP families, 19% and 18% read for more than an hour, compared to 32% and 31% in high SEP families on weekdays and weekends respectively (Bittman & Sipthor, 2011). Similar differences were found at 10 to 11 years. Children from low SEP families read less on weekends than children in medium or high SEP families (Mullan, 2013).

In addition, the education level of caregivers has been shown to be linked to the frequency with which children are read to (Rikin et al., 2015; Tomopoulos et al., 2007) and time spent reading to children (Bianchi & Robinson, 1997; Guryan et al., 2008). Parent’s education is also associated with the time children spend reading independently. In the United Kingdom, for example, Mullan (2010) reported that young people whose parents had a degree read for significantly more time (20 minutes) than those who did not have a degree (9 minutes). Hofferth and Sandberg (2001) also found that children in families with a better educated head spent more time reading independently. Bianchi and Robinson (1997) found that children of parents who were college educated spent significantly more time reading than children whose parents had less education.
LSAC data has shown variations in viewing times on the basis of families’ SEP. At 4 to 5 years, children from low SEP families were found to view 37 more minutes of television on weekends and 25 more minutes on weekdays than children from medium or high SEP families. At 10 to 11 years, differences were 22 and 16 minutes on weekdays and weekends respectively (Mullan, 2013).

Associations between viewing times and parents’ education levels have also been investigated in a number of studies. A review of 68 mostly North American studies found parent education levels were negatively associated with viewing times (Gorely et al., 2004; see also Christakis et al., 2004). Bianchi and Robinson (1997), in a United States time use diary study of children 3 to 11 years of age, found children of parents who were not college graduates spent significantly more time viewing television. Hofferth and Sandberg (2001) found children of better-educated parents watched half an hour less television a week. Australian studies have also found similar associations. In a study using LSAC data, Baxter and Hayes (2007) found that 4- to 5-year-olds whose parents had not completed secondary school viewed for about 2 hours on weekdays and for about 2 hours 20 minutes on weekends. In contrast children of parents with a bachelor’s degree viewed for about 1 hour and 40 minutes during the week and about 1 hour and 50 minutes on weekends.

In summary, gender, SEP and parent’s education levels have all been found to be associated with both viewing and reading times. If similar associations are found in the data used in the current study then these factors will need to be controlled to interpret associations between reading and viewing times.

### 4.6 Type of Day

A few studies have examined differences in children’s time use on weekdays and weekends. Vandwater et al. (2006) studied a subsample of participants in the child development supplement of the PSID. They found children viewed more on weekends and also spent more time reading on weekends. This study showed that at 6 to 8 years of age, children spent about an hour more time viewing and 6 minutes more time reading on weekends than weekdays. A study using data sourced from LSAC also showed viewing and reading times to
be greater on weekends (Mullan, 2013). For example, at 4 to 5 years of age children viewed for about 47 minutes more on weekends than they did during the week. At 10 to 11 years of age the difference between weekday and weekend viewing times was even greater, 94 minutes. This study also showed that children spent more time reading on weekends. Children of 4 to 5 years of age read for about 10 minutes more on weekends than weekdays, while at 10 to 11 years they read for about 5 minutes more on weekends.

However, other studies have found that more time is spent reading on weekdays and more time is spent viewing on weekends. Huston et al. (1999) conducted a longitudinal study of 2 cohorts of children, 2-year-olds and 4-year-olds, for 3 years. The authors found that more time was spent reading on weekdays and that reading times increased on weekdays (from about 20 minutes to 40 minutes) and declined on weekends (from less than 20 minutes to about 10 minutes) over the 3 years. Reading included being read to, reading independently, being told a story and looking at books. Television viewing of general audience programming was more than an hour on weekends, but less than an hour on weekdays. A study, based on LSAC data, found 4-year-olds viewed more on the weekend than during the week, however they engaged in slightly more educational activities during the week. This included having a story read to them, colouring or looking at books, playing educational games and being taught to do chores or to read. (Baxter & Hayes, 2007, see also Fiorini & Keane, 2013).

4.7 Aims

This chapter has the following aims:

- to describe time spent in reading activities and viewing television in a sample of Australian children
- to examine how viewing and reading times differed by child’s gender, mother’s level of education, and the type of day (weekday or weekend).

It is expected that children will spend more time viewing television than reading. It is expected that girls will read more than boys. There are no expectations about associations between gender and viewing times as studies have found different results. Children of
mothers with more years of education are expected to spend more time being read to and reading independently. There are no expectations about associations between the type of day and reading times as studies have found different results. Viewing times are expected to be higher on weekends.

4.8 Method

4.8.1 Participants

As described in Chapter 3, participants were children and families sourced from the first three waves of the K (Kindergarten) cohort of the Longitudinal Study of Australian Children (LSAC). Children were 4-5 ($M=4.74$, $SD=2.64$), 6-7 ($M=6.82$, $SD=2.95$) and 8-9 ($M=8.79$, $SD=2.92$) years of age, at waves 1, 2 and 3 respectively. The ages or waves will be referred to as 4 years, 6 years and 8 years, to simplify their description. The initial recruitment sample contained 4,983 children, with approximately equal numbers of boys (2,537) and girls (2,446).

Further details about participants, the study procedure, the measures used in the present study, data screening, sample selection and imputation of missing data can be found in Chapter 3.

4.8.2 Measures

The measures relevant to the present chapter are as follows:

**Time Spent in Shared Reading, Independent Reading and Viewing**

Time spent reading was calculated as the sum of 15-minute intervals of shared reading and independent reading. In addition, a measure of combined reading was calculated as many children engage in shared and independent reading over the years they are learning to read. Combined reading was shared reading at 4 years and combined shared and independent
reading at 6 and 8 years. Television viewing was the sum of 15-minute intervals of television viewing.

**Occurrence of Shared Reading, Independent Reading and Television Viewing**

Measures of time spent in reading activities and viewing included children who did no reading or viewing on the diary day. As a first step, percentages of children who did and did not engage in these activities were examined. Time spent on reading and television viewing were dichotomised into no reading or viewing on the diary day and some reading or viewing on the diary day.

**Mother's Education (at 4 years)**

Answers to three questions on mother’s education were combined to create a 5-point Likert scale (from 1= “Less than year 12” to 5= “Completed graduate diploma or post-graduate degree”), as described in Chapter 3. Following previous studies, the scale was dichotomised so that parents with a high school education or less were categorised as having fewer years of education while those with a trade certificate, bachelor’s degree or post graduate degree were categorised as having more years of education (Ghosh, 2013).

**4.8.3 Data Screening and Analyses**

The distributions of the reading variables were positively skewed because many children did no reading activities on the diary day. Log 10 transformations were applied to each of the variables and a constant (+1) added to each value. This improved the distribution of the variables. Values were back transformed and multiplied by 15 so reading times presented in the tables are in minutes.

Despite having some outliers, the distribution of the viewing variables was acceptable so they were not transformed for the analyses in this chapter.

SPSS 25 was used to estimate mean time spent in shared reading, independent reading, combined reading and television viewing. Paired and un-paired t-tests were used to examine whether reading and viewing times differed by gender, mother’s education and type of day.
(weekday or weekend). Tests were conducted using Bonferroni adjusted alpha levels of 0.025 per test (.05/2). If Levene’s test was not significant it was assumed that the homogeneity of variance assumption had not been violated.

4.9 Results

Results of analyses are presented in two parts. First, the mean time spent in reading and viewing activities in the current study is described. Then differences in reading and viewing times by key background variables, children’s gender, mother’s education and type of day, are described. Numbers and percentages of boys and girls and the total N for each data set are presented in Table 4.1.

Table 4.1

*Number (and Percentages) of Boys and Girls and total N for Each Dataset*

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th>Girls</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>957 (53)</td>
<td>845 (47)</td>
<td>1802</td>
</tr>
<tr>
<td>Weekend</td>
<td>962 (54)</td>
<td>814 (46)</td>
<td>1776</td>
</tr>
<tr>
<td>6 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>386 (52)</td>
<td>358 (48)</td>
<td>744</td>
</tr>
<tr>
<td>Weekend</td>
<td>694 (53)</td>
<td>626 (47)</td>
<td>1320</td>
</tr>
<tr>
<td>8 years</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>182 (50)</td>
<td>183 (50)</td>
<td>365</td>
</tr>
<tr>
<td>Weekend</td>
<td>620 (52)</td>
<td>570 (48)</td>
<td>1190</td>
</tr>
</tbody>
</table>
4.9.1 Time Spent Reading and Viewing

Occurrence of Reading and Viewing Activities

Most children engaged in shared reading at 4 years. This declined markedly at 6 years and again at 8 years (Table 4.2).

At 6 years and 8 years, the majority of children read independently on the diary day during the week. On weekends, a minority of children spent time reading independently (Table 4.2).

At each age the majority of children engaged in combined reading on weekdays. Numbers were lower on weekends, but still a majority of children (Table 4.2).

Almost all 4-year-olds viewed television. Numbers viewing decreased slightly at 6 years and 8 years on weekdays. On weekends, more than 90% of children viewed television at all ages (Table 4.2).

Table 4.2
Numbers (Percentages) of Children Engaged in Shared Reading, Independent Reading, Combined Reading and Television Viewing by Age and Type of Day

<table>
<thead>
<tr>
<th>Age and day</th>
<th>Shared reading</th>
<th>Independent reading</th>
<th>Combined Reading</th>
<th>Television viewing</th>
<th>Total sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes, N (%)</td>
<td>Yes, N (%)</td>
<td>Yes, N (%)</td>
<td>Yes, N (%)</td>
<td>N</td>
</tr>
<tr>
<td>4 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>1,438 (80)</td>
<td>—</td>
<td>1,438 (80)</td>
<td>1,616 (90)</td>
<td>1,802</td>
</tr>
<tr>
<td>Weekend</td>
<td>1,197 (67)</td>
<td>—</td>
<td>1,197 (67)</td>
<td>1,657 (93)</td>
<td>1,776</td>
</tr>
<tr>
<td>6 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>403 (54)</td>
<td>475 (64)</td>
<td>607 (82)</td>
<td>605 (81)</td>
<td>744</td>
</tr>
<tr>
<td>Weekend</td>
<td>556 (42)</td>
<td>545 (41)</td>
<td>827 (63)</td>
<td>1,225 (93)</td>
<td>1,320</td>
</tr>
<tr>
<td>8 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>110 (30)</td>
<td>228 (63)</td>
<td>268 (73)</td>
<td>286 (78)</td>
<td>365</td>
</tr>
<tr>
<td>Weekend</td>
<td>283 (24)</td>
<td>525 (44)</td>
<td>653 (55)</td>
<td>1,099 (92)</td>
<td>1,190</td>
</tr>
</tbody>
</table>

Combined Reading = shared reading time at 4 years and the sum of shared and independent reading time at 6 and 8 years.
Mean Reading and Viewing Times

Mean shared reading times were about half an hour or more at 4 years. Shared reading times declined markedly between 4 and 6 years with a smaller decline between 6 and 8 years (Table 4.3).

Independent reading times were close to 20 minutes on weekdays and much lower on weekends at both ages (Table 4.3).

Combined reading times exceeded 30 minutes on weekdays and were between 20 and 30 minutes on weekends (Table 4.3).
Table 4.3

Mean Time, in Minutes Spent in Reading Activities by Age and Type of Day

<table>
<thead>
<tr>
<th>Age and day</th>
<th>Reading activity</th>
<th>Mean (SE)</th>
<th>lower</th>
<th>upper</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean (SE)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>Shared Reading/</td>
<td>38.65 (0.32)</td>
<td>36.49</td>
<td>40.90</td>
<td>1,802</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekend</td>
<td>Shared Reading/</td>
<td>29.09 (0.34)</td>
<td>27.20</td>
<td>31.06</td>
<td>1,776</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>Shared Reading</td>
<td>12.08 (0.34)</td>
<td>10.91</td>
<td>13.31</td>
<td>744</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>16.75 (0.37)</td>
<td>15.26</td>
<td>18.30</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>42.30 (0.53)</td>
<td>38.55</td>
<td>46.32</td>
<td></td>
</tr>
<tr>
<td>Weekend</td>
<td>Shared Reading</td>
<td>9.49 (0.26)</td>
<td>8.66</td>
<td>10.32</td>
<td>1,320</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>10.65 (0.30)</td>
<td>9.68</td>
<td>11.66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>26.86 (0.42)</td>
<td>24.64</td>
<td>29.21</td>
<td></td>
</tr>
<tr>
<td>8 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>Shared Reading</td>
<td>5.85 (0.43)</td>
<td>4.71</td>
<td>7.06</td>
<td>365</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>19.99 (0.61)</td>
<td>17.33</td>
<td>22.85</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>33.64 (0.77)</td>
<td>29.06</td>
<td>38.68</td>
<td></td>
</tr>
<tr>
<td>Weekend</td>
<td>Shared Reading</td>
<td>4.67 (0.23)</td>
<td>4.10</td>
<td>5.26</td>
<td>1,190</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>12.84 (0.34)</td>
<td>11.64</td>
<td>14.09</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>21.52 (0.42)</td>
<td>19.57</td>
<td>23.56</td>
<td></td>
</tr>
</tbody>
</table>

Combined Reading = shared reading time at 4 years and the sum of shared and independent reading time at 6 and 8 years.

At 4 years, mean television viewing times were just under 2 hours on weekdays and a little over 2 hours on weekends. At 6 years and 8 years, weekday mean viewing times dropped to a little over an hour. Weekend viewing times were more than 2 hours at 6 and 8 years (Table 4.4).
Table 4.4
*Mean Time, in Minutes Spent Viewing Television by Age and Type of Day*

<table>
<thead>
<tr>
<th>Age and day</th>
<th>Television Viewing Mean (SE)</th>
<th>95% CI</th>
<th>Total Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>lower</td>
<td>upper</td>
</tr>
<tr>
<td><strong>4 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>110.20 (2.07)</td>
<td>106.14</td>
<td>114.25</td>
</tr>
<tr>
<td>Weekend</td>
<td>132.46 (2.24)</td>
<td>128.07</td>
<td>136.86</td>
</tr>
<tr>
<td><strong>6 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>70.49 (2.43)</td>
<td>65.73</td>
<td>75.26</td>
</tr>
<tr>
<td>Weekend</td>
<td>129.72 (2.41)</td>
<td>124.99</td>
<td>134.45</td>
</tr>
<tr>
<td><strong>8 years</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>76.83 (3.93)</td>
<td>69.10</td>
<td>84.56</td>
</tr>
<tr>
<td>Weekend</td>
<td>143.32 (0.33)</td>
<td>137.76</td>
<td>148.88</td>
</tr>
</tbody>
</table>

4.9.2 Child and Family Factors and Variations in Viewing and Reading Times

**Gender**

Boys and girls spent similar amounts of time being read to, with two exceptions. At age 4, girls were read to for about 4 minutes more than boys on weekdays and about 7 minutes more than boys on weekends. Girls read independently for about 3 minutes more than boys at 6 years on weekends. Girls also read for about 3 minutes more than boys at 8 years on weekends. Boys viewed television for about 9 minutes more than girls at 4 years during the week and for about 12 minutes more on weekends. Boys also viewed television for about 17 minutes more than girls at 6 years on weekdays. Girls had about 5 minutes more combined reading time than boys at 6 years on weekends (Table 4.5).
Table 4.5

Mean Time, in Minutes, Spent Viewing Television and in Reading Activities by Gender, Age and Type of Day

<table>
<thead>
<tr>
<th>Age and day</th>
<th>Boys</th>
<th>Girls</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SE)</td>
<td>N</td>
<td>Mean (SE)</td>
<td>N</td>
</tr>
<tr>
<td>4 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>Television Viewing</td>
<td>114.48 (2.91)</td>
<td>957</td>
<td>105.35 (2.92)</td>
</tr>
<tr>
<td></td>
<td>Shared Reading/</td>
<td>37.01 (0.42)</td>
<td>433</td>
<td>40.55 (0.48)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Television Viewing</td>
<td>137.76 (3.08)</td>
<td>962</td>
<td>126.20 (3.25)</td>
</tr>
<tr>
<td>Weekend</td>
<td>Shared Reading/</td>
<td>26.04 (0.46)</td>
<td></td>
<td>32.98 (0.50)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>41.06 (0.78)</td>
<td></td>
<td>43.67 (0.71)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>133.24 (3.39)</td>
<td>694</td>
<td>125.81 (3.42)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>16.10 (0.52)</td>
<td></td>
<td>17.50 (0.53)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>41.06 (0.78)</td>
<td></td>
<td>43.67 (0.71)</td>
</tr>
<tr>
<td></td>
<td>Television Viewing</td>
<td>9.77 (0.37)</td>
<td>386</td>
<td>9.16 (0.38)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>9.09 (0.39)</td>
<td></td>
<td>12.50 (0.45)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>24.78 (0.57)</td>
<td></td>
<td>29.29 (0.63)</td>
</tr>
<tr>
<td>6 years</td>
<td>Television Viewing</td>
<td>78.57 (3.68)</td>
<td>386</td>
<td>61.78 (3.04)</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>12.08 (0.50)</td>
<td></td>
<td>12.08 (0.47)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>41.06 (0.78)</td>
<td></td>
<td>43.67 (0.71)</td>
</tr>
<tr>
<td>Weekday</td>
<td>Television Viewing</td>
<td>133.24 (3.39)</td>
<td>626</td>
<td>125.81 (3.42)</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>9.16 (0.38)</td>
<td></td>
<td>9.16 (0.38)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>24.78 (0.57)</td>
<td></td>
<td>29.29 (0.63)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>12.50 (0.45)</td>
<td></td>
<td>12.50 (0.45)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>29.29 (0.63)</td>
<td></td>
<td>29.29 (0.63)</td>
</tr>
<tr>
<td>Weekend</td>
<td>Television Viewing</td>
<td>148.20 (4.06)</td>
<td>620</td>
<td>138.01 (3.93)</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>4.59 (0.31)</td>
<td></td>
<td>4.76 (0.33)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>11.57 (0.46)</td>
<td></td>
<td>14.29 (0.50)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>19.70 (0.58)</td>
<td></td>
<td>23.59 (0.62)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>23.59 (0.62)</td>
<td></td>
<td>23.59 (0.62)</td>
</tr>
</tbody>
</table>

Note: * p ≤ 0.025, ** p ≤ 0.01, *** p ≤ 0.001.
Combined Reading = shared reading time at 4 years and the sum of shared and independent reading time at 6 and 8 years.
T-tests were conducted on log transformed values for shared and independent reading. Values were back transformed to present time in minutes.
Mother's Education

Children of mothers with more years of education were read to for longer at all ages, on weekdays and weekends, with the exception of weekdays at 8 years (Table 4.6). At 4 years differences were large: 16 minutes at 4 years on weekdays and 14 minutes at 4 years on weekends. Differences declined to about 5 minutes at 6 years and about 1 minute at 8 years on weekdays as shared reading declined. Children of mothers with more years of education also did significantly more independent reading at 6 and 8 years on weekdays and weekends (Table 4.6). Differences ranged from 9 minutes at 8 years during the week to 4 minutes at 6 and 8 years on weekends. Unsurprisingly, children of mothers with more years of education also engaged in more combined reading. Differences in time ranged from 18 minutes at 6 years during the week to 8 minutes at 8 years on weekends.

Children of mothers with more years of education viewed significantly less television at all ages, on weekdays and weekends, with the exception of weekdays at 8 years. Most differences were large, ranging from 33 minutes at 4 years on weekdays to 15 minutes at 8 years on weekends (Table 4.6).
Table 4.6
Mean Time, in Minutes, Spent Viewing Television and in Reading Activities by Mother’s Education, Age and Type of Day

<table>
<thead>
<tr>
<th>Age and day</th>
<th>Fewer years of education</th>
<th>More years of education</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SE)</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>4 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekday</td>
<td>Television viewing</td>
<td>127.79 (3.32)</td>
<td>847</td>
<td>94.59 (2.46)</td>
</tr>
<tr>
<td></td>
<td>Shared reading/</td>
<td>30.82 (0.46)</td>
<td></td>
<td>46.70 (0.42)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>148.02 (3.56)</td>
<td>841</td>
<td>117.90 (2.77)</td>
</tr>
<tr>
<td>Weekend</td>
<td>Combined Reading</td>
<td>22.57 (0.47)</td>
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<td>36.08 (0.48)</td>
</tr>
<tr>
<td>6 years</td>
<td>Television Viewing</td>
<td>82.78 (4.04)</td>
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<td>62.56 (2.97)</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>9.32 (0.52)</td>
<td></td>
<td>14.02 (0.44)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>13.91 (0.59)</td>
<td></td>
<td>18.72 (0.47)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>31.88 (0.79)</td>
<td></td>
<td>50.25 (0.69)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>142.20 (3.74)</td>
<td>608</td>
<td>119.05 (3.07)</td>
</tr>
<tr>
<td>Weekend</td>
<td>Shared Reading</td>
<td>7.55 (0.37)</td>
<td></td>
<td>11.26 (0.37)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>8.58 (0.41)</td>
<td></td>
<td>12.56 (0.42)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>20.44 (0.58)</td>
<td></td>
<td>33.25 (0.60)</td>
</tr>
<tr>
<td>8 years</td>
<td>Television Viewing</td>
<td>84.06 (7.02)</td>
<td>149</td>
<td>71.84 (4.53)</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>4.93 (0.64)</td>
<td></td>
<td>6.51 (0.59)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>14.55 (0.92)</td>
<td></td>
<td>24.31 (0.811)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>24.26 (1.12)</td>
<td></td>
<td>41.38 (1.03)</td>
</tr>
<tr>
<td></td>
<td>Television Viewing</td>
<td>152.03 (4.31)</td>
<td>521</td>
<td>136.54 (3.74)</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>3.61 (0.32)</td>
<td></td>
<td>5.54 (0.32)</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>10.73 (0.50)</td>
<td></td>
<td>14.60 (0.47)</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>16.94 (0.61)</td>
<td></td>
<td>25.53 (0.59)</td>
</tr>
</tbody>
</table>

Note: * p≤0.025, **p≤0.01, ***p≤0.001.
Fewer years of educations denotes mothers with year 12 or less, more years of educations denotes mothers with qualifications beyond year 12.
Combined Reading = shared reading time at 4 years and the sum of shared and independent reading time at 6 and 8 years.
T-tests were conducted on log transformed values for shared and independent reading. Values were back transformed to present time in minutes.
4.9.3 Type of Day

More time was spent sharing books with children on weekdays than weekends at 4 years and 6 years. Children were read to for about 7 minutes more during the week at 4 years and about 2 minutes more during the week at 6 years. In addition, children read independently for about 5 minutes more during the week at 6 and 8 years than they did on weekends. Combined reading times were also higher during the week than on weekends, about 12 minutes higher at 6 years and about 7 minutes higher at 8 years. (Table 4.7).

Significantly more time was spent viewing television on weekends than during the week at all ages. Differences ranged from 20 minutes at 4 years to more than 60 minutes at 8 years.
Table 4.7

Mean Time, in Minutes, Spent Viewing Television and in Reading Activities by Age and Type of Day

<table>
<thead>
<tr>
<th></th>
<th>Weekday Mean (SE)</th>
<th>Weekend Mean (SE)</th>
<th>N</th>
<th>t-statistic</th>
<th>df</th>
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</thead>
<tbody>
<tr>
<td>4 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Television viewing</td>
<td>109.56 (2.75)</td>
<td>128.85 (2.98)</td>
<td>1022</td>
<td>-6.36***</td>
</tr>
<tr>
<td></td>
<td>Shared reading/</td>
<td>37.64 (0.42)</td>
<td>30.72 (0.45)</td>
<td></td>
<td>4.78***</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 years</td>
<td>Television viewing</td>
<td>70.79 (3.16)</td>
<td>125.37 (4.52)</td>
<td>395</td>
<td>-11.94***</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>12.02 (0.48)</td>
<td>10.15 (0.49)</td>
<td></td>
<td>2.01*</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>17.31 (0.52)</td>
<td>11.98 (0.57)</td>
<td></td>
<td>4.06***</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>43.19 (0.74)</td>
<td>30.26 (0.81)</td>
<td></td>
<td>4.32***</td>
</tr>
<tr>
<td>8 years</td>
<td>Television Viewing</td>
<td>78.69 (5.16)</td>
<td>145.20 (6.44)</td>
<td>211</td>
<td>-9.81***</td>
</tr>
<tr>
<td></td>
<td>Shared Reading</td>
<td>5.65 (0.58)</td>
<td>5.25 (0.54)</td>
<td></td>
<td>.44</td>
</tr>
<tr>
<td></td>
<td>Independent Reading</td>
<td>19.83 (0.83)</td>
<td>15.12 (0.86)</td>
<td></td>
<td>2.44*</td>
</tr>
<tr>
<td></td>
<td>Combined Reading</td>
<td>32.96 (0.99)</td>
<td>25.67 (0.03)</td>
<td></td>
<td>2.31*</td>
</tr>
</tbody>
</table>

Note: * p ≤ 0.025, ** p ≤ 0.01, *** p ≤ 0.001.

Combined Reading = shared reading time at 4 years and the sum of shared and independent reading time at 6 and 8 years.

T-tests were conducted on log transformed values for shared and independent reading. Values were back transformed to present time in minutes.
4.10 Discussion

4.10.1 Time Spent Reading and Viewing

Shared reading times in the current sample were close to 40 minutes a day on weekdays and about 30 minutes a day on weekends at 4 years. Not surprisingly, shared reading times dropped off steeply at 6 and 8 years. These estimates were higher than those found by Rideout (2014), about 21 minutes of shared reading for 2- to 4-year-olds and Hofferth and Sandberg (2001), about 12 minutes a day for 3- to 5-year-olds. It is possible that shared reading times were lower in these studies because they included a greater range of ages in their estimates. Time spent reading independently was close to 20 minutes during the week and a little over 10 minutes on weekends, at 6 and 8 years. Weekday estimates in the current study were higher than those found in a United Kingdom study (11 minutes) which used estimates of time with print media based on time diary data and therefore used comparable reading measures to those in the present study (Mullan, 2010). However, weekend estimates of independent reading times in this study and the United Kingdom study were similar. Combined reading times were about 40 minutes at 6 years during the week and a little over 30 minutes at 8 years during the week. Combined reading times were lower on weekends, 27 and 22 minutes at 6 and 8 years, respectively.

Television viewing times in the current study were close to 2 hours during the week at 4 years, but dropped to a little over an hour during the week at 6 and 8 years. Viewing times on weekends were over 2 hours at all ages. Estimates for the current study were lower than estimates for the United States but higher than those for countries such as Switzerland. However, it should be noted that television viewing times have been declining in Australia so estimates for the current sample might well be lower if they were based on more recent data (Commonwealth of Australia, ACMA, 2017).
4.10.2 Comparing Time Spent Reading and Viewing Television

Recommendations for viewing times are no more than 2 hours a day for school aged children (Australian Government, Department of Health, 2014) while recommendations for reading times are about 20 minutes a day (Shaywitz, 2003). Many children in this study read for less than the recommended time and viewed for more than the recommended time.

Further, consistent with expectations and with other studies, viewing times for children in the current sample exceeded time spent in reading activities. On average, at 4 years, children viewed television for more than 3 times the amount of time they were read to. At 6 and 8 years, children’s viewing times were 4 to 8 times longer than the time they spent reading independently. These results were consistent with the results of studies from the United States that, in general, children viewed for at least 4 times as long as the time they spent reading (Allen et al., 1992; Hofferth & Sandberg, 2001; Vandewater et al., 2006). The disparity in reading and viewing times was found at all ages, on weekdays and weekends, for both boys and girls.

The disparity in reading and viewing times may come about because so many children do no reading activities on the diary day (Mullan, 2010). Even at 4 years, a substantial minority of children were not read to and this increased rapidly over the next 4 years so that by 8 years about three quarters of children were not read to on the diary day. In relation to independent reading, at both 6 and 8 years, close to a third of children did no independent reading during the week, while on weekends this figure was higher, close to two thirds. This is comparable to figures in Mullan’s review of United Kingdom and United States studies (Mullan, 2010). Percentages of children who engaged in either shared reading, independent reading or both (combined reading) were higher. Around a fifth of children did no reading activities at all on weekdays at 6 and 8 years while more than a third did no reading activities on weekends.

In contrast, percentages of children who did not view television on the diary day were smaller. Less than a tenth of children did not view on weekends, at all ages.
4.10.3 Child and Family Factors

Girls were read to for about 4 minutes longer than boys on weekdays and about 7 minutes longer on weekends at 4 years. In addition, at 6 and 8 years on weekends girls were found to do significantly more independent reading than boys, while there was a trend for them to do more reading at 8 years during the week. Effect sizes were small, differences in time spent reading were only 3 minutes at 6 and 8 years. Consistent with this, girls also had higher combined reading times, although differences were only significant at 6 years on weekends.

These differences were in the expected direction (Common Sense Media, 2014; Mullan, 2010). This may mean, as Beentjes and van der Voort (1989) have suggested, that associations between viewing and reading differ for girls and boys. For example, if girls have a preference for reading, as figures in the current study show, even if they also spend considerable time viewing television, there may be little association between viewing and reading times of girls. Alternatively, if boys prefer to view, there may be a stronger negative association between viewing and reading for boys.

In three out of six comparisons boys spent significantly more time viewing television than girls. Differences were about 9 minutes at 4 years on weekdays and about 11 minutes at 4 years on weekends and 17 minutes at 6 years on weekdays. In some cases where differences between the genders in viewing times have been found, studies have used combined measures of screen use (LeBlanc et al., 2015) so some of the differences may be due to boys’ higher use of computers (Bucksch et al., 2016). This is consistent with other studies using LSAC data that have found a few differences in viewing times in favour of boys (Mullan, 2013; Yu & Baxter, 2015), but have concluded that differences were not marked (Yu & Baxter, 2015). Other studies have not found differences between the genders in viewing times (see Gorely et al., 2004 for a review), suggesting they are not strong.

There were consistent differences between reading and viewing times (5 out of 6 comparisons) on the basis of mother’s education, consistent with other research (Bittman & Sipthorp, 2011; Mullan, 2010; Rutherford et al., 2010). At 4 years, children were read to for 16 minutes more on weekdays and 14 minutes more on
weekends if their mothers had attained tertiary qualifications. Differences in combined reading times at 6 and 8 years were also substantial and in the expected direction, close to 20 minutes during the week and around 10 minutes on weekends. Children of more highly educated mothers also viewed less television. Differences ranged from 33 minutes less time spent viewing at 4 years on weekdays to 15 minutes at 8 years on weekends.

While differences in reading and viewing times were in the expected direction, consistent with mother’s education level, the pattern of higher viewing times on weekends and higher reading times on weekdays was seen in all families. This suggests that, regardless of mother’s years of education, families encourage reading during the week and are more relaxed about viewing on weekends.

It is likely more highly educated mothers both limit viewing and read more to their children and also structure their children’s time so that they have more opportunity to read. However, the strong consistent associations between mother’s education and reading and viewing times, meant that to interpret associations between viewing and reading it was necessary to control for mother’s education.

4.10.4 Type of Day

Children were read to for 7 minutes more during the week than on weekends at 4 years. In addition, children read independently for about 5 minutes more during the week at 6 and 8 years, than they did on weekends. Children’s combined reading time was about 13 minutes higher at 6 years during the week than on weekends. Combined reading times were also higher during the week than on weekends at 8 years, about 7 minutes.

Children spent more time viewing television on weekends than they did during the week, at all ages. Differences in time ranged from 20 minutes at 4 years to more than 60 minutes at 8 years.

Higher viewing times on weekends were consistent with other studies (Mullan, 2013; Vandewater et al., 2006). However, shared and independent reading times in the
current sample were higher during the week, apart from shared reading at 8 years. These results are inconsistent with research that has found reading times to be greater on weekends (Mullan, 2013; Vandewater et al., 2006). However, it was unclear whether the measure of reading Mullan used at 4 to 5 years was shared reading or time spent looking at books, so it was difficult to tell if results in his study were inconsistent with those found here for 4-year-olds. Vandewater et al. measured shared and independent reading times of children under 12 years. It may be that as children’s reading becomes more proficient and they do more leisure reading at home (Juel, 1988), reading times on weekends increase. Baxter and Hayes (2007) found children did more educational activities during the week at 4 to 5 years, which seems broadly consistent with present results, although the measure of educational activities they used was broader than reading activities. Results were also consistent with Huston et al. (1999) who found children did more reading on weekdays.

Differences in time use on weekdays and weekends in the current study may have been at least partly due to external demands and constraints on time use on different days of the week. For example, in the years when children were learning to read it may be that independent reading times during the week were greater because they include home reading set by teachers. It may also be that children view more on weekends as they have more free time and parents relax limits on viewing times. The differences found for reading and viewing times on weekdays and weekends in the current study, along with the differences found by other researchers, meant subsequent analyses were done separately for weekdays and weekends.

4.11 Conclusion

This chapter provided an overview of research findings on overall time spent in reading activities and television viewing as has been used in the typical study examining associations between reading and viewing times, described in Chapter 2. This chapter also described viewing and reading times for the current sample of 4- to 8-year-old Australian children.

The disparity in viewing and reading times of the children in this study were consistent with that commonly found in other studies. Viewing times for the current sample were a little higher than current Australian estimates at 4 years and on
weekends at 6 and 8 years. However, the viewing averages found here were about average by international standards, higher than countries such as Switzerland but not at high as the United States. Viewing times during the week at 6 and 8 years were broadly consistent with current Australian estimates, but were low by international standards. Weekday shared reading times were consistent with other Australian estimates of shared reading times. Weekend estimates were a little lower but were still higher than international estimates of shared reading times. Independent reading times during the week were also higher than international estimates, however weekend estimates were closer to international estimates.

As Bronfenbrenner has noted, background characteristics of children and families will influence time spent viewing and reading and may affect their association. Australian and international studies have found that viewing and reading times differ on the basis of gender, education and the type of day. Similar differences were found in the current study. Therefore, to understand associations between viewing and reading it is necessary to account for these factors.
5.1 Introduction

Gershuny (2000) states that time use patterns develop in interaction with opportunities and constraints afforded by the environment. This insight has two implications for children’s time use. First, the constraints and opportunities provided by work, school and organized leisure time commitments will structure the time families have available for activities such as television viewing and reading. This means viewing and reading activities are likely to follow predictable patterns through the day. That is, viewing and reading should be more likely to occur at particular times during the day than others, reflected in greater numbers of children engaging in these activities at certain times.

Second, as constraints and opportunities change, children’s time use patterns will also change. Changes in constraints and opportunities arise both from broad societal changes, such as the introduction of television or universal, compulsory education for children, and developmental changes in children’s time use, such as when they move from attending preschool to school.

The introduction of television represented a major social change and its impact on children’s time use excited interest and concern from its earliest days (Himmelweit, et al., 1958; Murray, & Kippax, 1978; Mutz et al., 1993; Schramm, Lyle, & Parker, 1961), as described in Chapter 2. Other social changes, such as increases in the number of mothers who work in paid employment outside the home (Gershuny, 2000) may also change children’s time use patterns as they may limit the time young children spend at home. In addition, the uptake of home computers and more recent mobile technology have increased the opportunities for children to use screen-based media (Vandewater et al., 2007). These changes have been reflected in changes in children’s time use patterns. For example, children’s time in more structured
activities supervised by adults (Hofferth & Sandberg, 2001) such as day care or after school care, as well as time spent in screen-based media activities (Vandewater et al., 2007), has increased. One implication of these changes is that children’s time in less-structured activities, such as leisure reading, has been reduced (Barker et al., 2014). This is of particular concern because, as Chapter 2 described, the time children spend being read to and reading for leisure is positively associated with the development of literacy skills and reading achievement (see Mol & Bus, 2011 for a meta-analysis).

Developmental changes in children’s time use also have clear implications for reading and viewing time. Around 87% of 4-year-olds are involved in some form of early childhood education and care (Baxter, 2015). When children start school they have less time for leisure reading and television viewing during school hours on school days. Leisure time outside school hours is not free of constraints for all children either. Between 13% and 17% of children aged 5 to 9 years were attending some form of before and after school care on weekdays (Baxter, 2015). Organised activities such as music classes, ballet or organised sport will impose further constraints on leisure time (Wheeler, 2014; Vincent & Ball, 2007). However, not all children participate equally in these activities. For example, a United States study found children from less privileged families had lower levels of involvement in organised activities (Lareau, 2003).

This description of the changing constraints on children’s time use may also mean that there are shifts in when opportunities for leisure time arise. For example, increases in time spent in structured activities during the day, such as school or sport, may mean that evenings provide one of the few opportunities for children and their families to engage in leisure activities, such as shared and independent reading.

In addition to changes in the environmental contexts in which children engage, Bronfenbrenner (2005) noted that there will be changes in how children spend their time as they develop new skills and interests (see also Bronfenbrenner & Morris, 1998). For example, the majority of parents read to young children, but shared reading declines when children learn to read independently (Scholastic, 2015). A study of 1,748 Australian parents showed that 57% of children younger than 5 years were read to, but this declined to 41% at 6 to 8 years and 10% at 9 to 11 years.
Similar declines in shared reading times were also found in the current study, as described in Chapter 4. Time spent reading independently also increases over these years. Children move from pre-literate activities, such as looking at books and being read to, to emergent literacy-naming and writing letters, reading simple words and knowing some basic sound and letter correspondences and then to conventional reading (Shaywitz, 2003). Recent reviews of shared and independent reading times of young children conducted in the United States have found that reading times increased from preschool years (ages 2 to 4) to early school years (ages 5 to 8) before declining when children reached tween and teenage years (Common Sense Media, 2014; Rideout, 2014).

Changes in how long children view television also occur over the years when they are learning to read. Data from 2013 showed Australian children, younger than 4 years of age, watched for 2 hours and 26 minutes a day while children aged 5 to 12 years viewed for an hour and 49 minutes a day (Commonwealth of Australia, ACMA, 2015). Similar changes in viewing times, on weekdays, were found in the current study, as described in Chapter 4. Viewing times declined on weekdays from around 2 hours at 4 years to a little over an hour on weekdays at 6 and 8 years. However, weekend viewing times were over 2 hours a day at each age.

Existing research into associations between television viewing and reading has looked at associations between overall time spent viewing and reading. Most, but not all, studies have found small negative associations between viewing time and reading time as described in Chapter 2 (see esp. Ennemoser & Schneider, 2007; Neuman, 1988; Vandewater et al., 2006). These studies have interpreted negative associations between total time spent viewing and reading to be consistent with displacement.

Interpreting negative associations between viewing and reading as displacement of reading time by viewing time makes two assumptions. The first is that if children were not viewing they would be reading (Vandewater et al., 2006). The second is that time is limited, so if time is spent on viewing there will be less time available for reading. This posits that there is a ‘symmetrical, zero-sum relationship’ between time for viewing and reading (Mutz et al., 1993). Both of these assumptions have been criticised. Vandewater et al. (2006) suggest there is little evidence that children
would be reading if they were not viewing. Mutz et al. (1993) question whether time for viewing is at the expense of developmentally important activities such as reading. They suggest that rather than taking time from developmentally important activities, time for viewing may come from more marginal activities such as day dreaming or hanging out. However, while these assumptions have been criticised, they have not, to the author’s knowledge, been examined directly.

The model of viewing and reading activities in Table 5.1.a illustrates behaviour that is consistent with the first assumption. Children who are viewing are not reading and children who are reading are not viewing. Clearly, model 5.1.a does not capture the complexity of children’s behaviour. Many children who are not viewing are engaging in other activities apart from reading and many children who view also read. Table 5.1.b shows a modified model which reflects these findings but is still consistent with a more relaxed form of the assumption that recognizes that children’s behaviour will encompass more than reading and viewing activities. However, it suggests, consistent with the assumption, that viewing and reading behaviour are negatively associated as nonviewers are more likely to read and viewers are less likely to read.

If children’s behaviour is not consistent with the first assumption of the displacement hypothesis then patterns of behaviour may be described by model 5.1.c. Nonviewers are less likely to engage in reading activities and most viewers are readers. Using these models as a basis, it is possible to examine whether children’s patterns of reading and viewing behaviour are consistent with the first assumption of the displacement hypothesis.

Table 5.1: Models of Viewing and Reading Behaviour

<table>
<thead>
<tr>
<th></th>
<th>nonviewers</th>
<th>viewers</th>
</tr>
</thead>
<tbody>
<tr>
<td>non-readers</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>readers</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
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<td>nonviewers</td>
<td>viewers</td>
</tr>
<tr>
<td>---------------</td>
<td>------------</td>
<td>---------</td>
</tr>
<tr>
<td>non-readers</td>
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<td>50</td>
</tr>
<tr>
<td>readers</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>

Even if children’s behaviour did accord perfectly with model 5.1.a and all viewers were not reading and all readers were not viewing this would not necessarily show that viewing is displacing reading. It is possible that nonviewers may not have the opportunity to read. It is also possible that viewers may not have the freedom to choose to whether to view or not. In these cases, it cannot be said that viewing is displacing reading. In addition to showing children would spend time reading if they were not viewing, it must also be shown that the time spent viewing takes up the time that would otherwise be spent reading, the ‘zero-sum’ assumption.

However, these models are useful. While it is not possible to know in any individual case whether a child would read if they were not viewing, or view if they were not reading, these models provide a tool to examine reading and viewing behaviour to determine whether there are times at which the majority of children who are viewing are not reading and the majority of children who are not viewing are reading. This also means that viewing at this time can be said to be more likely to displace time for reading. This chapter investigates both of these issues. In the first place, children’s reading and viewing behaviour across the day was assessed to identify times when nonviewers were more likely to read and viewers were less likely to read, so that viewing was more likely to displace reading. Then reading times of viewers and nonviewers were compared to determine whether there was evidence that viewing at these times was taking up time for reading.

**5.2 Aims**
This chapter has the following aims:

- To describe viewing and reading patterns over the day;
- to investigate whether percentages of children viewing and reading are consistent with the assumption that children who are not viewing will be reading and, by extension, children who are viewing will not be reading.
- To investigate whether the time spent by viewers and nonviewers on reading is consistent with the assumption that leisure time is limited so that viewers will read less than nonviewers.

Previous investigations of the viewing patterns of Australian children have indicated that viewing peaks in the morning and evening, with fewer children viewing at other times (Commonwealth of Australia, ACMA, 2015; Commonwealth of Australia, ACMA, 2007). Earlier studies have found that children view more on weekends as described in Chapter 4, section 4.10.4. It is therefore expected that viewing will peak in the morning and evening and that viewing times will be longer on weekends.

If the assumption that children who are not viewing are reading and conversely that children who are not reading are viewing holds in its modified form, then nonviewers will be more likely to read and viewers will be less likely to read. If the assumption that time use has a zero-sum association is correct, then reading times should be less for viewers than nonviewers.
5.3 Method

5.3.1 Participants

As described in Chapter 3, participants were children and families sourced from the first three waves of the K (Kindergarten) cohort of the Longitudinal Study of Australian Children (LSAC). Children were 4-5 \((M=4.74, SD=2.64)\), 6-7 \((M=6.82, SD=2.95)\) and 8-9 \((M=8.79, SD=2.92)\) years of age, at waves 1, 2 and 3 respectively. The ages or waves will be referred to as 4 years, 6 years and 8 years, to simplify their description. The initial recruitment sample contained 4,983 children with approximately equal numbers of boys (2,537) and girls (2,446).

Further details about participants, the study procedure, the measures used in the present study, data screening, sample selection and imputation of missing data can be found in Chapter 3.

5.3.2 Measures

The measures relevant to the present chapter were as follows:

**Tempograms**

SAS 9.1 was used to create arrays of the television viewing, shared reading and independent reading variables for each of the 96 15-minute time periods across 24 hours of the diary day (Appendix D). For each time period, for each activity, a programming loop returned a value of 1 if the child was engaging in the activity and a value of 0 if they were not. As described in chapter 4, some studies have found differences in viewing and reading times for boys and girls (Common Sense Media, 2014; Hesketh et al., 2007; LeBlanc et al. 2015; Mullan, 2010). Therefore, data sets were split by gender and programming run on each split.

Values were summed within each time period to calculate the number of boys and girls engaged in each activity in each 15-minute block of time over the day. Numbers
engaged in each activity were summed over each hour. These were converted into percentages and tempograms were created to show the percentages of children engaged in reading and viewing at each hour on the diary day. Weekdays and weekends were presented separately.

**Time Spent Reading and viewing**

Because children are beginning to read independently by 6 years of age, it was likely that some 6- and 8-year-olds would still be read to, some would read independently and some would do both, so shared and independent reading times were combined for 6- and 8-year-olds. This meant “reading” was shared reading at 4 years and combined shared and independent reading at 6 and 8 years.

The reading measure was the sum of the 15-minute intervals which children spent on shared reading at 4 years and shared and independent reading, combined, at 6 and 8 years. The viewing measure was the sum of the 15-minute intervals which children spent viewing television. Time spent in each activity was calculated for five 3-hour periods during the day, from 6 a.m., 9 a.m., 12 noon, 3 p.m. and 6 p.m. Creating equal blocks of time over the day meant the percentages of nonviewers and viewers who did and did not read and mean reading times for nonviewers and viewers in the different blocks of time during the day could be compared. In addition, this approach divided the day into segments that broadly corresponded with the times at which different activities occurred in children’s daily lives. For example, the block of time from 6 a.m. to 9 a.m. corresponded to the period of time before pre-school or school, the two blocks of time starting from 9 a.m. and 12 noon covered the school day, while the blocks of time from 3 p.m. and 6 p.m. corresponded to the period of time after school in the afternoon and the evening, respectively.
5.3.3 Data Screening and Analyses

The distributions of the reading variables were positively skewed because many children did no reading activities on the diary day. In addition, the viewing variables had a large number of outliers. Log 10 transformations were applied to the combined reading and viewing variables and this improved their distribution. A constant (+1) was added to each value so values of 0 were included in the analysis. To assist interpretation of the figures and keep results comparable to those in other studies, results were back transformed and multiplied by 15 so that reading times are shown in minutes. As noted in Chapter 3, time spent simultaneously viewing television and in reading activities was divided equally between the two activities.

There are three types of aggregate statistics that may be calculated from time use diary data. First, the percentage of the sample population who undertook the activity. Second, the mean time the entire sample spent in an activity on the diary day, which provides an estimate of the mean time spent reading by all the 4-, 6- and 8-year-olds in the sample. Third, the mean time those who engaged in the activity spent in the activity on the diary day, which provides an estimate of the mean time spent reading by the 4-, 6- and 8-year-olds who actually read on the diary day (Fisher & Gershuny, 2013). The analysis in this chapter followed this approach.

Chi square analysis using SPSS 25 was used to examine whether the percentages of nonviewers and viewers who were reading in each 3-hour block of time differed significantly. Mean reading times for nonviewers and viewers within each block of time, first for all children and then for only those who read were compared using one-way ANOVA. Bonferroni adjusted alpha levels of .01 per test (.05/5) were used.
5.4 Results

5.4.1 Tempograms: Patterns of Reading and Television viewing

Tempograms showed reading and viewing activities varied over the day, differed on weekdays and weekends and also changed with age (Figures 5.2 – 5.6).
Figure 5.2: Percentage of Boys and Girls Viewing Television and Engaged in Shared Reading, 4 years

Weekday

Note: N=1,802, Boys=957, Girls=845

Weekend

Note: N=1,776, Boys=962, Girls=814.
Figure 5.3: Percentage of Boys and Girls Viewing Television and Engaged in Shared Reading, 6 years

Weekday

Note: N=744, Boys=386, Girls=358

Weekend

Note: N=1,320, Boys=694, Girls=626
Figure 5.4: Percentage of Boys and Girls Viewing Television and Engaged in Shared Reading, 8 years

Weekday

Note: $N=365$, Boys=182, Girls=183

Weekend

Note: $N=1,190$, Boys=620, Girls=570
Figure 5.5: **Percentage of Boys and Girls Reading Independently, 6 years**

**Weekday**

<table>
<thead>
<tr>
<th>Time</th>
<th>Percentage</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
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<td>5am</td>
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<td></td>
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<td>6am</td>
<td>4</td>
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</table>

**Weekend**

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<th>Time</th>
<th>Percentage</th>
<th>Boys</th>
<th>Girls</th>
</tr>
</thead>
<tbody>
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<tr>
<td>12pm</td>
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</tr>
</tbody>
</table>

Note: Weekday \(N=744\), Boys=386, Girls=358

Weekend \(N=1,320\), Boys=694, Girls=626
Figure 5.6: Percentage of Boys and Girls Reading Independently, 8 years

**Weekday**

Note: Weekday, $N=365$, Boys=182, Girls=183

**Weekend**

Weekend $N=1,190$, Boys=620, Girls=570
At 4 years, television viewing was characterised by a bimodal distribution with a peak in the morning around 8 a.m., and again in the evening from 7 p.m. to 8 p.m. There was also a smaller viewing peak in the afternoon at 4 years during the week at about 4.30 p.m. Less children viewed in the afternoon at 4 years on weekends. Shared reading was characterised by a single peak in the evening at around 8 p.m. The peak for reading was higher than that for viewing in the evening on weekdays, but lower on weekends.

At 6 and 8 years, viewing showed the same bimodal distribution that was evident at 4 years. However, the size of the morning viewing peak declined and the evening viewing peak increased, a little on weekdays and much more on weekends, over these years. Shared and independent reading showed very low levels during the day. Independent reading increased slightly at 3 p.m. The evening peak for both shared and independent reading occurred at around 8 p.m. at both ages and on both types of day. In all cases the evening peak for viewing coincided with and was higher than the peak for either shared or independent reading, consistent with displacement of reading by viewing.

The tempograms showed shared reading was highest at 4 years. This was to be expected as few 4-year-olds read independently (Shaywitz, 2003). Therefore, the reading measure used in this chapter was shared reading at 4 years. The tempograms showed that shared reading declined sharply at 6 and 8 years. They also showed independent reading increased as shared reading declined, particularly during the week, suggesting children were transitioning from shared to independent reading over these ages. It was likely that some children were still being read to while others were reading independently and some would do both. Therefore, the measure of reading for 6- and 8-year-olds was shared and independent reading combined. This was calculated by summing the number of 15-minute intervals of shared and independent reading times.

Taken together, the tempograms showed shared and independent reading were low across the day, with a single peak in the evenings at around 8 p.m. Even when shared and independent reading were combined at 6 and 8 years, profiles for viewing and reading showed numbers viewing were higher than numbers reading at all times of
day, except weekday evenings at 4 years. In addition, the tempograms showed viewing and reading both peaked in the evening. Higher viewing numbers points to competition between these activities making displacement of reading by viewing intuitively plausible. The tempograms also showed there was an increase in reading in the afternoon after school. It was possible that some children were reading in the afternoon and then viewing in the evenings. Viewing also increased over this period, suggesting for others viewing may always be the dominant activity.

5.4.2 Percentages of Nonviewers and Viewers who were reading

To examine how reading and viewing activities were associated over the day, the day was divided into five 3-hour blocks of time from 6 a.m., 9 a.m., 12 noon, 3 p.m. and 6 p.m. As noted, this was consistent with the standard transitions in a child’s day. Each 3-hour block of time would therefore have a different set of potential commitments and constraints on viewing and reading choices. Differences between the percentage of viewers and non-viewers who were reading in each block of time was examined.

Comparing percentages of viewers and nonviewers who were and were not reading provides direct information about the numbers of nonviewers and viewers who were reading, and this allows the assumption that children who were not viewing were reading and children who were viewing were not reading, to be tested.

Day

During the day, at 4 years, on both types of day, most children did not read. Percentages reading were around 20% during the week and approximately 15% on weekends (Table 5.7). During preschool hours from 9–12 noon and 12–3 p.m., most children did not view. This shows that the majority did not read or view. In the early morning, from 6–9 a.m. and in the late afternoon, from 3–6 p.m. on weekdays and on weekends, the majority were viewing and not reading and a substantial minority were neither viewing nor reading, apart from one case. In the late afternoon on weekends at 4 years the majority of children did not view or read. At 4 years no comparisons reached significance.
Patterns were similar at 6 and 8 years. During the day most children did not read. This was particularly marked during school hours from 9–12 noon and 12–3 p.m. when percentages reading were less than 5%. Percentages reading were higher in the hours before and after school, particularly in the afternoons during the week when approximately 25% of children read. Across the day, on weekdays and weekends there were higher percentages of nonviewers than viewers, so the majority did not read or view. In the hours before and after school, a substantial minority viewed and did not read.

A significant negative chi square would reflect a behavioural pattern consistent with model 5.1.b and the first assumption of the displacement hypothesis. That is, that there were more nonviewers who read and that there were more viewers who did not read. However, there were few significant associations between viewing and reading during the day at any age or on any type of day, and in the few cases that were significant, most of the associations were not in the direction that would be expected to be consistent with the assumption of the displacement hypothesis (Table 5.7). That is, there was a positive association meaning that relatively more viewers than nonviewers read and that higher numbers were neither reading nor viewing.

At 6 and 8 years, three comparisons reached significance: 6-and 8-year-olds who viewed between 9–12 noon on weekdays were significantly more likely to read than those who did not view $\chi^2(1) = 25.93$, $p < .001$, $\Phi = .187$, $p < .000$ and $\chi^2(1) = 15.14$, $p < .000$, $\Phi = .204$, $p < .000$. Eight-year-olds who viewed from 12–3 p.m. on weekdays were also significantly more likely to read than those who did not view $\chi^2(1) = 30.57$, $p < .000$, $\Phi = .288$, $p < .000$. In each comparison, one cell expected frequency fell below 5, reflecting the high number of children, more than 90%, who were not reading, probably because they were in school. This means the results must be interpreted with caution.
Table 5.7

Percentages of Nonviewers and Viewers Reading, Blocks of Time, Age and Type of Day

<table>
<thead>
<tr>
<th>Wave</th>
<th>Day</th>
<th>Time</th>
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<th>9-12 noon</th>
<th>12-3 p.m.</th>
<th>3-6 p.m.</th>
<th>6-9 p.m.</th>
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<tr>
<td></td>
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<td>no %</td>
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<td>no %</td>
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<td>7</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: cells may not add to 100% due to rounding
Evening

In the evening, the percentage of children who were reading more than doubled (Table 5.7). At 4 years, approximately two-thirds of children read on weeknights, around half on weekends. Percentages who were viewing were also higher than during the day, approximately 50% during the week and on weekends. In contrast to the day, a minority of children were neither viewing nor reading during the evening. On weeknights the majority of 4-year-olds read and did not view. On weekends, the majority viewed and did not read. This comparison reached significance: children who viewed on weekend evenings were significantly less likely to read than children who did not view $\chi^2(1) = 19.61, p < .000, \varphi = -.11, p < .000$.

Patterns were similar at 6 and 8 years to those at 4 years in the evening. Close to two thirds of children read on weeknights at 6 and 8 years. Percentages were lower on weekends, around half of children at 6 years and a little more than a third at 8 years. Percentages who viewed were also higher than during the day at 6 and 8 years. More than half of children viewed on weeknights and more than two thirds on weekends. On weeknights the majority of children both viewed and read. On weekends the majority viewed and did not read. At 6 years, children who viewed were significantly less likely to read than children who did not view $\chi^2(1) = 38.80, p < .000 \varphi = -.17, p < .000$. At 8 years, the comparison just failed to reach significance.

5.4.1 Whole Sample

To examine whether the extent to which behavioural patterns consistent with the first assumption of the displacement hypothesis were reflected in longer reading times for nonviewers and shorter reading times for viewers, reading times of viewers and nonviewers in each block of time over the day were compared.

Reading times during the day were low at 4 years and by 6 and 8 years had declined to almost nothing (Figure 5.8). There were few significant differences between mean reading times between viewers and nonviewers during the day. At 4 years during the
week from 9–12 noon and 12–3 p.m. children who viewed had higher reading times than those who did not view $F(1, 986.80)=7.40, p<.01; F(1, 636.93)=6.74, p<.01$ (respectively). At 6 years on the weekend, nonviewers read for more time than viewers from 9–12 noon, $F(1, 1,249.57)=8.77, p<.01$.

Reading times more than doubled during the evening at each age and on each type of day. Significant differences between mean reading times of viewers and nonviewers were found in the evening from 6–9 p.m. at each age and on each type of day: $F(1, 1,800)=46.53, p<.000$ (4 years, weekday); $F(1, 1,624.53)=26.17, p<.000$ (4 years, weekend); $F(1, 742)=12.01, p<.01$ (6 years, weekday); $F(1, 842.56)=51.54, p<.000$ (6 years, weekend); $F(1, 363)=14.73, p<.000$ (8 years, weekday); $F(1, 571.70)=11.10, p<.01$ (8 years, weekend) (Figure 5.8). Children who did not view in the evening had higher reading times than those who viewed at each age and on each type of day.
Figure 5.8
Reading Times, Viewers and Nonviewers in Blocks of Time, 6–9 a.m., 9–12 noon, 12–3 p.m., 3–6 p.m. and 6–9 p.m., all Children
4 Years, Weekday

6 Years, Weekday

8 Years, Weekday

4 Years, Weekend

6 Years, Weekend

8 Years, Weekend
These results could have come about because there were more non-readers among viewers or because viewers read for less time than nonviewers or a combination of both. To clarify this, one-way ANOVA compared the time viewers and nonviewers spent reading only for children who spent time reading (Figure 5.9).
Figure 5.9: Mean Reading Times, Viewers and Nonviewers in Each Block of Time, 6–9 a.m., 9–12 p.m., 12–3 p.m., 3–6 p.m. and 6–9 p.m., Readers Only

4 Years, Weekday

4 Years, Weekend

6 Years, Weekday

6 Years, Weekend

8 Years, Weekday

8 Years, Weekend
5.4.2 Readers only

At 4 years, children who read, read for more than 30 minutes in all time blocks on weekdays and weekends. Nonviewers read for significantly more time than viewers in one of the four weekday time blocks and two of the four weekend time blocks: 9–12 noon at 4 years on weekdays: $F(1, 365)=7.78, p<.01$ and from 9–12 noon and 12–3 p.m. at 4 years on weekends $F(1, 323)=12.57, p<.000$; $F(1, 319)=12.92, p<.000$ (respectively).

Type of day differences were clearer at 6 and 8 years. On weekdays during the time blocks before and after school, children read for 20 to 30 minutes, but were not recorded as reading during the time blocks when they were at school. On weekends, in all time blocks both groups read for approximately 30 to 40 minutes. At 6 and 8 years, there were no significant differences between viewers and nonviewers.

At all ages reading times in the evening were longer when only readers were considered. At 4 years children read for more than 30 minutes. At 6 and 8 years they read for 40 minutes.

In every case nonviewers were reading for longer than viewers in the evening. Significant differences between mean reading times of viewers and non-viewers were found at each age and on each type of day: $F(1, 1,1199)=17.27, p<.000$ (4 years, weekday); $F(1, 907)=6.75, p<.01$ (4 years, weekend); $F(1, 502)=7.74, p<.01$ (6 years, weekday); $F(1, 613)=15.28, p<.000$ (6 years, weekend); $F(1, 222)=9.0, p<.01$ (8 years, weekday), $F(1, 441)=11.46, p<.01$ (8 years, weekend) (Figure 5.9).
5.4.3 Balancing reading and viewing across the day

The previous analyses divided the day into blocks and associations between reading and viewing were examined within time blocks. Conducting the analysis in this way enabled associations to be examined in detail across the day. However, it is likely that family’s structure children’s time for reading and viewing across the day to ensure there is time for both activities. This means that viewers who were not reading in one block of time may have read during another block of time. Alternatively, nonviewers who were reading in a block of time may have viewed during another block of time. To check whether this was the case an analysis linking reading and viewing behaviour across blocks of time was conducted. Because the percentage of children reading did not exceed a quarter of children in any time block over the day, daytime blocks were collapsed. The analyses examined whether children who viewed in the evening were more likely to have read during the day and whether children who read during the evening were more likely to have viewed during the day.

At all ages and on both types of day, about a fifth of children viewed in the evening and had read during the day. At 4 years on weekends there was a significant association between viewing during the evening and having read during the day. However, in all cases, children who read during the day were not more likely to view in the evening than children who had not read during the day (Table 5.10).
Table 5.10
Percentage of Children who Engage in Reading (yes or no) 6 a.m. to 6 p.m. by Viewing (yes or no), 6 p.m. to 9 p.m.

<table>
<thead>
<tr>
<th>Wave and day type</th>
<th>Reading 6 a.m. to 6 p.m.</th>
<th>6 p.m. to 9 p.m.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no %</td>
<td>yes %</td>
</tr>
<tr>
<td>4 years weekday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a)</td>
<td>31</td>
<td>32</td>
</tr>
<tr>
<td>4 years weekend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b)</td>
<td>28</td>
<td>39</td>
</tr>
<tr>
<td>6 years weekday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c)</td>
<td>27</td>
<td>36</td>
</tr>
<tr>
<td>6 years weekend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(d)</td>
<td>25</td>
<td>45</td>
</tr>
<tr>
<td>8 years weekday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>25</td>
<td>42</td>
</tr>
<tr>
<td>8 years weekend</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td>20</td>
<td>51</td>
</tr>
</tbody>
</table>

Note. (a)N=1,802. (b) N=1,776 \( \chi^2 (1) = 4.93, p < .05, \phi = -0.05 \)  (c) N=744 (d) N=1,320 (e) N=365 (f) N=1,190. Percentages in each cell may not add to 100% due to rounding.

At 4 years and at 6 and 8 years on weekdays, the majority of children who read in the evening had viewed during the day. At 6 and 8 years on weekends, the majority did not read in the evening and had viewed during the day. However, there were no significant associations between reading during the evening and having viewed during the day (Table 5.11).
Table 5.11
Percentage of Children who Engaged in Viewing (yes or no) 6 a.m. to 6 p.m. by reading (yes or no), 6 p.m. to 9 p.m.

<table>
<thead>
<tr>
<th>Wave and day type</th>
<th>Television viewing</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6 a.m. to 6 p.m.</td>
<td>6 p.m. to 9 p.m.</td>
</tr>
<tr>
<td></td>
<td>no %</td>
<td>yes %</td>
</tr>
<tr>
<td></td>
<td>yes %</td>
<td></td>
</tr>
<tr>
<td>4 years weekday(^{(a)})</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>55</td>
</tr>
<tr>
<td>4 years weekend(^{(b)})</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>45</td>
</tr>
<tr>
<td>6 years weekday(^{(c)})</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>43</td>
</tr>
<tr>
<td>6 years weekend(^{(d)})</td>
<td>11</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>43</td>
<td>38</td>
</tr>
<tr>
<td>8 years weekday(^{(e)})</td>
<td>16</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>35</td>
</tr>
<tr>
<td>8 years weekend(^{(f)})</td>
<td>14</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>30</td>
</tr>
</tbody>
</table>

Note.  (a) N=1,802  (b) N=1,776  (c) N=744  (d) N=1,320 (e) N=365  (f) N=1,190
Percentages in each cell may not add to 100% due to rounding.
5.5 Discussion

Negative associations between viewing and reading time have been interpreted to be consistent with displacement. That is, viewing takes up time that children would otherwise devote to reading (Ennemoser & Schneider, 2007; Gadberry, 1980; Huston et al., 1999; Shin 2004; Wolfe et al., 1984). This hypothesis is based on two assumptions. The first, that if children were not viewing they would be engaged in “more worthwhile” activities (Vandewater et al., 2006), in this case reading. Secondly, that there is a ‘symmetrical, zero-sum relationship’ between time for viewing and reading (Mutz et al., 1993; Vandewater et al., 2006). This chapter sought to examine both of these assumptions.

Reading and viewing behaviour patterns and the time spent reading by viewers and nonviewers were examined. If the first assumption holds, in its most extreme formulation, all nonviewers would read and conversely all viewers would be non-readers. A modified form of this formulation, which recognises that reading is just one of a number of activities that children engage in, holds that among nonviewers the majority will read, and by extension, among viewers only a minority will read.

Initially, tempograms were used to examine viewing and reading patterns over the day. To investigate whether patterns of viewing and reading behaviour were consistent with the first assumption of the displacement hypothesis, the day was divided into five 3-hour blocks of time. Analysis of associations between percentages of children reading and viewing during the day generally did not support the assumption of the displacement hypothesis that nonviewers would be more likely to read and viewers would be less likely to read. However, in the evening, reading and viewing behaviour patterns were either partially or wholly consistent with the first assumption. Nonviewers were consistently more likely to read. Viewers were less likely to read on weekends but more likely to read on weeknights. Reading times of nonviewers were consistently higher than those of viewers in the evening in the whole sample analysis. This reflected the finding that nonviewers were more likely to read.
in the evening. Reading times of nonviewers were also higher than those of viewers in the analysis of readers only in the evening. This showed that not only were nonviewers more likely to read they also read for longer. These findings will be reviewed in turn.

5.5.1 Viewing and Reading Patterns Over the Day

The tempograms provided a clear picture of children’s participation in viewing and reading activities over the day. In general, more children read during the week and more children viewed on weekends. Reading and viewing were concentrated at specific times of day. Numbers viewing peaked in the morning and the evening. Numbers reading peaked in the evening. The peak for viewing was higher than the peak for reading at all ages and on both types of day except at 4 years on weekdays. The coincidence of peaks in viewing and reading raised the possibility of competition between the two activities for children’s time. The tempograms also showed that numbers of children who were read to declined as children got older.

The profile of activities was consistent with known constraints on children’s time use, while changes in the profile of activities were consistent with developmental changes in children’s time use. For example, viewing was bimodal, with peaks in the morning and evening, consistent with constraints on time arising from attending preschool or school. The profile of viewing was also consistent with patterns of viewing described in ACMA data for Australian children 14 years and under (Commonwealth of Australia, ACMA, 2017). Shared reading was unimodal, with a single peak in the evening, consistent with parent availability to read to children at this time and reading being a favoured activity for bed time routines. Shared reading decreased as children got older and developed independent reading skills. Shared reading dropped to almost nothing across the day at 6 and 8 years after children started school. There were also few children who read independently during the day at 6 and 8 years on weekdays, consistent with constraints on time arising from school and participation in other activities. Viewing times also declined across the day during the week at 6 and 8 years, after children started school, but about 10% viewed across the middle of the day on weekends. Viewing and reading patterns for boys and girls proved to be similar, so they were grouped together for subsequent analysis.
Consistency between the picture of daily activities provided by the tempograms and known constraints and changes in children’s time use showed the tempograms provide a reliable and useful way to describe patterns of viewing and reading activities. In particular, they showed when activities were most likely to occur and, notably, identified times at which reading and viewing were most likely to compete.

5.5.2 Patterns of Television Viewing and Reading Activities

Percentages of Nonviewers and Viewers who were reading

Patterns of reading and viewing differed for the day and evening so the results for associations between engagement in reading activities and viewing during the day are discussed separately from those during the evening.

Day

The assumption that nonviewers would be reading was not met in this sample during the day on both weekdays and weekends. In general, the majority of children were neither viewing nor reading. Even at 4 years, percentages of children reading and not viewing were less than 15% during the day. It was anticipated that 4-year-olds would have more time available during the day and shared reading would be at its height. However, even at this age, children’s time during the day was constrained. About 89% of Australian 4-year-olds are enrolled in preschool programs (ABS, 2016) and about 26% of children are in formal care such as long day care (ABS, 2017). It is likely that the group of 4-year-olds who neither viewed or were read to fell into this category.

At 6 and 8 years when children would normally be attending school the percentages who were neither viewing nor reading exceeded 90%. These percentages were so high that the assumption that nonviewers would be more likely to read than viewers could not be reliably tested because the assumptions of the chi-square test regarding cell size could not be met. Even during the time before and after school, when
children’s time was less constrained, the majority of children, more than 45%, neither viewed nor read. While the majority of viewers did not read, comparing the percentages of nonviewers and viewers who read showed that the assumption that nonviewers would be more likely to read than not was not supported. Percentages of nonviewers who were not reading far outweighed those who were.

On weekends, the opportunities to view and read during the day should have been greater. Using LSAC data one study showed that 4- to 5-year-old children spent about an hour on weekends participating in organised activities, including sport (Mullan, 2013). However, percentages who were reading were low across the day, around a fifth of children at 4 years and around 10% or less of children at 6 and 8 years. While, consistent with the assumption, the majority of viewers did not read, the percentage of nonviewers who read was much less than the percentage of nonviewers who did not read. Again, the assumption that nonviewers would be more likely to read was not supported.

Taken together these results showed that evidence for the assumption of the displacement hypothesis that nonviewers would read was weak during the day. While most viewers did not read, the assumption that nonviewers would read was not met. While the evidence suggested there were times when children could neither read or view, when children did have time available they chose to view rather than read during the day. However, evidence from the tempograms also showed that reading peaked in the evening. While it could not be assumed that children who did not view during the day would read, the next step was to examine whether children who did not view in the evening, read.

**Evening**

Patterns of reading and viewing behaviour were very different in the evening from those during the day. The percentages of children viewing in the evening increased at all ages and on both types of day, except 4 years on weekdays. However, percentages of children reading increased even more at all ages and on both types of day. The percentage reading between 6–9 p.m. was almost triple the percentage reading between 3–6 p.m. Reading levels were at their highest in the evening.
Comparing the percentages of nonviewers and viewers who were reading showed that, consistent with the assumption of the displacement hypothesis, nonviewers were more likely to read than not to read at 4 years during the week. However, among viewers, there were more readers than non-readers which was inconsistent with the assumption.

At 4 years and 6 years on weekends, the majority of viewers were not reading, consistent with the hypothesis. In addition, the majority of nonviewers were reading. The comparison just failed to reach significance at 8 years. The modified assumption that viewers would be less likely to read and that nonviewers would be more likely to read held for weekend evenings at 4 and 6 years of age and was close to significant at 8 years of age.

However, weekday evenings showed different viewing and reading patterns at 6 and 8 years. On weekdays, the majority of nonviewers read at each age, suggesting support for the assumption of the displacement hypothesis. However, the majority of viewers also read on weeknights and the comparisons failed to reach significance. This suggested reading takes a special place in family routines on weekday evenings.

Taken together, results showed that even the modified assumption that nonviewers would be more likely to read did not hold at any time block during the day at any age. While the evidence suggested there were times when children could not read or view, when children did have time available they chose to view rather than read during the day. However, at 4 and 6 years on weekends, patterns of viewing and reading behaviour were consistent with the modified form of the assumption of the displacement hypothesis. Among nonviewers, the majority were reading and among viewers, the majority were not reading.

The analysis of the percentage of children reading and viewing during the day showed many children were able to combine reading and viewing, particularly in the evenings. A second assumption that underpins displacement is that the time children have for reading and viewing activities is limited. This has been taken to mean that children who view will have less time for other activities, including reading. If
nonviewers are more likely to read and, conversely, viewers are less likely to read it would be expected that nonviewers would have longer reading times than viewers. (Mutz et al. 1993; Vandewater et al., 2006). The next analysis examined whether viewers read for less time than nonviewers.

**Time spent reading by nonviewers and viewers, whole sample analysis**

**Day**

None of the reading and viewing behaviour patterns over the day were consistent with the assumption that nonviewers would be more likely to read. It was not surprising then that there were only three significant differences in reading times between viewers and nonviewers over the day and only one of them supported the assumption that nonviewers would read for more time. Consistent with the assumption, at 6 years on weekends (from 9–12 noon) nonviewers read for more time than viewers. However, the differences in time were very small, about a minute and a half. At 4 years during the week, children who viewed from 9–12 noon and 12–3 p.m. in the afternoon read for about 2 minutes longer than nonviewers. Because these children were viewing, this suggested they were most likely at home and could be read to. Nonviewers were more likely to be out of the home and were therefore less able to be read to.

**Evening**

Reading times were higher in the evenings than during the day at all ages. They were higher during the week than on weekends.

Reading and viewing behaviour patterns on weekend evenings were consistent with the assumption that nonviewers would be more likely to read and viewers would be less likely to read. On weekday evenings behaviour patterns were only partially consistent with the model. More nonviewers read, however, more viewers also read. Consistent with the assumption that children who viewed would read for shorter times
than children who did not view, significant differences in reading times were found in the evening at each age and on each type of day. However, again, the differences were small, with nonviewers reading for between 4 and 11 minutes longer than viewers. It may be that viewing was not encroaching on reading time to a great extent, because reading times were relatively short at these young ages. Juel (1988), in a study conducted in the United States, found that time spent reading at home was minimal before 8 years of age. Children are not reading sufficiently competently over these early years to see sharp increases in leisure reading times (Guryan et al., 2014).

Mean reading times for viewers and nonviewers in these analyses were based on readers and non-readers. Consequently, reading times were influenced both by the numbers of children who did not read and the length of time readers, spent reading. In a second analysis, the reading times of viewers and nonviewers only for children who actually read were compared.

**Time spent reading by nonviewers and viewers, readers only**

**Day**

At 4 years, when non-readers were excluded from the analysis, daytime reading times for nonviewers and viewers increased. Nonviewers read for between 38 to 47 minutes on weekdays and between 35 to 51 minutes on weekends. Viewers read for between 32 to 43 minutes on weekdays and between 34 to 41 minutes on weekends. Reading times for nonviewers were consistently higher than those for viewers. In three out of the eight day time blocks nonviewers had significantly longer reading times supporting the assumption that children who viewed would read for less time than children who did not read.

At 6 years and 8 years, time spent reading remained low during school hours but in the time before and after school it increased markedly for viewers and nonviewers when non-readers were excluded from the analysis. Reading times for both groups were highly similar. At 6 years, nonviewers read for between 23 to 27 minutes on
weekdays and between 30 to 43 minutes on weekends. Viewers read for between 22 to 27 minutes on weekdays and between 29 to 35 minutes on weekends. At 8 years, nonviewers read for between 27 to 31 minutes on weekdays and between 36 to 42 minutes on weekends. Viewers read for between 27 to 30 minutes on weekdays and between 30 to 39 minutes on weekends. No significant differences were found so there was no support for the assumption of the displacement hypothesis that children who viewed would read for less time than children who did not read during the day in these age groups.

**Evening**

At 4, 6 and 8 years in the evening when non-readers were excluded from the analysis, evening reading times for both nonviewers and viewers increased by about 23 minutes on average. As explained above, differences between viewers and nonviewers in reading times in the whole sample could have reflected greater numbers on non-readers among viewers or differences in the lengths of time spent reading. When non-readers were excluded from the analysis, reading times of viewers were higher than in the whole sample analysis, showing that non-readers did pull the mean down for this group. However, mean reading times for viewers were still lower than those of nonviewers. This shows that viewers were reading for less time than nonviewers. At 4 years, viewers read for approximately 32 and 35 minutes on weekdays and weekends, respectively. Nonviewers read for approximately 37 minutes on weekdays and weekends. At 6 years nonviewers read for approximately 48 and 45 minutes on weekdays and weekends, respectively, while viewers read for 39 and 36 minutes on weekdays and weekends, respectively. At 8 years nonviewers read for approximately 48 and 46 minutes on weekdays and weekends, respectively, while viewers read for 36 minutes on weekdays and weekends. Reading times were very similar on weekdays on weekends.

As with the whole sample analysis, there was much stronger support for the assumption of the displacement hypothesis in the evenings in the readers only analysis. Nonviewers read for significantly longer than viewers on both types of day.
Balancing reading and viewing across the day

The percentages of children reading and viewing across the day showed that some children viewed in the afternoon. They also showed that some children read in the afternoon. Families may plan reading and viewing time across the day. It seemed likely that some families might have a pattern of reading during the day and then viewing together as a family in the evenings. Particularly if reading was set for homework and parents had a policy of completing homework before viewing. This meant children may view and not read in the evening because they have read earlier in the day, for example. Alternatively, families might allow children to view earlier in the day but reserve evenings for reading. Consequently, viewing during the day would not be displacing reading, if these children then read in the evening. Viewing and reading may occur at different times over the day.

To address this issue, the association between reading during the day and viewing during the evening and the association between viewing during the day and reading during the evening was investigated. None of the associations between day time reading and evening viewing or day time viewing and evening reading were significant. Rather than showing that families were balancing reading and viewing across the day by reading at one time and viewing at another, the children who read during the day were not more likely to view in the evening. Children who viewed during the day were more likely to read in the evening, however associations were not significant showing that children who did no reading in the evening were as likely to have viewed during the day.

Percentages who read during the day and viewed in the evening were low at all ages and on all types of day, around a fifth of children or less. Rather than balancing reading and viewing across the day, in most cases the majority did no reading during the day and then viewed in the evening. This suggests there was a vulnerable group of children who do not read during the day and then viewed during the evening. It was possible that some of these children both read and viewed in the evening, in
which case viewing time might restrict their reading time. This issue will be examined in Chapter 6.

There was more evidence for a pattern of viewing during the day and reading in the evening. At 4, 6 and 8 years during the week, the majority of children viewed during the day and then read in the evening. This suggested that these families may have planned viewing and reading across the day. Viewing times have been found to be constrained by parent rules (Barradas, Fulton, Blanck & Huhman, 2007). In particular, parents of young children often have rules about the content of what they can view (Commonwealth of Australia, ACMA, 2007). When LSAC data were collected, most free-to-air programming during the day were programs designed for children or programs that were suitable for them to watch without adult supervision (Free TV Australia, 2004). Parents who limited their children's viewing to age-appropriate content may, therefore, have had children who viewed during the day. Evenings may then have been reserved for reading in these families. However, it should also be noted that some families do not have rules about their children’s viewing (Commonwealth of Australia, ACMA, 2007). Some of the children viewing during the day may also have been viewing during the evening. If this were the case, their reading times may have been constrained by evening viewing. Again, this issue will be addressed in Chapter 6.

The pattern of viewing during the day and reading in the evening was not seen on weekends. On weekends substantial numbers viewed during the day and did not read in the evening. It seemed likely that families have more social commitments on the weekends that make it more difficult to find time for reading in the evening. Families may also be more relaxed about reading on weekends if reading has occurred during the week. Balancing may occur over the week as well as over the day.

Taken together results suggested there was little evidence families balanced reading and viewing by reading during the day and then viewing in the evening. There was more evidence that children who viewed during the day read in the evening. This suggested that viewers who were not reading during the day may have been reading in the evening.


5.6 Conclusion

Taking results of analyses in this chapter together suggested support for the assumption of the displacement hypothesis on weekends in the evening at 4 and 6 years. At 8 years on the weekend results came close to significance. However, results did not support the assumption during the day. In the evening, in both the whole sample analysis and the analysis of readers only, nonviewers read for longer than viewers on both weekdays and weekends. Taken together these results showed some support for both of the assumptions of the displacement hypothesis and this would seem to support the case that viewing is displacing reading in the evening.

However, results also showed, that many viewers also read in the evening. On weekday evenings there were more viewers who were reading than not reading. In addition, comparing reading times of nonviewers and viewers with average viewing times, suggested that nonviewers were not spending all their nonviewing time reading and viewers were managing to read for quite substantial periods of time. Viewing times were about an hour on average in the evening at 4 years on both types of day. However, the difference in reading times of nonviewers and viewers in the readers only analysis was approximately 5 minutes during the week and 3 minutes on the weekend. Both groups read for over 30 minutes in the evening. At 8 years on the weekend, average viewing time was approximately one hour and 20 minutes. Yet the difference in reading times of viewers and nonviewers in the readers only analysis was about 10 minutes. Much of nonviewers “free” time was not spent engaged in reading and those who viewed found almost as much time for reading as those who did not view.

Looked at in this way, it is not possible to tell if viewers’ shorter reading times were because the time they spent viewing was taking up the time they would otherwise devote to reading or because they were engaged in other activities. Table 5.7 showed that even during the evenings, when constraints imposed by other activities were minimised, there were children who were neither reading nor viewing and must therefore have been engaged in other activities. To suggest that viewing was displacing reading it needs to be shown that increases in viewing time are associated
directly with corresponding reductions in reading time. This issue will be addressed in Chapter 6
Chapter 6: Do Children who Spend more Time Viewing Spend Less Time Reading in the Evening?

6.1 Introduction

The impact of time spent viewing television on the time children spend reading has long been a concern for researchers, as noted in Chapter 2 (Himmelweft, et al., 1958; Murray & Kippax, 1978; Mutz et al., 1993; Schramm et al., 1961). Chapter 5 showed many children viewed during the day on both weekdays and weekends, apart from weekdays during school hours and these children did not read. This would seem to support concerns that viewing time might be displacing reading time. However, Chapter 5 also showed that nonviewers were also not reading during the day. This meant there was little evidence in support of the assumptions of the displacement hypothesis during the day.

The picture was quite different in the evenings. Numbers viewing in the evening increased at 6 and 8 years from numbers viewing during the day. At 4 years numbers viewing in the evening were similar to numbers viewing during the day. Numbers reading in the evening increased much more. Higher percentages of children were reading in the evening than during the day, around two thirds of children. Even on weekends, when there were less children reading, a third to half of children were reading in the evening.

Clearly, the evening was the time when children and their families were most likely to read. However, evening was also the time at which the majority of children were viewing. This meant the competition between time for reading and viewing was likely to be most acute at this time of day. It also meant that if viewing did significantly constrain reading at this time of day, then the consequences for reading time were likely to be substantial. Chapter 5 also showed there was more support for the assumptions of the displacement hypothesis in the evenings. Namely, that children
who are not viewing will engage in “more appropriate” activities such as reading (Vandewater et al., 2006). Nonviewers were significantly more likely to read than not at all ages and on all types of day in the evening. Viewers were significantly less likely to read than not at 4 and 6 years on weekends in the evening. The comparison almost reached significance at 8 years. However, during the week, viewers were more likely to read than not. In addition, when viewers read, the time spent reading was significantly shorter than time spent reading by nonviewers consistent with the ‘zero-sum’ assumption that time for viewing was forcing out time for reading (Mutz et al., 1993, Vandewater et al., 2006).

The ‘zero-sum’ assumption posits that time spent viewing television will force out time for other activities. Mutz et al. (1993) acknowledge that there are only 24 hours in the day so time spent viewing must come from somewhere. However, they question that time for viewing comes at the expense of important activities such as reading. They suggest that time for viewing may come from activities that are often unmeasured in time use studies, rather than developmentally important activities. They also note that many activities are conducted simultaneously with television viewing, such as eating or reading. In the present study there were cases where viewing and reading were recorded simultaneously. However, with complex cognitive tasks, such as reading, children cannot attend to both viewing and reading at the same time (Yeung & Monsell, 2003). There was no information in the present study about whether children who were recorded as simultaneously viewing and reading were attending more to viewing or more to reading, so the time was divided equally between the two activities. This aside, viewing may only be said to displace reading if increased viewing time is at the expense of reading time, rather than time for other activities. While it is not possible to show a particular child would read if they were not viewing, if it could be shown that there were systematic reductions in reading time with increases in viewing time, this would strengthen the case that time for viewing was at the expense of reading time.

Chapter 5 showed that the evening was the time when children were most likely to read and/or view. While children’s time in the evening generally had less external constraints than during the day, there may still be time commitments that may take children out of the home that may mean it is not possible to allocate time to viewing
or reading. It is possible to measure associations between viewing and reading more stringently if only time when children are at home and awake is analysed. In the analysis in Chapter 5, reading and viewing time were compared across the 3-hour evening block. However, as children in the study were aged between 4 and 8 years it was likely that some children went to bed earlier than others. Children who read for less time may have gone to bed earlier and have had less time to read. This chapter analyses associations between time spent reading and viewing when children were at home and awake in the evening from 6 p.m. until each child was recorded as going to sleep. The analyses also control for the length of each child’s evening.

### 6.2 Aims

The aim of this chapter is to examine whether there are systematic associations between time spent viewing and whether and how long children read.

This chapter has the following more specific aims:

- To investigate whether there are systematic reductions in the percentage of children reading with increases in evening viewing time
- To investigate whether there are systematic reductions in reading times with increases in evening viewing time

In chapter 2, a number of characteristics of children themselves and their families were identified which have been found to be associated with both time spent reading and time spent viewing. To understand if associations between time spent reading and viewing persist, the influence of child and family characteristics on time spent on these activities also needs to be taken into account. Therefore, the third aim is:

- To investigate whether any systematic associations between evening viewing and reading times persist, after controlling for the length of each child’s evening and factors known to be associated with both reading and television
viewing behaviour: children’s gender and receptive vocabulary, mother’s education and family activities conducted with children.

If the zero-sum assumption is correct, then as evening viewing time increases the percentage of children who read and their reading time will decrease systematically. If the changes in reading time reflect changes in viewing time then any associations between viewing and reading time will persist when background factors are controlled.

6.3 Method

6.3.1 Participants

As described in Chapter 3, participants were children and families sourced from the first three waves of the K (Kindergarten) cohort of the Longitudinal Study of Australian Children (LSAC). Children were 4-5 ($M=4.74$, $SD=2.64$), 6-7 ($M=6.82$, $SD=2.95$) and 8-9 ($M=8.79$, $SD=2.92$) years of age, at waves 1, 2 and 3 respectively. The ages or waves will be referred to as 4 years, 6 years and 8 years, to simplify their description. The initial recruitment sample contained 4,983 children, with approximately equal numbers of boys (2,537) and girls (2,446).

Further details about participants, the study procedure, the measures used in the present study, data screening, sample selection and imputation of missing data can be found in Chapter 3.

6.3.2 Measures

Available Evening Time

The length of each child’s evening was calculated by finding the difference in time between 6 p.m. and the time they went to sleep as recorded in the time use diary. Six p.m. was chosen as the start of the evening as this marked the time by which most out-of-home or after-school care activities had ceased and therefore, at least one parent would have finished work and would be at home with children. The time children had
available in the evening was the sum of 15 minutes intervals when they were at home from 6 p.m. until they went to bed. There were some children who spent no time at home in the evening (Table 6.1). Because there was no way of knowing whether these children had the option to read or view, the analysis was confined to those children who spent at least some time at home in the evening. Other children were not at home for some of the evening and this time was not counted towards their available evening time.

Table 6.1

<table>
<thead>
<tr>
<th>Age</th>
<th>Weekday Frequency</th>
<th>%</th>
<th>Weekend Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td>47</td>
<td>2.6</td>
<td>115</td>
<td>6.5</td>
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<tr>
<td>6 years</td>
<td>18</td>
<td>2.4</td>
<td>69</td>
<td>5.2</td>
</tr>
<tr>
<td>8 years</td>
<td>6</td>
<td>1.6</td>
<td>53</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**Time Spent Reading (“Evening reading Time”)**

Time spent reading was calculated as the sum of 15-minute intervals of shared reading time at 4 years and the sum of 15-minute intervals of both shared and independent reading time at 6 and 8 years in the evening from 6 p.m. when children were at home and awake. As noted in Chapter 3, time spent simultaneously viewing television and reading was divided equally between the two activities.

**Time Spent Viewing Television (“Evening Viewing Time”)**

Time spent viewing was calculated as the sum of 15-minute intervals spent viewing in the evening from 6 p.m. when children were at home and awake. In order to determine if percentages of children reading and lengths of time spent reading varied systematically with viewing time, time spent viewing was first converted to a percentage of the available evening time. Viewing time percentages were divided into four quartiles to enable differences between different levels of viewing time to be compared. A fifth category was added to cover children who did not view.
Altogether, the analysis compared five levels of viewing time, no time spent viewing, 1–24%, 25–49%, 50–74% and 75–100% of evening time spent viewing.

**Mother’s Education (at 4 years)**

Answers to three questions were combined to create a 5-point Likert scale for mother’s education (from 1= “Less than year 12” to 5= “Completed graduate diploma or post-graduate degree”), as described in Chapter 3.

Mother’s education, in particular, has been shown to be closely associated with children’s educational attainment, indexed by the number of years children remain at school (Chevalier, Harmon, O’Sullivan & Walker, 2010). In addition, mothers play a central role in the reading environment created in the family. Mothers spend more time reading to children and listening to them read than other family members (Guryan, Hurst & Kearney, 2008; Mullan, 2010). Mothers also believe they have a greater influence over their child’s reading achievement than fathers (Mullan, 2010). Because of the close associations between mother’s education and reading behaviour, the current study used a measure of mother’s education level to clarify the contribution of SEP to the association between time spent viewing and reading.

**Peabody Picture Vocabulary Test-III (PPVT-III)**

The PPVT-III was selected as a covariate as language development is generally considered to be the foundation for literacy (Zubrick, Taylor & Christensen, 2015). The PPVT-III is also a screening test which provides a quick estimate of verbal and scholastic ability (Kalb & van Ours, 2013). In addition, it was measured at all 3 ages.

A shortened form of the PPVT-III was developed for LSAC. Children were shown a page with four black and white line drawings and were asked to choose the picture that best matched the word spoken by the tester. The PPVT-III is a well-established test, with good psychometric properties. The person separation index, an estimate of the proportion of true variance relative to the true and error variance for the full test
was 0.88, and for the shortened version of the test was 0.78 (Rothman, 2003). While lower than that for the full test, this was regarded as acceptable (DeVellis, 1991).

**Family Activities**

While family characteristics such as parent’s education are a useful index to measure the social capital available to children, they do not capture the processes by which the family environment influences reading development (Foster et al., 2005). While the literacy environment that parents provide for children, such as reading to them and the provision of children’s books, has been widely examined (Baker et al., 1997; Sénéchal & LeFevre, 2002; Sénéchal & LeFevre, 2014) interest has turned recently to examining a broader range of factors that may influence reading development. These dynamic “process” variables, along with literacy activities, serve to create a rich home learning environment (Foster et al., 2005; Neuman, 1995; Yu & Daraganova, 2014). A measure of family activities was therefore included in the analysis.

At all three ages parents were asked, in the face-to-face interview, how frequently they, or someone in the family, did various activities with the study child. Five activities were analysed at 4 and 6 years. These were: drawing or craft activities, playing music or dancing, playing board or card games, involving the child in everyday activities, such as cooking or caring for pets and playing outdoors. Responses ranged from (0=none, 1=1-2 days, 2=3-5 days and 3=6-7 days per week). Values for responses to these five questions were summed and the mean was calculated. Two activities were analysed at 8 years, involving the study child in everyday activities and playing outdoors with the study child. Values for responses to the last two questions were summed and the mean was calculated. Higher values on this variable represented families who engaged in more activities with their children more frequently.
6.3.3 Data Screening and Analyses

Screening and transformation of the reading variables are described in Chapter 5. Transformation of the viewing variable is also described in Chapter 5.

As described in Chapter 5, there are three types of aggregate statistics that may be calculated from time use diary data. These are: the percentage of the sample population who undertook the activity, the mean time the entire sample spent in an activity on the diary day and the mean time those who engaged in the activity spent in the activity on the diary day (Fisher & Gershuny, 2013). This sequence was followed in the analysis in this chapter.

Univariate ANOVA, using SPSS 25, was used to examine differences in evening viewing times. Post hoc tests used the Games-Howell post hoc criterion for significance. General linear modelling, using SPSS 25, was used to examine associations between evening viewing and time spent in reading activities when controlling for child and family factors. Univariate analyses were run first to examine associations between evening viewing and time spent reading. Second, GLM models were run with evening viewing time, available evening time, gender (coded 0=female, 1=male), child PPVT-III scores, mother’s education and the mean of family activities conducted with the child as independent variables.

The models were run first with all covariates. Then, using backward elimination, the covariates with the highest p-value were omitted from the analysis. The model was re-run until only significant terms were left in the model. When gender was a significant predictor in the model, estimated marginal means were examined to see how reading times differed for boys and girls.
6.4 Results

6.4.1. Background information on available evening time and length of time spent viewing

The mean length of time children had available at home in the evening is shown in Figure 6.2. Inspection of Figure 6.2 showed available evening time increased only slightly from 4 to 8 years by 29 minutes. At all ages the time children were recorded as going to sleep was slightly later on weekends than during the week, a difference of 3 minutes at 4 years and 8 minutes at 6 and 8 years. Large standard deviations at all ages showed children of the same age could differ by more than an hour in their available evening time.

Figure 6.2
Available Evening Time, Age and Type of Day, Standard Deviation

Mean viewing times for each level of the percentage of the evening spent viewing is shown in Figure 6.3. Inspection of Figure 6.3 shows that mean viewing times increased with each increase in the percentage of the evening spent viewing, apart from the 75–100% viewing level at 8 years during the week. The fact the confidence intervals do not overlap shows that these increases were significant (Field, 2013). Mean viewing times were slightly longer on weekend evenings than weekday evenings. Confidence intervals were small for all levels of viewing except the 75–
100% viewing level, where evening viewing times on weekdays at all ages could vary from half an hour to more than an hour.

Figure 6.3
*Evening Viewing Times by Viewing Level, Age and Type of Day, 95% Confidence Intervals*

6.4.2. Did the percentage of children who read decrease as evening viewing time increased?

At 6 years on both types of day and at 8 years on weekdays there were no significant differences in the percentage of non-readers at different levels of evening viewing time when less than 50% of the evening was spent viewing (Table 6.4). At 4 years on weekdays, there were significantly more non-readers among children who viewed for 25–49% of their evening than among nonviewers. At 4 years on weekends there were significantly more non-readers among those who viewed for 25–49% of their evening than among nonviewers. At 8 years on weekends, contrary to the assumption, there were significantly more non-readers among nonviewers than among children who viewed for 1–24% of their evening. Taken together results for children viewing less than 50% of their available evening time did not show systematic associations between the percentages of non-readers as viewing increased. However, when more
than 50% of the evening was spent viewing, the percentage of children who read 
decreased significantly as viewing increased (Table 6.4). At each age on weekends, 
the decrease was stepwise: as the level of viewing increased by 25%, the percent 
reading decreased significantly.
Table 6.4

**Engagement in Reading by the Percentage of the Evening spent viewing**

<table>
<thead>
<tr>
<th>Wave and day type</th>
<th>Reading</th>
<th>0%</th>
<th>1-24%</th>
<th>25-49%</th>
<th>50-74%</th>
<th>75-100%</th>
<th>Total %</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years weekday</td>
<td>No</td>
<td>26</td>
<td>25_{a,b}</td>
<td>36_b</td>
<td>54_c</td>
<td>63_c</td>
<td>32</td>
<td>567</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>74</td>
<td>75</td>
<td>64</td>
<td>46</td>
<td>37</td>
<td>68</td>
<td>1188</td>
</tr>
<tr>
<td>4 years weekend</td>
<td>No</td>
<td>40_{a,b}</td>
<td>33_b</td>
<td>46_a</td>
<td>63_c</td>
<td>81_d</td>
<td>47</td>
<td>772</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>60_{a,b}</td>
<td>68_b</td>
<td>54_a</td>
<td>37_c</td>
<td>19_d</td>
<td>54</td>
<td>889</td>
</tr>
<tr>
<td>6 years weekday</td>
<td>No</td>
<td>27_a</td>
<td>18_a</td>
<td>28_a</td>
<td>58_b</td>
<td>83_b</td>
<td>31</td>
<td>225</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>73_a</td>
<td>83_a</td>
<td>72_a</td>
<td>42_b</td>
<td>17_b</td>
<td>69</td>
<td>501</td>
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<tr>
<td>6 years weekend</td>
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<td>39_a</td>
<td>34_a</td>
<td>48_a</td>
<td>68_b</td>
<td>88_c</td>
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<td>634</td>
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<td></td>
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<td>61_a</td>
<td>66_a</td>
<td>53_a</td>
<td>33_b</td>
<td>12_c</td>
<td>49</td>
<td>617</td>
</tr>
<tr>
<td>8 years weekday</td>
<td>No</td>
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<td>26_a</td>
<td>33_a</td>
<td>69_b</td>
<td>91_b</td>
<td>37</td>
<td>133</td>
</tr>
<tr>
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<td>31_b</td>
<td>9_b</td>
<td>63</td>
<td>226</td>
</tr>
<tr>
<td>8 years weekend</td>
<td>No</td>
<td>53_a</td>
<td>34_b</td>
<td>50_{a,b}</td>
<td>75_c</td>
<td>87_d</td>
<td>60</td>
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<td>25_c</td>
<td>13_d</td>
<td>40</td>
<td>458</td>
</tr>
</tbody>
</table>

Note: Different subscript letters denote column proportions that differ significantly from each other at the .05 level.
6.4.3 Did children who spent more evening time viewing spend less time reading?

Whole sample

To investigate whether time spent reading differed systematically by evening viewing, a one-way between-subjects analysis of variance with planned contrasts examined whether time spent reading differed by the percentage of the evening that each child spent viewing.

Inspection of reading times by evening viewing (Figures 6.5 and 6.6) revealed possible curvilinear relationships. At 4 and 6 years on both types of day and at 8 years on weekends reading times for those who viewed for 1–24% of their evening were greater than for nonviewers. At 8 years on weekdays reading times for these groups were similar. Thereafter, reading times declined with greater percentages of the evening spent viewing. As a result, the models tested both a curvilinear and linear relationship between evening viewing and reading times.

The assumption that time for viewing and reading is ‘zero-sum’ in nature so that as time spent viewing increases, time spent on reading decreases systematically (Mutz et al., 2004, Vandewater et al., 2006) posits that each increase in viewing time will result in a comparable reduction in reading time (Mutz et al., 1993). Therefore, contrasts compared mean reading time at each level of evening viewing with the level before: no viewing compared with children who viewed for 1–24% of their evening, 1–24% with 25–49%, 25–49% with 50–74% and 50–74% with 75–100%. Tests for the contrasts were conducted using Bonferroni adjusted alpha levels of .0125 per test (.05/4)
Figure 6.5
Mean Reading Times by Percentage of the Evening Spent Viewing by Age and Type of Day, Whole Sample

Note. 4 years Weekday N=1,755, 4 years Weekend N=1,661, 6 years Weekday N=726, 6 years Weekend N=1,251, 8 years Weekday N=359, 8 years Weekend N=1,137.
Levene’s test of the homogeneity of variances were significant in every analysis. Welch’s F tests were therefore used.

There was a significant main effect for evening viewing time: 4 years on weekdays, \( F(4, 358.17)=53.38, p<.000 \) and weekends \( F(4, 489.95)=52.20, p<.000 \), at 6 years on weekdays, \( F(4, 147.18)=33.00, p<.000 \) and weekends, \( F(4, 422.12)=62.99, p<.000 \), and at 8 years on weekdays, \( F(4,67.24)=19.08, p<.000 \) and weekends, \( F(4,421.90)=47.63, p<.000 \) (Figure 6.5).

In all cases except one, the linear trend and quadratic terms were significant indicating that reading times declined as evening viewing time increased but that associations were curvilinear. At 8 years during the week, the quadratic term was not significant, however the linear term was significant indicating that reading times declined linearly as evening viewing increased.

Planned contrasts showed that at 4 and 6 years on weekdays and weekends and at 8 years on weekends, reading times declined significantly with each increase in viewing level from 1–24% of evening viewing. At 4 years, weekdays: approximately 7 minutes \( t(529.93)=4.12, p<.000 \), 6 minutes \( t(390.07)=4.29, p<.000 \), and 5 minutes \( t(169.30)=3.42, p<.001 \), respectively; weekends: 8 minutes \( t(421.76)=4.03, p<.000 \), 5 minutes \( t(609.62)=4.06, p<.000 \), and 5 minutes \( t(253.49)=4.74, p<.000 \), respectively.

At 6 years, weekdays: approximately 9 minutes \( t(255.46)=2.42, p<.01 \), 13 minutes \( t(183.49)=4.43, p<.000 \) and 7 minutes \( t(64.92)=3.24, p<.01 \), respectively; weekends: 10 minutes \( t(173.16)=3.65, 7 minutes p<.000, t(588.49)=4.95, p<.000 \) and 5 minutes \( t(291.90)=4.92, p<.000 \), respectively.

At 8 years, weekends: 13 minutes \( t(156.64) = 3.83, p < .000 \), 9 minutes, \( t(513.78) = 7.19, p < .000 \) and 2 minutes \( t(309.29)=2.89, p<.01 \), respectively. In addition, at 8 years on weekends the difference in reading times between nonviewers and those who
viewed for 1–24% of their evening was significant $t(155.59) = -3.82$, $p < .000$. Viewers read for approximately 13 minutes more than nonviewers.

At 8 years on weekdays only one contrast was significant. Children who viewed for 50–74% of the evening read for approximately 13 minutes less time than children who viewed for 25–49% of their evening.

**Readers only**

Levene’s test of the homogeneity of variances were significant at 8 years. Welch’s F tests were therefore used.

Results for only those children who read in the evening revealed a significant main effect for evening viewing on time spent reading, at 4 years, $F(4, 1183)=16.10$, $p<.000$ (weekdays) and $F(4, 884)=6.80$, $p<.000$ (weekends), at 6 years $F(4, 497)=3.47$, $p<.05$ (weekdays), $F(4, 612)=6.98$, $p<.000$ (weekends), at 8 years $F(3, 72.37)=6.76$, $p<.000$ (weekdays) and, $F(4, 94.04)=13.48$, $p<.000$ (weekends) (Figure 6.6).

In only one case the linear trend and quadratic terms were significant, at 4 years during the week, indicating that reading times declined as evening viewing increased but that associations were curvilinear. In all other cases, only the linear term was significant, indicating that reading times declined as evening viewing increased.

At 4 years planned contrasts showed that reading times declined significantly as viewing increased from 1–24% to 25–49% of the evening and from 50–74% to 75–100% of the evening. On weekdays this was approximately 6 minutes, $t(1183)=3.47$, $p<.01$ and 13 minutes $t(1183)=3.94$, $p<.000$, respectively. On weekends this was approximately 6 minutes $t(280.58)=2.81$, $p<.01$ and 9 minutes, $t(32.98)=3.14$, $p<.01$, respectively.
At 6 years on weekends reading times declined significantly by approximately 12 minutes as viewing increased from 1–24% to 25–49% of the evening $t(612)=2.96$, $p<.01$.

At 8 years on weekends reading times declined significantly as viewing increased from 1–24% to 25–49% and from 25–49% to 50–75% of the evening, approximately 16 minutes, $t(111.08)=2.99$, $p<.01$ and 11 minutes $t(202.33)=5.05$, $p<.000$, respectively.
Figure 6.6
Mean Reading Times by Percentage of the Evening Spent Viewing by Age and Type of Day, Readers Only

Note. 4 years Weekday $N=1,755$, 4 years Weekend $N=1,661$, 6 years Weekday $N=726$, 6 years Weekend $N=1,251$, 8 years Weekday $N=359$, 8 years Weekend $N=1,137$. 
6.4.4 Child and Family Factors and Associations Between Evening Viewing Time and Evening Reading Time

To investigate whether associations between evening viewing and time spent reading persisted when key child and family factors known to be associated with reading and viewing were included in the model, general linear models were run. In each case, an initial model included only evening reading time and evening viewing time. Subsequent models added the covariates: length of the child’s available evening time, gender, PPVT-III score, mother’s education, and the mean score for family activities. The available evening time, from 6 p.m. until they went to bed, was positively correlated with the percentage of the evening they spent viewing. That is, children who went to bed later (and therefore had longer evenings) spent a greater percentage of their evening viewing. For this reason, this was controlled for in the analysis.

Univariate analyses (model 1) showed significant negative relationships between evening viewing and reading time at each age and on each type of day (Table 6.7 a, b and c). Model $R^2$ was small, ranging from .06 to .10, meaning the percentage of the evening spent viewing explained 6% to 10% of the variance in reading time. The final models, after covariates were added and non-significant terms were sequentially omitted, are also presented in Tables 6.7 a, b and c.
Table 6.7a
Associations between time spent Reading and Gender, PPVT-III, Mother's Education and Family Activities for Weekdays and Weekends, 4 years

<table>
<thead>
<tr>
<th></th>
<th>Weekday</th>
<th>95% CI</th>
<th></th>
<th>Weekday</th>
<th>95% CI</th>
</tr>
</thead>
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<tr>
<td></td>
<td>B</td>
<td>SE</td>
<td>lower</td>
<td>B</td>
<td>SE</td>
</tr>
<tr>
<td>Intercept</td>
<td>.411***</td>
<td>.01</td>
<td>.392</td>
<td>.349***</td>
<td>.011</td>
</tr>
<tr>
<td>Evening viewing</td>
<td>-.058***</td>
<td>.005</td>
<td>-.068</td>
<td>-.051***</td>
<td>.005</td>
</tr>
<tr>
<td><strong>Model 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>-.151*</td>
<td>.075</td>
<td>-.298</td>
<td>.058</td>
<td>.034</td>
</tr>
<tr>
<td>Evening viewing</td>
<td>-.055***</td>
<td>.005</td>
<td>-.065</td>
<td>-.053***</td>
<td>.005</td>
</tr>
<tr>
<td>Available evening time</td>
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<td>.002</td>
<td>.008</td>
<td>.011***</td>
<td>.002</td>
</tr>
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<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td>.031*</td>
<td>.014</td>
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<tr>
<td>PPVT-III</td>
<td>.004***</td>
<td>.001</td>
<td>.002</td>
<td>.036***</td>
<td>.005</td>
</tr>
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<td>Mother's education</td>
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<td>.027</td>
<td>.036***</td>
<td>.005</td>
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<tr>
<td>Family Activities</td>
<td>.032**</td>
<td>.012</td>
<td>.010</td>
<td>.045***</td>
<td>.011</td>
</tr>
</tbody>
</table>

Model 1 $R^2=.064$; Model 2 $R^2=.135$

Note: * $p<.05$, **$p<.01$, ***$p<.00$
### Table 6.7b
**Associations between time spent Reading and Gender, PPVT-III, Mother's Education and Family Activities for Weekdays and Weekends, 6 years**

<table>
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<th></th>
<th>Weekday</th>
<th></th>
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<th></th>
</tr>
</thead>
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<td></td>
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<td>lower</td>
<td>upper</td>
</tr>
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<tr>
<td>Intercept</td>
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<tr>
<td>Evening viewing</td>
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<td>.011</td>
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<td>-.050</td>
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<tr>
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<td>.164</td>
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<td>.011</td>
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<tr>
<td>Available evening time</td>
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<td>.004</td>
<td>.018</td>
<td>.035</td>
</tr>
<tr>
<td>Gender</td>
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<tr>
<td>PPVT-III</td>
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</tr>
<tr>
<td>Mother's education</td>
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<td>.008</td>
<td>.014</td>
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</tr>
<tr>
<td>Family Activities</td>
<td>.071**</td>
<td>.023</td>
<td>.026</td>
<td>.116</td>
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</tbody>
</table>

Model 1 $R^2=.060$; Model 2 $R^2=.142$

Note: * $p<.05$, ** $p<.01$, *** $p<.000$
Table 6.7c
Reading and Gender, PPVT-III, Mother’s Education and Family Activities for Weekdays and Weekends, 8 years

<table>
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<th></th>
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<th></th>
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<th>95% CI</th>
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<td>upper</td>
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<td><strong>Model 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.476***</td>
<td>.026</td>
<td>.424</td>
<td>.527</td>
<td>.334***</td>
</tr>
<tr>
<td>Evening viewing</td>
<td>-.087***</td>
<td>.012</td>
<td>-.112</td>
<td>-.063</td>
<td>-.060***</td>
</tr>
<tr>
<td><strong>Model 2</strong></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Intercept</td>
<td>-.642*</td>
<td>.248</td>
<td>-1.131</td>
<td>-.154</td>
<td>-.496***</td>
</tr>
<tr>
<td>Evening viewing</td>
<td>-.094***</td>
<td>.013</td>
<td>-.118</td>
<td>-.069</td>
<td>-.065***</td>
</tr>
<tr>
<td>Available evening time</td>
<td>.021***</td>
<td>.006</td>
<td>.011</td>
<td>.032</td>
<td>.013***</td>
</tr>
<tr>
<td>Gender</td>
<td>PPVT-III</td>
<td>.010**</td>
<td>.003</td>
<td>.004</td>
<td>.016</td>
</tr>
<tr>
<td></td>
<td>Mother's education</td>
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<td>.011</td>
<td>.012</td>
<td>.054</td>
</tr>
<tr>
<td></td>
<td>Family Activities</td>
<td></td>
<td></td>
<td>.024*</td>
<td>.012</td>
</tr>
<tr>
<td>Model 1 $R^2 = .095$</td>
<td>Model 2 $R^2 = .181$</td>
<td></td>
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</tr>
<tr>
<td>Model 1 $R^2 = .070$</td>
<td>Model 2 $R^2 = .125$</td>
<td></td>
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</tr>
</tbody>
</table>

Note:  * $p < .05$, ** $p < .01$, *** $p < .000$
Model $R^2$ for the final models was small to moderate, ranging from .12 to .18. The final models with evening viewing and the covariates, explained 12% to 18% of the variance in time spent in reading times in the evening.

In the final models, evening viewing time was significantly negatively associated with time spent reading in the evening at all ages and on all types of day. At 4 years, on weekdays and weekends, reading times declined by about 2 minutes for each additional level of evening viewing.

The length of available evening time was significantly positively associated with time spent reading at all ages and on all types of day. Time spent reading in the evening increased by almost a minute for each additional 15 minutes of available evening time.

Gender was significantly associated with evening reading time at 4 years on the weekend. Analysis of estimated marginal means (back-transformed and multiplied by 15 to show time in minutes) showed girls ($M=14.89$, $SE=0.01$) read for about 2 minutes more than boys ($M=12.97$, $SE=0.33$).

Children’s PPVT-III scores were significantly positively associated with the time they spent reading in the evening at 4 years during the week, at 6 years on the weekend and at 8 years on weekdays and weekends. Reading time increased by almost a minute for each one point increase in PPVT-III test score.

Mother’s education was significantly positively associated with evening reading at all ages and on all types of day. At each age children read for about a minute more for each additional level of education their mothers attained (for example, completing year 12, attaining a bachelor’s degree or attaining a post-graduate degree).

Family activities conducted with children were significantly positively associated with evening reading time at each age and on each type of day except for 6 years on weekends and at 8 years during the week. At 6 years during the week, when the effect of family activities was greatest, children read for about 3 minutes longer for each increase in the family
activities variable (a measure of both the number and frequency of activities conducted with children).

6.5 Discussion

Much of the previous research examining associations between viewing and reading times has used measures of total daily time spent viewing and reading. Researchers have interpreted overall negative associations between reading and viewing times to be consistent with the displacement of reading time by viewing time. However, it is not possible to tell from these studies whether the viewing time of viewers was at the expense of reading time or whether they would never read so viewing time is at the expense of some other activity. This chapter sought to test the association between viewing and reading time more rigorously. If viewing is at the expense of reading time, consistent with the assumption that time for reading and viewing is ‘zero-sum’, it would be expected that each increase in viewing time would be associated with a systematic reduction in reading time.

Viewing and reading time were measured during a discrete period of the day, that is, the evening from 6pm until children went to bed. The evening was chosen because Chapter 5 showed this was a time when reading and viewing peaked in this group of children and there were relatively few outside commitments to constrain choices to read and view. Because the length of children’s evenings was likely to differ, viewing was analysed as a proportion of the time they had available. In addition, only time when children were at home was analysed. This meant the capacity to engage in viewing and reading activities was as unconstrained as possible.

Nonviewers were as likely to read as children who viewed for up to 50% of their evening, with three exceptions. However, at higher levels of viewing, there were significant increases in the percentage of non-readers. Reading times declined significantly with each increase in viewing time in the whole sample analysis when children viewed for more than a quarter of their evening, with one exception. However, there were fewer significant decreases in reading times with increases in viewing times in the readers only analysis.
6.5.1. Did the percentage of children who read decrease systematically as evening viewing increased?

There were no systematic increases in the percentages of non-readers as evening viewing time increased at low levels of evening viewing time, with three exceptions. At 4 years there were significantly more non-readers among those who viewed for 25–49% of their evening than among nonviewers (on weekdays) and those who viewed for 1–24% of their evening (on weekends). At 8 years on weekends there were significantly more non-readers among nonviewers than those who viewed for 1–24% of their evening. Overall, viewing for relatively short periods was not systematically associated with a reduction in the likelihood of reading.

However, at all ages and on both types of day, children who spent more than half their evening viewing were significantly less likely to read with each increase in viewing level. The association increased in strength with age. At 4 years, among those who viewed for 50–74% of their evening, around 54% were non-readers. By 8 years on the weekend this had increased to around 75%. It was not possible to say that viewing time was forcing out reading time for these children. An 8-year-old child had about 2 hours and 43 minutes available evening time on the weekend (Figure 6.2). A child of this age who viewed for 50–74% of their evening spent about 1 hour 39 minutes viewing, on average, on the weekend (Figure 6.3). This child would have a little over an hour available after they had finished viewing. This shows there was sufficient opportunity for this child to read. In the more extreme case, if an 8-year-old child viewed for 75–100% of their evening, they viewed for about 2 hours and 10 minutes (Figure 6.3). This meant they had a little over half an hour left over from viewing time. It is possible that non-discretionary tasks, such as bathing and getting reading for bed, would then fill their remaining evening time. However, the results from the readers only analysis showed that at 8 years on weekends, children who viewed for this length of time managed to read for a little under 30 minutes (Figure 6.6). This suggests, that, although slight, there was scope for these children to read. Rather than viewing forcing out reading time for these children, it is suggested that some of these children may never read, even if they were not viewing. Reading varies on different days however, so it is likely that some of these children would be recorded as reading on other days. If this were the case
it could be their high levels of viewing on the diary day meant they had little opportunity to read and so reading was squeezing out viewing time.

Chapter 5 showed outside commitments, such as day care and school, explained why many children had low levels of reading during school hours. Outside commitments may also have constrained reading during the hours after school, but to a lesser extent. However, during the evening, children were relatively free of these outside commitments. At 4 years there were fewer children who were non-readers, even at high levels of viewing. This suggests at younger ages families may structure evening time so time for reading is included. However, shared reading had declined by 8 years and percentages of children reading likely reflected choices of children themselves to read independently. It seems likely these were children who preferred to view rather than read and would be unlikely to read even if they were not viewing.

6.5.2. Did children who spent more available evening time viewing spend less time reading?

The analysis of associations between evening viewing and reading times were carried out first by comparing changes in reading times with increases in viewing times for the whole sample and then for readers only (Fisher & Gershuny, 2013). Findings for the whole sample are discussed first.

Whole sample

If it is assumed that time for viewing and reading has a ‘zero-sum’ quality it follows that each increase in viewing time will be systematically associated with a decrease in reading time (Mutz et al., 1993). While consistently negative associations were found between viewing and reading times, in the whole sample, unexpectedly, the associations between viewing and reading times were curvilinear in all cases but one. Children who viewed for less than 25% of the evening read for similar or longer times than nonviewers. This was not consistent with the assumption that there would be systematic decreases in reading time with increases in viewing time. Further undermining the assumption, at 8 years on the weekend nonviewers read for 13 minutes while those who viewed for less than a quarter of their evening read for twice as long, for 26 minutes.
However, when viewing times exceeded a quarter of the evening, results were consistent with the assumption of the displacement hypothesis. There was a systematic significant decline in reading time as viewing increased in all cases except at 8 years during the week. Reading times declined from over 20 minutes for those who viewed for less than a quarter of their evening to less than 5 minutes for those who viewed for more than three-quarters of their evening. As described, the number of non-readers increased markedly for viewing levels that exceeded 50% of the evening which would explain the big differences in reading times at higher levels of viewing.

Readers only

As discussed in Chapter 4, Mullan (2010) found children 8 to 18 years of age who reported reading on the diary day read for about 52 minutes on average. Mean evening reading times for 8-year-olds who viewed for less than a quarter of their evening in the current study were similar. While the reading measure in the current study was based on combined shared and independent reading times, shared reading was so low by 8 years that this total was likely constituted mostly by independent reading time and the time was therefore comparable to that described in Mullan’s study. In addition, Mullan reported that reading times for the whole sample (including non-readers) were 11 minutes. This shows that the differences in evening reading times between the whole sample analysis and the analysis for readers only found in the current study were also comparable in many cases to that described by Mullan.

Overall, consistent negative associations were found between viewing and reading times in the readers only analysis as in the whole sample analysis. At 4 years, reading times declined from close to 40 minutes for those who viewed for less than a quarter of their evening to around 20 minutes or less for those who viewed for more than three-quarters of their evening. At 6 and 8 years, reading times declined from close to or more than 50 minutes for those who viewed for less than a quarter of their evening to around 30 minutes or less for those whose viewing times exceeded a half or three-quarters of the evening.
Unlike the whole sample analysis, relationships were curvilinear only at 4 years during the week. However, while associations were not curvilinear, differences in reading times between nonviewers and those who viewed for less than a quarter of their evening were still not consistent with the assumption that time for reading and viewing was zero-sum and that time spent viewing would reduce time for reading. In all cases differences in reading times between these two groups were not significantly different.

While the evening was freer from external constraints, such as school, there were likely to have been other constraints on the length of time children could spend reading that were independent of viewing. For example, parental availability for shared reading, and limits on children’s capacity to concentrate. In the case of independent reading, children’s reading competence as they learned to read independently (Guryan et al., 2014; Juel, 1988) would place an upper limit on reading time. Consistent with this, much of the nonviewing time of 6- and 8-year-olds who viewed for less than a quarter of their evening, was not spent reading. This meant that lower levels of viewing were unlikely to constrict reading time as there was time for reading to reach these natural limits and for this reason reading times of nonviewers and those who viewed for less than a quarter of their evening did not differ significantly. In addition, even during the evening, when there are fewer outside constraints, responsibilities around the home may also constrain time for reading (Hofferth, 2001).

The most consistently significant decreases in reading times in the readers only analysis occurred as viewing increased from less than a quarter of the evening to less than half of the evening. At 4 years the drops in reading times between these two groups were about 6 minutes on weekdays and weekends. At 6 and 8 years on weekends drops in reading times were 12 and 16 minutes respectively. Decreases here reached significance in all cases except 6 and 8 years on weekdays. As numbers of non-readers were, in most cases, similar in these two groups, the drop in reading times were largely due to children who viewed between a quarter and half of their evening reading for less time. This would seem to provide some support for the assumption that as viewing increased there were reductions in reading time. In most other cases, however, the drops in reading times between adjacent levels of viewing were not significant and the declines did not show systematic patterns. This suggests reductions in reading time were not systematically associated with increases in viewing time.
so this cannot be considered consistent with the assumption that as viewing times increased children had less time available for reading

Declines in reading times were not as great with each increase in viewing level in the analysis of readers only as they were in the whole sample analysis. This suggests that much of the systematic decline in reading times in the whole sample analysis was due to increased numbers of non-readers as viewing levels increased. As described, it seems probable that these were children who would be unlikely to read even if they were not viewing. However, even though declines in reading time were not systematic, this analysis did provide support for the assumption that time for viewing and reading is zero-sum, so that at higher levels of viewing, viewing was squeezing out time for reading. A 4-year-old child had about 2 hours 15 minutes available evening time on weekends. A 4-year-old who viewed for 75–100% of their evening on the weekend viewed for about 1 hour and 48 minutes. This meant this child had about 29 minutes of evening time left over after viewing was subtracted. Children at this viewing level read for about 23 minutes on average. This was much less reading time than a child who viewed for only 1–24% of their evening, about 39 minutes. This suggested that at high levels of viewing, viewing is constricting time for reading.

As described, an 8-year-old child had about 2 hours and 43 minutes of available evening time on the weekend. If this child viewed for 75–100% of their evening on the weekend, then they viewed for about an hour and a half. Average reading times for this child in the readers only analysis showed they read for about 28 minutes. This was about the amount of available evening time they had left after they had finished viewing. While this was quite a substantial length of time, this child read for much less time than an 8-year-old child who viewed for only 1–24% of their evening. A child who viewed for 1–24% of their evening read for about 54 minutes on the weekend on average. Because this analysis only included children and families who showed evidence that they valued and enjoyed reading, it seems that viewing was constraining time for reading in children with longer viewing times. It is possible that heavier viewers may not have wanted to read for longer than half an hour, however the longer reading times of lighter viewers suggests heavier viewers would have read for longer if they had not been viewing. Taken together, results suggest that heavy viewing is at the expense of reading time.
The differences in reading times between low and high viewers in the readers only analysis were not as great at 4 years as they were at 8 years. In addition, confidence intervals around reading times were wider at 6 and 8 years than they were at 4 years (Figure 6.6). This was partly due to smaller sample sizes, particularly at higher levels of viewing in the readers only analysis. However, there was also greater variability in reading times as children got older. It is possible that at 4 years shared reading times with parents were more consistent than reading times when children began to have more control over their reading times as they began to read independently. Mol and Bus (2011) note that before children can read independently, parent behaviours are critical in determining their children’s print exposure. However, they suggest that as children transition to reading independently, reading skill and comprehension become more influential in determining reading times and with this comes greater variability in individual leisure reading times. The wider confidence intervals in the present case are consistent with this.

**Meaningful differences?**

To put the declines in reading time in context, it is worth noting that even small changes in daily shared reading amounts can have demonstrable effects on children’s reading development. An American meta-analysis (Sloat, Letourneau, Joschko, Schryer & Colpitts, 2015) of reading interventions in low-income families examined changes in daily reading duration or frequency of shared reading. In one study, tutors visited intervention families 18 times over 7 months and modelled interactive reading practices and provided books and encouragement to the families to read daily to their children. The researchers found, compared to a control group, children in the intervention group were read to 15.7 minutes each day on average, 3.2 minutes more than the control group who were read to 12.5 minutes on average. Assessments of the language skills of children in the intervention group showed significant post-intervention increases in expressive language and language comprehension compared to the control group. It was not possible to disentangle the extent to which these gains were due to a change in the quality of shared reading or to increases in time spent reading to children. However, this study does show that small increases in interactive reading over several months may benefit skills that indirectly support reading development.
An Australian intervention study showed similar gains in pre-reading skills from small increases in time spent in shared reading (Elias, Hay, Homel & Freiberg, 2006). Preschool children in socially and economically disadvantaged families had increased daily shared reading time after a 6-month interactive reading intervention. Average reading times increased by 7 minutes from approximately 5 minutes a day. One year later, teachers reported improved pre-literacy skills and vocabulary knowledge in the intervention group. This study did not include a control group and vocabulary and pre-literacy skills were not measured before and after the intervention, so its evidence is not strong. It is also not possible to isolate the independent effects of increased shared reading time from changes in quality. However, it does corroborate the findings of Sloat et al.’s (2015) study in an Australian context and suggests that small daily increases in amounts of interactive shared reading can be significant when measured longitudinally. There is also evidence that small differences in the frequency of shared reading can substantially improve reading development. The effect of reading to children on 6–7 days a week has been shown to equate to being approximately 6 months older in reading competency compared to children who were read to 3–5 days per week (Kalb & van Ours, 2013).

The implications of the differences in reading times for long term reading development become clearer when differences in time spent reading are calculated over longer periods. Six- and 8-year-olds, who viewed for more than three quarters of their evening read for about 24 minutes less than those who viewed for less than a quarter of their evening in the readers only analysis. This is a drop of about 44% of reading time. This would amount to about 83 hours less reading time over a year, for children who read 4 times a week. The findings of the studies above suggest the differences are likely to be associated with slower development of reading and the language skills that support reading. However, in the analysis of readers only, the best estimate about how long kids read when they did read, reading times in children reading for more than three quarters of their evening did not fall below the levels likely identified as being necessary for reading to develop at an age appropriate rate in typically developing children. In relation to independent reading, one study showed steep improvements in reading comprehension when 10-year-old children read for up to 10 minutes each day for 2 to 6 months (Anderson et al., 1988). Beyond this reading comprehension continued to improve with greater reading time, but not as steeply. Shaywitz (2003) has noted that children who scored on the 50th percentile for reading achievement read for about 5 minutes a day while those who scored at the 90th percentile read for about 20 minutes a
day. Most children in the readers only analysis had reading times well in excess of the 10 to 20 minutes required to develop reading skills at an age appropriate rate. However, this analysis focussed on just one day and many children do not read every day so it is likely that many of these children would not be reading for this length of time every day. In any case, the high percentages of non-readers among children who viewed for more than half their evening were cause for concern.

6.5.3 Covariates and Associations Between Evening Viewing and Reading

Associations between the covariates and time spent reading in the evening were in the expected direction. There were significant positive associations between mother’s education (all cases) and children’s receptive language skills as measured by the PPVT-III (4 out of 6 cases) and family activities and children’s reading (4 out of 6 cases). In addition, at all ages and on all types of day, the length of children’s evening was positively associated with the time children spent reading. In all cases, effect sizes were small. There were also significant negative associations between evening viewing and reading in all cases in both the univariate models and the models with the covariates. This showed that negative associations between evening viewing and reading persisted when factors known to be associated with viewing and reading were included in the model. The covariates will be discussed in more detail in Chapter 8.

6.6 Conclusion

While it was not possible to conclude that evening viewing was displacing reading, results of analyses conducted in this chapter provided partial support for the assumption of the displacement hypothesis that increased viewing time in the evening would result in decreased reading time (Ennemoser & Schneider, 2007; Gadberry, 1980; Wolfe et al., 1984). Percentages of non-readers increased as viewing increased. In some cases, it seemed likely these children might never read. However, it was also probable that some of these children would read on other days, in which case high levels of viewing on the diary day may have squeezed out opportunities for reading. Overall, there were negative associations between
viewing and reading time. At low levels of viewing there was enough time for reading. However, at higher levels results were consistent with the assumption that time for reading and viewing is ‘zero-sum’ in the evening so that increases in viewing time were associated with decreases in reading time. Contrasts showed associations were not entirely systematic however. At lower levels of viewing there was little evidence that viewing reduced opportunities to read or time spent reading. However, at higher levels of viewing there was evidence that reading time was reduced to fit into the available time left after children had finished viewing. This would suggest that viewing time was at the expense of reading time at these levels.

Children’s viewing and reading times will vary when measured on different days. It is not clear to what extent viewing and reading times will covary when measured on different days over time. Chapter 7 will examine these issues.
Chapter 7: Longitudinal Relationships Between Evening Viewing and Reading

7.1 Introduction

Bronfenbrenner (2005) noted that there will be changes in how children spend their time as they develop new skills and interests (see also Bronfenbrenner & Morris, 1998). A multitude of factors influence changes in time use, including development of skills, constraints and demands on children’s time and the influence of peers and families.

Chapter 5 described how changes in constraints on children’s time will influence changes in viewing and reading across the day. For example, Chapter 5 showed there were few children reading or viewing during school hours on school days. Other activities such as sport, hobbies and cultural activities such as ballet and music (ABS, 2012), along with commitments such as before and after school care (Baxter, 2015) increase as children get older and also serve to constrain children’s leisure time. However, Chapter 5 also showed that there were fewer outside constraints on children’s time in the evening. Time use at this time will likely represent more closely the preferences of children and their families in the allocation of time between viewing and reading. Associations between time spent viewing and reading at this time of day are the focus of this chapter.

Developmental psychologists have shown that the way in which children spend their time early in life influences the development of skills and preferences, and later behaviour (Huston, Wright, Marquis & Green, 1999; Pagani, Fitzpatrick, Barnett & Dubow, 2010). Skills developed when children are young can be particularly important because they can have long term implications for children’s subsequent development and quality of life. This is because early skill development supports subsequent skill attainment and means later investments in skill development are more productive (Cunha, Heckman, Lochner & Masterov, 2006). This has been suggested to be the case for reading.

Mol and Bus (2011), in a meta-analysis looking at 99 studies, suggest that shared and independent reading may be associated longitudinally. One study has described a strong positive correlation between the frequency of being read to as a young child and reading for pleasure in fifth grade (Neuman, 1986). Another study found that children whose parents
continued reading to them until 8 years of age on average were more likely to become avid readers, to read for more than an hour on diary days. In contrast, children who did no reading on the diary days had parents who stopped reading to them sooner, at 6 years of age on average (Shapiro & Whitney, 1997). In addition, a number of studies have examined associations between earlier and later independent reading times (Mol & Bus, 2011). Koolstra and van der Voort (1996) found the best predictor of children’s later exposure to books was children’s earlier exposure, which explained 92% of the variance in reading exposure one year later.

However, research has also shown that reading times vary widely between different children. Not all children read every day and the time spent reading varies across the children who do read. Phillips (2011) reported that children from more advantaged families had spent over 400 more hours in literacy activities before they commenced school than children from less advantaged backgrounds. Mullan (2010) reported that only 21% of children 8 to 18 years of age surveyed in the United Kingdom Time Use Survey 2000-2001 reported reading on the diary day. However, of those that did read, the average reading time was 52 minutes. A similarly broad range of reading times in the sample of children studied here was described in Chapters 4, 5 and 6.

As explained in Chapter 2, the differences in time spent reading have been found to strongly influence the development of literacy. Mol and Bus (2011) provide evidence for the importance of the time spent in reading activities at home to children’s reading development. Shared reading with parents is the start of a “continuum of leisure time reading experiences” (p. 267) that contributes directly and indirectly to children’s reading development. The time children spend reading independently at home for leisure also contributes to vocabulary and spelling skills, reading comprehension and technical reading skills. There is evidence that ensuring children have these reading experiences at home, assists them in learning to read. Leslie and Allen (1999) conducted an intervention study to help struggling readers in grades 1 to 4. The intervention involved intensive in-school tutoring and parent education sessions in how to support children’s reading. They found that parental involvement through sharing books with children and encouraging them to read alone, or with parents, was positively associated with reading progress. Taken together this evidence suggests that anything that may detract from early reading time may have long term consequences.
One factor that has consistently been suggested to detract from early reading time is time spent viewing. Time spent viewing television has generally been found to be negatively associated with time spent reading (see Vandewater et al., 2006 for an exception). Time spent viewing also varies across children. Ennemoser and Schneider (2007) found that time spent viewing in the 6-year-olds they studied ranged from 6 to 91 minutes while viewing for the 8-year-olds ranged from 22 to 136 minutes. Vandewater (2005) found a similarly broad range of viewing times. At 3 to 4 years mean viewing times were 77 minutes with a large standard deviation of 73 minutes. At 5 and 6 years the mean viewing time was 65 minutes with a standard deviation of 63 minutes. A similarly broad range of viewing times in the sample of children studied here was described in Chapters 4, 5 and 6.

How differences in the time children spend viewing are associated with differences in the time they spend reading has been the subject of several investigations (Ennemoser & Schneider, 2007; Koolstra and van der Voort, 1996; Vandewater et al., 2006). However, as yet, less is known about how the changes in children’s viewing and reading times are associated over the years when they are establishing their reading skills and forming behavioural preferences around reading and viewing. For most children this is a sensitive period where the reading habits laid down are likely to have long term consequences for their reading development.

One possibility is a negative or downward spiral where children who view more read steadily less over time. Mol and Bus (2011) describe associations between earlier and later reading as a positive causal spiral where children who read more often improve reading skills, comprehension and vocabulary further, which motivates them to spend more time reading. In addition, the process by which the gap in reading achievement between children with better reading skills and children with weaker reading skills widens over time has been called the Matthew effect (Stanovich, 1986). That is, children rich in reading skills get richer and those with poorer reading skills get poorer. The question that then arises is whether the association between time spent viewing and reading can be described as a similar spiral, in this case where children who view more when young go on to view steadily more over time and to read steadily less over time.

This chapter examines whether children who view more on average also spend less time reading on average over the ages studied here. If viewing is increasingly negatively
associated with reading, over time, it suggests viewing may be associated with a downward spiral in reading time. Even small daily decreases in reading time may accumulate and become meaningful impairments to reading progress.

7.2 Aims

This chapter has the following aims:

- To describe how time spent reading in the evening changes between 4 and 8 years.
- To investigate how evening viewing and reading times are associated across the whole sample at 4, 6 and 8 years of age.
- To investigate whether any deviations from the individual child’s mean evening viewing times are associated with their reading times measured on the same occasions.
- To investigate whether associations between evening reading and viewing time between 4 and 8 years of age persist after controlling for the length of the child’s evening and child and family factors.

Existing studies do not provide a clear picture of how reading times change between 4 and 8 years of age. However, descriptive results for each dataset, reported in Chapter 4, show that reading times decrease slightly from 4 to 8 years. It is therefore expected that reading times will decrease slightly with age in the longitudinal analysis. If the association between viewing and reading is in the form of a downward spiral it is expected that, if viewing times increase with age, reading times will decrease. It is also expected that any association between viewing and reading will persist after the length of the child’s evening and child and family characteristics are controlled.

7.3 Method

7.3.1 Participants

As described in Chapter 3, participants were children and families sourced from the first three waves of the K (Kindergarten) cohort of the Longitudinal Study of Australian Children (LSAC). Children were 4-5 ($M=4.74$, $SD=2.64$), 6-7 ($M=6.82$, $SD=2.95$) and 8-9 ($M=8.79$, 170
SD=2.92) years of age, at waves 1, 2 and 3 respectively. The ages or waves will be referred to as 4 years, 6 years and 8 years, to simplify their description. The initial recruitment sample contained 4,983 children, with approximately equal numbers of boys (2,537) and girls (2,446).

Further details about participants, the study procedure, the measures used in the present study, data screening, sample selection and imputation of missing data can be found in Chapter 3.

7.3.2 Measures

The measures relevant to the present chapter are as follows:

Available Evening Time

As described in Chapter 6, the time children had available in the evening was calculated by adding the time that children were recorded as being at home from 6 p.m. until they went to sleep. Time when children were not at home was not included in the calculation of available evening time. In addition, the analysis was confined to children who had time available in the evening.

Time Spent Reading (“Evening reading time”)

Time spent reading was calculated as the sum of 15-minute intervals of shared reading time at 4 years and combined shared and independent reading time at 6 and 8 years during available evening time as described in Chapter 5. As noted in Chapter 3, time spent simultaneously viewing television and reading was divided equally between the two activities.

Time Spent Viewing Television (“Evening Viewing time”)

Time spent viewing was calculated as the sum of 15-minute intervals of television viewing time during available evening time as described in Chapter 5. As noted in Chapter 3, time
spent simultaneously viewing television and reading was divided equally between the two activities.

**Child and Family Characteristics**

As noted above, a number of child and family characteristics have been shown to influence the changes in the time children spend viewing and reading (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 1998). The child and family characteristics included in the analysis were: the child’s age (in months), gender, PPVT-III score, mother’s education (at 4 years) and a score for the number and frequency of family activities conducted with the child. Because the length of available evening time differed across children, it was also included in the analysis.

**7.3.3 Data Screening and Analyses**

The distribution of the reading and viewing variables was non-normal with substantial numbers of non-readers and non-viewers and, in the case of viewing, some long viewing times. Log 10 transformations were applied to the reading and viewing variables and this improved the distribution of the variables. A constant (+1) was added to each value so values of 0 were included in the analysis. To assist interpretation of the parameter estimates and keep results comparable to those in other studies, results were back transformed and multiplied by 15 so results were presented in minutes.

Multilevel linear modelling (MLM), also called individual growth modelling (Singer & Willett, 2003), using SPSS 25 was used to examine changes in time spent reading between 4 and 8 years. In addition, MLM was used to examine associations between evening viewing and reading times over time and to examine individual differences in these associations. In addition, MLM was used to examine whether associations between variations in reading and viewing times persisted when child and family factors were controlled.

MLM was used as measures of reading and viewing were taken repeatedly on the same children. Measures taken from the same children are expected to vary less than measures
taken from different children. MLM takes into account the correlation between measures taken from the same subject over time (Tabachnick & Fidell 2001, West 2009) and therefore controls for type I error rate. A two-level hierarchical model also enabled differences between children (level 2) and differences within children (level 1) on different occasions to be compared. In addition, the measures of shared reading and time spent independently with books at each age were not equally spaced. MLM does not require measurements to be evenly spaced (Tabachnick & Fidell 2001, West 2009). Hierarchical modelling can also accommodate time invariant predictors (such as gender) and time varying predictors such as reading and viewing time at each wave.

To prepare data for analysis using MLM the “person-level” datasets used in the cross-sectional analyses in earlier chapters were transformed into “person-period” datasets. Rather than there being one row of data for each participant, the person-period data set has multiple records for each participant, one for each time at which data were collected. Two person-period data sets were created; one for weekdays and one for weekends.

Person-period data sets contain a time variable indicating when each measurement occasion occurred. The time variable for the current data set could have been the wave at which data were collected or the age of each participant at the time data was collected. Age was selected as the time metric as age was expected to be associated with the time children spent reading and it provided a more precise and meaningful way of measuring changes in reading time than the wave of data collection (Singer & Willett, 2003).

As the analysis in Chapter 7 was examining the associations between two time-varying variables it was necessary to group-mean center the predictor variable to provide unbiased estimates of the relationship and to ensure the model parameters were interpretable (Peugh, 2010). This meant the within- and between-person variance was decomposed (Howard, 2015; Nezlek, 2012). Participants with only one wave of data provide no information about within person change in reading, those with only two waves of data provide little information about within person change in reading (Singer & Willet, 2003). For this reason, the analysis was carried out on cases with 3 waves of data.
Initial exploratory analysis revealed that 75 (3%) weekday cases and 287 (10%) weekend cases had at least some data for all three ages. Chi square analysis and independent samples t-tests were conducted to compare cases retained for analysis and cases lost from the analysis on the key demographic and background variables of interest. In the weekday dataset, cases retained and lost from the analysis did not differ significantly on gender, however retained cases had significantly higher PPVT-III scores (M=65.83, SD=5.30) than lost cases (M=62.19, SD=7.84), t (120.33) = -5.25, p < .000. In addition, among cases retained for analysis, mothers education was significantly higher (M=3.20, SD=1.52) than mothers among lost cases (M=2.45, SD=1.44), t (4915) = -4.45, p < .000. In the weekend dataset, cases retained and lost from the analysis did not differ significantly on gender, however retained cases had significantly higher PPVT-III scores (M=65.94, SD=5.67) than lost cases (M=64.09, SD=6.50), t (340.91) = -4.80, p < .000. In addition, among cases retained for analysis, mothers education was significantly higher (M=2.78, SD=1.42) than mothers among lost cases (M=2.45, SD=1.44), t (4,937) = -3.62, p < .000.

Following the methodology suggested by Singer & Willett (2003), a series of models were run to analyse how children’s reading time changed over the years when they were learning to read. Separate models were run for weekdays and weekends. Models were run first with the outcome variable, time spent reading, and no predictors to calculate the intra-class correlation coefficient (ICC) (the unconditional mean model). The ICC shows what percentage of the variance in the outcome measure is accounted for by differences between groups, with individual children being the grouping variable in the current study. Model 2, an unconditional growth model, included the age of the child in months at each measurement point. This model showed the mean change in time spent reading over the three ages.

Models 3, 4 and 5 were level 1 models that examined the association between evening viewing and evening reading time. Evening viewing was a time varying predictor. This meant its values could differ on each measurement occasion. Time varying-predictors, measures that are repeatedly taken on the same person, contain both within and between person variance (Howard, 2015). Between-person variance is the amount by which a particular measurement observation for a child deviates from the grand mean, the mean of all the viewing times in the dataset. Within-person variance is the amount by which viewing time measured on one occasion deviates from the mean of all of the child’s viewing times.
measured on different occasions. To examine the association between evening viewing and reading times, viewing times were divided into their within- and between-person components. This resulted in the creation of two new variables, one representing the between person variance across time points and the other representing the within-person residual variance at each measurement occasion.

Table 7.1

Example Dataset Showing Raw Evening Viewing Time, Child’s Mean Viewing Time, Person-mean Centered Variable, Grand Mean of Viewing and the Person Mean Variable.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Age</th>
<th>Raw evening viewing time</th>
<th>Child’s mean viewing time</th>
<th>Person-mean centered</th>
<th>Grand mean</th>
<th>Person mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
<td>.00</td>
<td>.36</td>
<td>-.36</td>
<td>.31</td>
<td>.05</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>.48</td>
<td>.36</td>
<td>.12</td>
<td>.31</td>
<td>.05</td>
</tr>
<tr>
<td>1</td>
<td>8</td>
<td>.60</td>
<td>.36</td>
<td>.24</td>
<td>.31</td>
<td>.05</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
<td>.40</td>
<td>.16</td>
<td>.32</td>
<td>.31</td>
<td>-.15</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>.00</td>
<td>.16</td>
<td>-.16</td>
<td>.31</td>
<td>-.15</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>.00</td>
<td>.16</td>
<td>-.16</td>
<td>.31</td>
<td>-.15</td>
</tr>
</tbody>
</table>

To create the measure of between-person variance, the mean of each child’s three viewing measures, the child’s mean viewing time, was calculated. The grand mean of viewing was then subtracted from the child’s mean viewing time to create the person mean (Table 7.1). This meant that where the child’s mean viewing time was less than the grand mean, the child would have a negative value for their person mean. Conversely, if the child’s mean viewing time was greater than the grand mean, their person mean would have a positive value. The person mean isolates the between-person variance in the viewing covariate and can be used to examine whether children who view more on average over time also spend less time reading on average (Howard, 2015).

To create the measure of within-person variance, viewing time was group-mean centered, or person-mean centered as it is known in the context of repeated measures. This involved subtracting the child’s mean viewing time from each of their raw viewing times (Howard, 2015) (Table 7.1). Where the raw viewing time was equal to the child's mean viewing time, the person-mean centered value was 0. Where raw viewing times were greater or less than the child’s mean viewing time, the person-mean centered value was positive or negative,
respectively. In sum, the person-mean centered term measured the extent to which each child deviated from his or her own mean at each measurement point. Centering the viewing values in this way meant the newly created variable was purely a measure of within-person variance, without any between-person variance. This made it possible to examine whether a child who spent more time viewing than was typical for them on the diary day, spent less time reading.

In model 3 the person mean term was added to the model as a fixed effect. In model 4 the person-mean centered term was added to model 3 as a fixed effect. In model 5, the person-mean centered term was added as a random term.

An additional model (results not shown) tested the interaction between the person-mean centered term and age (grand-mean centered) to see if the association between viewing and reading varied with age. On both weekdays and weekends the term was not significant and was dropped from further model testing.

Level 2 models assessed whether associations between evening viewing and reading time, persisted when child and family characteristics were added to the model. The covariates were: gender, child’s PPVT-III score, mother’s education, and family activities conducted with the child. Because the length of time available in the evening differed across children, it was included in the analysis.

For each model, maximum likelihood estimation was used so change in the measures of model fit, the likelihood ratio test (-2LL), Akaike Information Criterion (AIC) and Bayesian Information Criterion (BCC) could be compared (Singer & Willett, 2003). In general, the smaller the values of these fit statistics the better the model fit (Shek & Ma, 2011). Covariates were entered one at a time so model fit could be assessed at each step and a decision made to retain or drop the covariate (Nezlek, 2012).

Maximum likelihood estimation was used to estimate variance components and weighted least squares was used to estimate fixed effects. Distributions of the variables were acceptable and there were no extreme outliers as the log transformed versions of the variables, as described previously described, were used. Tests of collinearity among predictors proved satisfactory. The variance inflation factors (VIF) were all around 1.
7.4 Results

7.4.1. Background Descriptives

Sample sizes, means and standard deviations for the evening viewing and reading variables at each measurement point are shown in Table 7.2.

Table 7.2

Means and Standard Deviations of Evening Viewing and Reading at Each Measurement Point

<table>
<thead>
<tr>
<th></th>
<th>4 years</th>
<th>6 years</th>
<th>8 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>Mean (SD)</td>
<td>n</td>
</tr>
<tr>
<td>Weekday</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening Reading</td>
<td>75</td>
<td>21.04 (13.04)</td>
<td>74</td>
</tr>
<tr>
<td>Evening Viewing</td>
<td>75</td>
<td>12.85 (14.70)</td>
<td>74</td>
</tr>
<tr>
<td>Weekend</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evening Reading</td>
<td>273</td>
<td>14.40 (13.86)</td>
<td>277</td>
</tr>
<tr>
<td>Evening Viewing</td>
<td>273</td>
<td>20.06 (19.70)</td>
<td>277</td>
</tr>
</tbody>
</table>

Inspection of the tables showed unexpectedly low viewing times on week nights at all ages. While reading times stayed stable on weekday evenings and decreased slightly on weekends viewing times increased over the ages. Results described in Chapter 4 showed viewing declined during the week and increased slightly on weekends across the ages studied here (see Table 4.4). It is possible the profile of changes in evening viewing differed from changed in viewing measured over the whole day, however viewing times were also lower than expected. This may have reflected a higher number of nonviewers in the smaller sample. Comparing numbers of viewers and nonviewers in the smaller sample and in the full sample supports this. In the sample used in the longitudinal analysis, numbers who were not viewing were high: on weekdays numbers of nonviewers were around 51% at 4 years, 50% at 6 years and 40% at 8 years. On weekends numbers of nonviewers were around 43% at 4 years, 37% at 6 years and 27% at 8 years. In the cross-sectional analyses numbers of nonviewers were much lower. As shown in Table 4.2 percentages of nonviewers were less than 10% on weekends at each age. During the week percentages of nonviewers were around 10% at 4 years and around 20% at 6 and 8 years.
7.4.2 Changes in time spent reading

The overall mean reading time can be a useful summary, however it may differ from the individual trajectories from which it is derived, and so cannot be used to infer the shape of individual trajectories (Singer & Willett, 2003). Therefore, to examine how changes in time spent reading could be described, empirical growth plots were created for each case with data for all three data collection time points. Examination of the plots suggested that on both weekday and weekend evenings, the time children spent reading differed across children at all ages. Examining the trajectories of time spent reading at the different ages showed close to linear increases or declines in reading times. With only 3 waves of data it was not possible to test higher order growth terms (Singer & Willett, 2003; Peugh, 2010). However, testing only the effect of linear growth on reading time seemed appropriate given the near linear appearance of many of the growth plots.
Model 1: The Unconditional Means Model

To examine the change in time spent reading, it was first necessary to examine how much of the variance in the reading time was accounted for by differences in the same children measured on different occasions, (level 1) and differences between different children (level 2).

To calculate the ICC, the variance in reading time was modelled without including any predictors in the model (the unconditional mean model) (Tables 7.3 and 7.4). The ratio of the between person variance and the total variance was then calculated (the ICC). The ICC estimates the percentage of the total variance in reading, unexplained by any predictors, that can be attributed to differences between individual children (the level-2 grouping variable) in reading times. The ICC was 0.26 for the weekday data set and 0.31 for the weekend data set. This showed that 26% and 31%, respectively, of the variability in time spent reading was accounted for by differences between children. This percentage represents an appropriate level of difference between children to conduct MLM (Shek & Ma, 2011; Tabachnick & Fidell, 2013).

Comparison of the intercept and residual variance components in this initial model also showed there were significant differences between the reading times of the children and in individual children’s reading times at different measurement points. Comparison of the variance estimates showed that there was more variance in reading times within children than between children on both weekdays and weekends.
Table 7.3: Weekday: Taxonomy of Multilevel Linear Models for Change in Time Spent Reading at 4, 6 and 8 Years of Age, Parameter Estimates, (Standard Error), Variance Components and Indices of Model Fit

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Composite model</td>
<td>0.402***</td>
<td>0.402***</td>
<td>0.402***</td>
<td>0.402***</td>
<td>0.402***</td>
<td>-0.081***</td>
</tr>
<tr>
<td>Intercept (Initial status)</td>
<td>(.026)</td>
<td>(.026)</td>
<td>(.010)</td>
<td>(.026)</td>
<td>(.010)</td>
<td>(.132)</td>
</tr>
<tr>
<td>Time (rate of change)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person-mean</td>
<td>-0.253*</td>
<td>-0.253*</td>
<td>-0.256*</td>
<td>-0.256*</td>
<td>-0.256*</td>
<td>-0.256**</td>
</tr>
<tr>
<td>Person-mean centered</td>
<td>(.124)</td>
<td>(.124)</td>
<td>(.123)</td>
<td>(.123)</td>
<td>(.123)</td>
<td>(.123)</td>
</tr>
<tr>
<td>Available evening time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPVT-III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother's Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Variance components</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within-person</td>
<td>0.076*** (.008)</td>
<td>0.076*** (.009)</td>
<td>0.076*** (.009)</td>
<td>0.076*** (.009)</td>
<td>0.075*** (.010)</td>
<td>0.076*** (.009)</td>
</tr>
<tr>
<td>Level-2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In initial status</td>
<td>0.027*** (.009)</td>
<td>0.027*** (.009)</td>
<td>0.024** (.009)</td>
<td>0.024** (.009)</td>
<td>0.024** (.009)</td>
<td>0.015** (.007)</td>
</tr>
<tr>
<td>Covariance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rate of change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goodness-of-fit</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviance</td>
<td>112.06</td>
<td>112.05</td>
<td>107.96</td>
<td>107.68</td>
<td>107.62</td>
<td>93.88</td>
</tr>
<tr>
<td>AIC</td>
<td>118.06</td>
<td>120.05</td>
<td>115.96</td>
<td>117.68</td>
<td>121.06</td>
<td>105.88</td>
</tr>
<tr>
<td>BIC</td>
<td>128.30</td>
<td>133.70</td>
<td>129.60</td>
<td>134.74</td>
<td>144.94</td>
<td>126.35</td>
</tr>
</tbody>
</table>

Model 1 is the unconditional means model to calculate the ICC. Model 2 is the unconditional growth model with time grand mean centered as a fixed term. Model 3 tests evening viewing person means as a fixed term. Model 4 adds evening viewing person-mean centered as a fixed term. Model 5 adds evening viewing person-mean centered as a random term. Model 6 evening viewing person means and the main effects of the covariates as fixed effects.
Table 7.4: Weekend: Taxonomy of Multilevel Linear Models for Change in Time Spent Reading at 4, 6 and 8 Years of Age, Parameter Estimates, (Standard Error), Variance Components and Indices of Model Fit

<table>
<thead>
<tr>
<th>Fixed effects</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
<th>Model 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite model</td>
<td>0.274***</td>
<td>0.275***</td>
<td>0.274***</td>
<td>0.274***</td>
<td>0.274***</td>
<td>-0.150*</td>
</tr>
<tr>
<td>Intercept (Initial status)</td>
<td>(.014)</td>
<td>(.014)</td>
<td>(.014)</td>
<td>(.014)</td>
<td>(.014)</td>
<td>(.061)</td>
</tr>
<tr>
<td>Time (rate of change)</td>
<td>-0.001*</td>
<td>-0.001*</td>
<td>-0.169***</td>
<td>-0.170**</td>
<td>-0.172**</td>
<td></td>
</tr>
<tr>
<td>Person mean</td>
<td>-0.169***</td>
<td>-0.170**</td>
<td>-0.172**</td>
<td>-0.224***</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person-mean centered</td>
<td>-0.193***</td>
<td>-0.196***</td>
<td>-0.224***</td>
<td>-0.224***</td>
<td></td>
<td></td>
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<tr>
<td>Available evening time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPVT-III</td>
<td>0.035***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother's Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(.090)</td>
</tr>
<tr>
<td>Family Activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.081**</td>
</tr>
<tr>
<td>Variance components</td>
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</tr>
<tr>
<td>Level-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within-person</td>
<td>0.068***</td>
<td>0.064***</td>
<td>0.068***</td>
<td>0.063***</td>
<td>0.060***</td>
<td>0.073***</td>
</tr>
<tr>
<td>In initial status</td>
<td>(0.004)</td>
<td>(0.006)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.005)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Level-2</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Covariance</td>
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</tr>
<tr>
<td>Rate of change</td>
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<td></td>
</tr>
<tr>
<td>Goodness-of-fit</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Deviance</td>
<td>362.06</td>
<td>353.00</td>
<td>352.12</td>
<td>314.99</td>
<td>311.88</td>
<td>311.83</td>
</tr>
<tr>
<td>AIC</td>
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<td>365.00</td>
<td>360.12</td>
<td>324.99</td>
<td>325.87</td>
<td>325.83</td>
</tr>
<tr>
<td>BIC</td>
<td>382.22</td>
<td>393.33</td>
<td>379.10</td>
<td>348.60</td>
<td>358.91</td>
<td>358.88</td>
</tr>
</tbody>
</table>

Model 1 is the unconditional means model to calculate the ICC. Model 2 is the unconditional growth model with time grand mean centered as a fixed and random term. Model 3 tests evening viewing person means as a fixed term. Model 4 adds evening viewing person-mean centered as a fixed term. Model 5 adds evening viewing person-mean centered as a random term. Model 6 evening viewing person means and the main effects of the covariates as fixed effects.
Model 2: The Unconditional Linear Growth Model (Age)

Model 2 was a simple linear growth model. It was run with the linear growth term time (age in months) grand-mean centered. This meant the intercept represented the average time spent reading at the mean of age.

Weekday

The addition of age as a predictor did not significantly improve the model fit ($\chi^2(1) = 112.06 - 112.05 = 0.01, p > .05$). Age was not significant in the model. The intercept showed mean reading time at the mean of age, 6 years 8 months was approximately 23 minutes.

While, on average, estimates of reading time did not change significantly with age, the variance components showed there were significant differences between children in their mean reading times and the mean reading time of all children. There were also significant residual differences between individual children’s reading times and the mean of their own reading times (Table 7.3).

Age was not significant as a fixed term in the weekday model. It was possible this was because some of the slopes of children at level 2 were positive and some were negative, in which case the overall fixed effect for age would not be significant. To investigate if this was the case the grand-mean centered term of age was entered as a random term in the model (Nezlek, 2012). The model failed to converge with age as a random term in the model. Examining the estimates for the covariance parameters showed that the estimate of the variance for the slopes was very close to 0. This suggested that the slopes for reading did not differ across individuals with age (Grace-Martin, n.d.).

Weekend

The addition of age as a predictor significantly improved the model fit over the model without any predictors ($\chi^2(1) = 362.06 - 356.63 = 5.43, p < .05$). Age was significant but only weakly negatively associated with reading times. The intercept showed mean reading time at the mean of age, 6 years 8 months was approximately 13 minutes (Table 7.4).
The grand-mean centered term of age was then entered as a random term in the model (Nezlek, 2012). Examining the estimates for the covariance parameters showed that the estimate for the random intercept was significant. There were significant differences between 4-year-olds in their reading times. While the model converged, the slopes variances were close to 0 as in the weekday dataset and the term was non-significant suggesting slopes for reading differed very little across individual children with age (Grace-Martin, n.d.)

7.4.3 Are Changes in Evening Viewing Time Associated with Changes in Evening Reading Time?

Model 3: Person-mean

Weekday

The addition of the person-mean term as a predictor significantly improved the model fit over the model without any predictors ($\chi^2(1) = 112.06-107.96=4.1, p<.05$) (Table 7.3). Results showed that the person-mean viewing term was significantly, negatively associated with evening reading time (Table 7.3). Children who viewed more on average over time read for about 7 minutes less time for each 15 minutes more viewing time.

Weekend

The addition of the person-mean term as a predictor significantly improved the model fit over the model without any predictors ($\chi^2(1) = 362.06-352.12=9.94, p<.01$) (Table 7.4). Results showed that the person-mean viewing time term was significantly, negatively associated with evening reading time. Children who viewed more on average over time read for about 5 minutes less time for each 15 minutes more viewing time.

Model 4: Person-mean centered term as a fixed term

Weekday

The addition of the person-mean centered term as a fixed term did not significantly improve the model fit over the model with the person-means term ($\chi^2(1) = 107.96-107.68=0.28, p>$
.05) (Table 7.3). Viewing for longer than usual on weekday evenings was not associated with reading for less time.

**Weekend**

The addition of the person-mean centered term as a fixed term significantly improved the model fit over the model with the person-mean term ($\chi^2 (1) = 352.12 - 314.99 = 37.13$, $p < .01$) (Table 7.4). The person-mean centered viewing term was significantly negatively associated with reading time. Results showed that every additional 15 minutes spent viewing in the evening, above and beyond the child’s average viewing time, predicted an approximately 5 minutes less reading time. That is, on weekend evenings when children viewed more than usual they tended to read less.

**Model 5: Person-mean centered term as a random term**

**Weekday**

The person-mean centered evening viewing term was not significant as a fixed term in the weekday model. It was possible this was because some of the slopes of children at level 2 were positive and some were negative, in which case the overall fixed effect would not be significant. To investigate if this was the case the person-mean centered term was entered as a random term in the model (Nezlek, 2012). The addition of the person-mean centered term as a random term did not significantly improve the model fit over the model with the person-mean centered term as a fixed term ($\chi^2 (1) = 107.68 - 107.62 = 0.06$, $p > .05$). However, the random intercept for the person-mean centered term was significant. This showed that the effect of more viewing than usual on initial reading times was different in different children (Hoffman & Stawski, 2009). This could explain why the term was not significant as a fixed effect. The random slopes and the covariance of slopes and intercepts were not significant. It could not be shown that the effect of viewing more than usual meant that some individuals reading times declined more rapidly over time than others.
Weekend

The addition of the person-mean centered term as a random term did not significantly improve the model fit over the model with the person-mean centered term as a fixed term ($\chi^2 (1) = 314.99 - 311.88 = 3.11, p > .05$) (Table 7.4). However, the random intercept for the person-mean centered term was significant. This showed that the effect of more viewing than usual was different in different children (Hoffman & Stawski, 2009). The random slopes and the covariance of slopes and intercepts were not significant. It could not be shown that the effect of viewing more than usual meant that some individuals reading times declined more rapidly over time than others.

Summary of Level 1 results

Children’s reading times differed significantly at 4 years. Differences in time spent viewing were associated with these differences. Changes in the ages of the children were not associated with changes in their reading times on weekday evenings. They were only weakly associated with changes in their reading times on weekend evenings. So initial differences remained stable across ages. Children who viewed for more time in the evening, on average relative to other children, tended to read for less time.

The inclusion of the person-mean centered viewing term as a fixed term in the model showed that on weekend evenings when children viewed more than usual they tended to read less. Entering the person-mean centered term as a random term in the model showed that the effect of more viewing than usual on initial reading times was different in different children but that slopes and covariances of slopes and intercepts for reading times did not differ for individual children.

What this meant for reading time for the viewing levels described in Chapter 6 is illustrated in Figure 7.5. The initial point of the trajectories was the time children spent reading at 4
years. Examination of the plots suggested that, on weekday evenings, this initial mean time spent reading and the trajectory differed across viewing levels. For nonviewers reading times increased slightly at 6 years and then declined. For those who viewed from 1–24% and 25–49% of their evening reading times increased from 4 to 8 years. Children who viewed for more than half of their evening showed a decline in reading times from 4 to 8 years. On weekend evenings, the initial mean time spent reading differed across viewing levels, but the trajectories showed little change between 4 and 8 years of age.

Figure 7.5:

*Mean Reading Times and Standard Errors by Percentage of the Evening Spent Viewing*

**Weekday:**

![Weekday Reading Times](image)

**Weekend:**

![Weekend Reading Times](image)
7.4.4 Do Associations Between Evening Viewing and Reading Persist after Controlling for Child and Family Characteristics?

The level 2 models assessed whether the associations between time spent viewing and time spent reading in the evening endured when the length of each child’s available evening time and child and family characteristics were included in the models.

Level 2 models include time invariant predictors. These include variables such as gender or ethnicity or variables that are treated as largely time invariant, such as mother’s education, where values at 4 years only were included. Time invariant predictors are included in the level 2 models as there is no within person variance to estimate (Singer & Willett, 2003). Because the child’s available evening time, PPVT-III score and level of involvement in family activities were time-varying predictors, they would normally appear in level-1 models. However, as they were to serve as control variables in the current analysis, and the interest was in seeing if associations between changes in time spent viewing in the evening and changes in reading time endured when these variables were controlled, these variables were treated as time-invariant predictors by using the person mean of children’s scores on these variables. This meant they could be included in the level 2 models. As noted, covariates were entered one at a time and removed if they were nonsignificant (Nezlek, 2012).

**Weekday**

In the final weekday model, after omitting nonsignificant covariates, available evening time was significantly positively associated with evening reading time. Children who had more time at home in the evening spent more time reading ($\beta$=0.035, $p<.01$). Time spent reading increased by a little over a minute for each 15-minute increase in available time at home in the evening. Mother’s education was also significant in the final model. Children of mothers with more years of education spent more time reading ($\beta$=0.047, $p<.000$). On average, children’s reading time increased by a little over a minute for each additional educational milestone attained by their mothers (for example, finishing year 12 or attaining an undergraduate degree).

The main question of interest for this model was to clarify the association between available time spent viewing in the evening and reading time after controlling for the covariates. As shown in Table 7.3 (model 6), after controlling for significant covariates, evening viewing
remained significant. Children who on average spent more time viewing, spent less time reading ($\beta=-0.332, p < .000$). For each 15-minute increase in evening viewing time children spent about 8 minutes less time reading, on average.

**Weekend**

In the final weekend model, after omitting nonsignificant covariates, evening viewing was significantly positively associated with evening reading time. Children who had more time at home in the evening spent more time reading ($\beta=0.020, p < .000$). Time spent reading increased by a little under a minute for each 15-minute increase in available time at home in the evening. Mother’s education was also significant in the final model. Children of mothers with more years of education spent more time reading ($\beta=0.035, p < .000$). On average, children’s reading time increased by a little over a minute for each additional educational milestone attained by their mothers (for example, finishing year 12 or attaining an undergraduate degree). Family Activities was also significant in the final model. Children whose families engaged in more family activities with the child more frequently spent more time reading on the weekend ($\beta=0.081, p < .000$). On average, children’s reading time increased by a little over 3 minutes for each additional increase in the number and frequency of family activities.

The main question of interest for this model was to clarify the association between evening viewing and reading time after controlling for the covariates. As shown in Table 7.4 (model 6), after controlling for significant covariates, evening viewing remained significant. Children who on average spent more time viewing spent less time reading ($\beta=-0.224, p < .000$). For each 15-minute increase in evening viewing time children spent about 6 minutes less time reading, on average.

**Summary of Level 2 results**

Evening viewing remained significantly associated with changes in reading time in both the weekday and weekend models after the inclusion of the covariates in the model. Associations between available evening time, mother’s years of education and family activities conducted with the child were in the expected direction. Available evening time,
and mother’s years of education were positively associated with evening reading times on weekday and weekend evenings. Engaging in leisure activities with family was also positively associated with evening reading times on weekend evenings.

**Covariance Structure**

As a last step, the final models were re-run with a first-order autoregressive (AR1) covariance structure, to allow for the fact that measurement occasions that were closer together in time for some children would have more highly correlated errors, than ones that were taken further apart in time (Shek & Ma, 2011). However, the results for both the weekday and weekend models were almost identical to those using the Unstructured covariance structure.

**7.5 Discussion**

The findings for the level-1 and level-2 models were summarised above. The findings will be discussed in turn.

**7.5.1 Changes in Evening Viewing and Reading Times with Age**

Evening reading times were very similar, on average, over the ages studied here. On weekdays evening reading times rose from a little over 20 minutes at 4 years to 26 minutes at 6 years before declining to a little over 20 minutes at 8 years. On weekends, evening reading times were a little lower and showed a slight decline from approximately 14 minutes at 4 years to 11 minutes at 8 years. A recent review of studies examining young children’s reading times in the United States, found reading times increased from 29 minutes per day at 2 to 4 years to 32 minutes per day at 5 to 8 years (Common Sense Media, 2014). The measures of reading time in these studies combined shared reading and time spent independently with books as was the case in the present study. The lower reading times in the current study reflect that reading time was measured only during the evening and these studies used whole day reading totals. It is also possible that focusing on the evening showed a different profile of development in reading times than reading over the whole day. Table 4.3 in Chapter 4 showed mean reading times during the week rose slightly from 39 minutes at 4 years to 42 minutes at 6 years, before declining to 34 minutes at 8 years. On
weekends mean reading times declined from 29 to 22 minutes across the 3 ages. As shown in Table 5.7 between 12% and 13% of children were reading before school, and between 23% and 26% of children were reading after school. These would have increased reading times during the day. However, the overall profile of changes in reading times with age was similar in the evening to that during the day.

Evening time spent reading remained remarkably consistent even though children’s reading skills can be expected to have improved greatly between 4 and 8 years of age. These unexpectedly small changes in reading times over these years was consistent with a United States study that showed that time spent reading at home was minimal at 6 to 8 years of age and only increased after this age (Juel, 1988). There are a number of reasons why this could be the case. Guryan and colleagues (2014) have suggested that independent leisure reading may not benefit children before 7 or 8 years of age as children are not yet reading sufficiently competently at younger ages. The children in this study were making the transition from shared to independent reading during this period. However, even at 8 years some children were still reading with their parents (Table 4.3), suggesting that the language and attentional skills needed for independent reading were still developing. Further constraints from the broader environment, (Bronfenbrenner’s exosystem) mean that parents’ availability is likely to be particularly limited on weekday evenings. With one or both parents at work during the day many families’ evenings are tightly structured around activities that cannot be done at any other time; the shared evening meal, personal care, reviewing the day and preparing for the next. Enjoyable activities that families do together have to be fitted in around these other non-optimal activities. The time left for these activities is not likely to increase much between 4 and 8 years of age. Evening reading times also remained consistent even though viewing times increased overall in the evening. It may be that the high variance in evening viewing times and the large numbers of nonviewers explain why evening reading times did not show overall declines with increases in viewing.

Evening reading times declined slightly but significantly on weekends. There are fewer constraints on parents’ and children’s time during the day on weekends. This means that weekend evening routines are likely to be less structured on parents’ and children’s time
during the day and also families may be more relaxed about the need to include educational activities in the evening routine.

7.5.2 Television Viewing and Time Spent Reading

The significant intercept variances on both days showed there were sizeable differences between children in the time children spent reading in the evening at 4 years. The absence of an age effect on weekday evenings and the small size of the estimate on weekend evenings meant that these differences persisted from 4 to 8 years. The finding that there were no significant slope differences at the individual level, shows that the effect of viewing on reading was not stronger or weaker for different children. The associations were similar across children over time.

The strongest influence on time spent reading was time spent viewing, where an extra 15 minutes viewing time was associated with a decrease of between 5- and 8-minutes reading time. Figure 7.5 shows the trajectory of reading for the different levels of viewing that are described in Chapter 6. This figure shows that there was not a downward spiral where reading times decreased with increased viewing times. Rather, children who started out with high levels of viewing and low levels of reading, maintained this trajectory across ages. However, while evidence was not consistent with a downward spiral, results did suggest that children who started out on a trajectory of high viewing times and low reading times, were unlikely to close any gap that developed in their reading competence through lack of practice of reading skills (Protopapas, Sideridis, Mouzake & Simos, 2011). These issues will be discussed in more detail in Chapter 8.

In this context it is important to note that children in this sample had significantly higher receptive vocabulary scores and mothers who had higher levels of education than cases lost from the analysis in both the weekday and weekend datasets. This meant these children may have been less vulnerable to the effects of reduced reading times than children who had poorer language skills or mothers with less education. However, even in cases where children’s reading skills are developing normally, time spent reading at home still makes a substantial contribution to the development of reading skills (Mol & Bus, 2011).
Viewing for more time than usual on a weekend evening meant that, on average, children read for less time that evening. For every 15 minutes extra evening viewing time, above the child’s mean evening viewing time, evening reading time decreased by 5 minutes. The fixed term was not significant in the weekday model, possibly because some of the slopes of children at level 2 were positive and some were negative, in which case the overall fixed effect was not be significant (Nezlek, 2012). The random intercept for the weekday term was significant suggesting this was likely to have been the case. This suggested that for some children the effect of viewing more than usual during the week meant they read for less time, but for other children viewing more than usual had no effect on their reading time that evening. That is, the effect of viewing more than usual varied for different children on weeknights (Hoffman & Stawski, 2009). It may be that some families protect reading activities more on weeknights, even if children view more than usual. This issue will be discussed in more detail in Chapter 8.

### 7.5.3 Covariates and Associations Between Evening Viewing and Reading

The between-person effect (person-mean term) was negatively associated with evening reading time. There were positive associations between evening reading time and available evening time, mother’s education, and, on weekends, family activities. The strongest influence on time spent reading, however, was time spent viewing, where an extra 15 minutes viewing was associated with a decrease of between 6 and 8 minutes in reading time. Each increase in mother’s education (for example obtaining a degree) meant reading time increased by a minute on weekdays and weekends. For each extra 15 minutes of available evening time children read for an additional minute, on average, on weekdays and weekends. Children read for an extra 3 minutes for each increase in the family activities variable (a measure of both the frequency and number of activities conducted with children) on weekends. The covariates will be discussed in more detail in Chapter 8.

It should be noted that the covariates were included in the model as time invariant terms. This meant that their effects reflected their mean value across the 4 years. Two covariates,
mother’s education and PPVT-III scores were not likely to have changed greatly in this period. However, family activities were likely to have changed as children got older and developed new skills and interests. This meant that using this variable as a time invariant predictor may have underestimated its associations with reading. Even if this were the case, it is unlikely that its effect would out-weigh the effect of viewing.

### 7.6 Conclusion

The analysis in Chapter 5 showed the evening was the time when most children read. This was also the time of day when viewing and reading were most likely to compete. This chapter examined whether associations between viewing and reading time during the evening could be described as a downward spiral. Results suggested this was not the case. Children who viewed more and read less maintained this trajectory over time. Particularly because the effect for long term differences between children in viewing behaviour at this time of day over time, were more strongly associated with reading times than fluctuations in viewing times on a particular evening. Basing the analysis on ordinary days and focussing on the evening when behaviour is more likely to be consistent across days meant associations were more likely to generalise beyond the diary day. This suggested that patterns of heavy viewing and reduced reading at this time would be likely to have a cumulative impact on reading development and become substantial over time.
Chapter 8: Discussion

8.1 Theoretical background of the study

Being able to read is not only necessary to function effectively in today’s society but also bestows a range of other benefits. However, it takes time and effort on the part of children themselves and their families to learn to read. Most learning development for reading takes place at school, however, reading at home still has an important contribution to make. This is because sustained practice of reading skills is essential in the process of learning to read. Mol and Bus (2011) provide evidence for the importance of the time spent in reading activities at home to children’s reading development. The importance of time spent reading in the process of learning to read means that anything that detracts from time for reading at home may pose a threat to reading development. There are many things that potentially compete with time for reading. However, even from the earliest days, television viewing has been a focus of particular concern (Himmelweit et al., 1958; Schramm et al., 1961). These concerns are still held today (Vandewater et al., 2006).

Not surprisingly, the association between viewing and reading has been studied for the last 6 decades. A handful of early studies examined the impact of the introduction of television on time spent in other activities, including reading. However, only two of these studies found that when television was introduced children’s reading times decreased (Himmelweit et al., 1958; Mutz et al., 1993), and one of these studies found the reduction in reading time was only temporary (Himmelweit et al., 1958). Other early studies found no association between the introduction of viewing and decreases in reading time (Schramm et al., 1961).

Quasi-experimental studies where reading times were examined after interventions to reduce viewing time provide the clearest evidence for displacement. But the small sample size (Wolfe et al., 1984) or the restricted social class range (Gadberry, 1980) makes it uncertain whether their conclusions can be generalised. In addition, these were relatively short-term interventions so it is not clear whether the effect of the intervention persisted over time.
Most studies have relied upon survey or time diary data to show negative associations between time spent viewing and time spent reading. The majority of the larger, cross-sectional population studies have shown small negative associations between time spent viewing and time spent reading (Attewell, Suazo-Garcia & Battle, 2003; Hofferth, 2010; Shin, 2004). Evidence from longitudinal studies converge with those of cross-sectional studies (Ennemoser and Schneider, 2007; Koolstra & van der Voort, 1996). Findings in these studies have been interpreted to mean viewing may displace shared reading and reading independently for pleasure.

While results of these studies converge, strengthening evidence that there are negative associations between the two activities, they cannot demonstrate conclusively that viewing is displacing or causing reductions in reading time. It cannot be shown that children would read, even if television viewing was not available. Negative associations found in these studies could be because children who would never read choose to view more, rather than viewing taking up time that would otherwise be devoted to reading.

It is probably impossible to demonstrate displacement using data on how much time children spend on reading and viewing. To be able to show displacement experimental studies need to be conducted where activity choices are restricted to viewing and reading and time for these activities needs to be constrained. However, it is possible to use time use diary data to examine the assumptions underpinning the displacement hypothesis.

There are two key assumptions underpinning the displacement hypothesis. The first is that time viewing takes up time that children would otherwise spend on more “worthwhile” activities, such as reading (Vandewater et al., 2006). This assumption has been questioned. Vandewater et al. (2006) suggest there is little evidence that children would be reading if they were not viewing. The second assumption is that time budgets are full and the introduction of something new forces out something old (Mutz et al., 1993). This means that if time is spent viewing television there will be less time to spend on developmentally important activities, such as reading (Mutz et al., 1993; Vandewater et al., 2006). This assumption has also been questioned. It is suggested that time for viewing could come from marginal activities, such as daydreaming or “doing nothing” rather than reading (Mutz et al., 1993). If this was the case then viewing would not constrain time for reading. Mutz et al. also note
that other activities such as school and sleep may also constrain reading time and that the role of these activities has not been considered.

This study examined evidence for both of these assumptions directly. First, it examined a modified form of the assumption that children who were not viewing were reading and children who were viewing were not reading. That is, it examined if children who were not viewing were more likely to read and whether children who were viewing were less likely to read. It also examined whether time for viewing and reading was zero-sum in nature. This second assumption was examined by investigating whether increases in viewing time were matched by systematic decreases in reading time. If evidence in support of these assumptions was found, this would suggest that displacement is a useful description of associations between viewing and reading time.

8.2 Design of the study

LSAC is a national, broadly representative, population based longitudinal study of over 10,000 Australian children and their families. The study commenced in 2004 and is ongoing. It comprises data from two cohorts of children. This study focussed on the first 3 waves of data from one of these cohorts, referred to as the K cohort. Data on child and family characteristics and time use diary data when children were approximately 4, 6 and 8 years of age, were analysed.

The time use diary recorded the study child’s activities on two designated days, one weekday and one weekend day at each age, in 15-minute blocks. Activities included time spent viewing television and reading. Time use diaries that collect data about the full range of activities across the day have been shown to be a valid source of information about time use and to be relatively free of social desirability bias (Beentjes & van der Voort, 1989; Robinson & Martin, 2012).

Using LSAC data it was possible to examine evidence for these assumptions in a number of ways. First, by describing the patterns of viewing and reading over the day to see if there was evidence of competition between these two activities for children’s time and whether there was evidence that children were choosing between time for reading and viewing. Then, by using a fine-grained analysis to examine associations between viewing and reading during the
period when reading and viewing compete: in the evening. Finally, it was possible to examine the associations longitudinally to see if variations in reading and viewing behaviour fluctuated in concert over time.

8.3 Research Findings

8.3.1 Overview—Average Time Spent Reading and Viewing

Chapter 4 described reading times and viewing times found in Australian and international research. This was important as viewing and reading times are likely to differ between families (Thompson et al., 2017) and in different countries (Bucksch et al., 2015; Mullan, 2010). This meant it was possible to judge if data in the current study was consistent with that of other studies and also provided a benchmark against which to judge associations found between reading and viewing times in the current study.

Because children were transitioning from shared to independent reading over these years, analyses in Chapters 5, 6 and 7 used a combined reading measure, that is, shared reading at 4 years and combined shared and independent reading at 6 and 8 years. However, results of analyses in Chapter 4 for combined reading were similar to those for shared and independent reading measured separately. Shared reading times peaked at 4 years, close to 40 minutes during the week and about half an hour on weekends, and then declined at 6 years and then again at 8 years. Independent reading times were a little under 20 minutes during the week and a little more than 10 minutes on weekends at 6 and 8 years. Combined reading times were around 40 minutes during the week at 6 years and around 30 minutes during the week at 8 years. On weekends combined reading times were a little over 20 minutes at both 6 and 8 years. This showed that there were 6- and 8-years-olds who were still being read to even as they began to read independently. Average viewing times in the current sample were considerable, exceeding one hour at 6 and 8 years on weekdays and more than 2 hours at 4 years on weekdays and at all ages on weekends.

Shared reading times were higher than those found in other international studies. Independent reading times during the week also exceeded reading times found in other international studies. This would suggest that reading times for the current sample were not cause for concern. However, Chapter 4 showed that even at 4 years, when shared reading
was at its height, about a fifth of children were not read to during the week. At 6 years shared reading had declined steeply and about half of children were not read to. Substantial numbers of children also did no independent reading on the diary day, about a third of children during the week and close to two-thirds on weekends. Even in the case of combined reading about a fifth of children did not read during the week and about a third at 6 years on weekends and close to half at 8 years on weekends. In addition, the disparity in reading and viewing times in the current sample was similar to that found in other studies. Television viewing times exceeded shared reading times by over an hour and independent reading times by over an hour and a half. This suggests that it was possible that viewing and reading times might be negatively associated, consistent with displacement.

8.3.2 Viewing and reading behaviour

Distribution of Viewing and Reading over the Day

Chapter 5 presented tempograms of the percentages of children engaged in viewing and reading over the day. Viewing peaked in the morning and evening at all three ages on weekdays and weekends, with an additional peak in the afternoon, particularly during the week at 4 years. Shared reading and independent reading times also peaked in the evening at all three ages on both weekdays and weekends. Viewing and reading were low across the day at 4 years and almost no children viewed and read during the day on weekdays at 6 and 8 years.

Examining viewing and reading in this way revealed a number of key points. Percentages of children viewing were higher than percentages of children reading at all times of day except for weekday evenings at 4 years. This suggested that viewing time might be at the expense of reading time. Reading had a single peak in the evening and percentages reading across the day were low. This suggested that many children may have read only once a day in the evening. Notably, the peak for reading coincided with that for viewing in the evening. This suggested that these activities were competing for time and that there might be trade-offs in time for these activities. If this were the case it was possible that those children who were not viewing might be those who were choosing to read. In addition, viewing time at this time
might be at the expense of reading time, so that viewers would read for less time or not at all. The analyses in Chapter 5 sought to examine these possibilities in more detail.

**Were nonviewers reading and viewers not reading?**

Chapter 5 began with a series of models of reading and viewing behaviour. Model 1 described behaviour that was entirely consistent with the first assumption of the displacement hypothesis, that all nonviewers would be reading and that all viewers would not be reading. In reality, however, some nonviewers will not be reading and some viewers may read. Model 2 presented a modified version of model 1 where the majority of nonviewers read and the majority of viewers do not read, however some children did neither and some children both viewed and read. The third model described behaviour that was entirely inconsistent with the assumptions of the displacement hypothesis. Nonviewers were less likely to engage in reading activities and most viewers were readers.

The day was divided into five 3-hour blocks of time, from 6–9 a.m., 9–12 noon, 12–3 p.m., 3–6 p.m. and 6–9 p.m. These blocks of time corresponded with the key activities and transitions across children’s days. These were, the period before school or preschool, the school day, the period in the afternoon after school and the evening. Then using the models as a guide, percentages of children viewing and not reading and reading and not viewing were compared against the models to find times during the day where patterns of reading and viewing behaviour could be described as consistent with the assumption that viewers would be less likely to read and nonviewers would be more likely to read. This also meant that viewing at this time could be said to be more likely to displace time for reading.

The assumption that children who were not viewing would be reading and that children who were viewing would not be reading, was not supported in this sample during the day on weekdays or weekends. In most cases, the majority of children were neither viewing nor reading. So while the majority of viewers did not read, consistent with the assumption, the percentage of nonviewers who did read was much less than the percentage of nonviewers who did not read. The assumption that nonviewers would be more likely to read was not supported.
However, the picture was quite different in the evening. While percentages of children viewing in the evening increased, the percentage of children reading increased even more. On weeknights, the majority of nonviewers read at each age consistent with the first assumption. However, because the majority of viewers also read on weeknights, patterns of reading and viewing were only partially consistent with the first assumption. On weekends however, nonviewers were significantly more likely to read and viewers were significantly less likely to read at 4 and 6 years. At 8 years, on weekends, the model also showed a similar pattern of behaviour, but just fell short of significance.

**Were viewers reading for less time?**

The first analyses in Chapter 5 identified times at which nonviewers were more likely to read and therefore, times at which viewing would be more likely to displace time for reading. If time for viewing and reading is ‘zero-sum’ in nature, the second assumption of the displacement hypothesis, then viewing at these times would take up time for reading and mean that viewers would read for less time than nonviewers (Mutz et al., 1993). Therefore, the next analysis compared the reading times of nonviewers and viewers.

During the day only one comparison of viewers and nonviewers reading times supported the assumption. However, viewers had consistently shorter reading times than nonviewers at all ages and on both types of day in the evening. This suggested that at a time when children who were not viewing were likely to read, spending time viewing was taking up time for reading. This was notable, because during the week, analyses showed that among viewers, more were reading than not reading during the week. This also points to viewing taking time for reading. Differences were found in both the whole sample analysis and the readers only analysis. This showed that it was not just that there were more non-readers among viewers, but that viewers were reading for shorter times than nonviewers. These results were consistent with the second assumption of the displacement hypothesis.

While these results were suggestive, it was not possible to tell from this analysis if viewer’s shorter reading times were because the time they spent viewing was taking up the time they would otherwise devote to reading or reductions in reading time were because they were
engaged in other activities. To provide stronger evidence for the second assumption of the displacement hypothesis, that the relationship between time for viewing and reading is ‘zero-sum’ in nature, it was necessary to show that as time spent on viewing increased, there would be systematic reductions in reading time (Mutz et al., 2004, Vandewater et al., 2006).

**Is the relationship between time for reading and viewing zero-sum in nature?**

To more rigorously test that viewing was associated with reductions in reading time, it was necessary to show that the relationship between time for reading and viewing was ‘zero-sum’ in nature so that each increase in viewing time would be associated with systematic reductions in reading time. The analysis only considered reading and viewing behaviour when children were at home and awake in the evening, so choices about the length of time spent viewing and reading were as unconstrained as possible. As ‘ordinary’ days were selected for analysis this meant that reading and viewing times were representative of typical reading and viewing times for these children. In addition, as children went to bed at different times and this would affect the length of time they had to read or view, viewing was calculated as a percentage of each child’s available evening time.

As Chapter 5 showed the first assumption of the displacement hypothesis, that nonviewers would be more likely to read and viewers would be less likely to read, was strongly supported on weekends in the evening and partially supported on weekdays in the evening, analyses in Chapter 6 focussed on the evening. Viewing time was calculated as a percentage of this time and was divided into levels so comparisons between reading time for each level of viewing time could be made. Using a similar procedure to that in Chapter 5, the percentages of non-readers for each level of evening viewing time were examined. There were no systematic associations between the percentages of non-readers and viewing level for children viewing for less than 50% of their evening. However, when viewing exceeded 50% of the evening, the percentage of non-readers increased significantly in most cases as viewing increased.

As in Chapter 5, a comparison of reading times by evening viewing time was conducted first on the whole sample, including both readers and non-readers and then only for those who
spent some time reading. While consistently negative associations were found between viewing and reading times, in the whole sample, unexpectedly, the associations between viewing and reading times were curvilinear in all cases but one. Children who viewed for less than 25% of the evening read for similar or longer times than nonviewers. However, when viewing times exceeded a quarter of the evening, results were consistent with the assumption that time for reading and viewing is zero-sum. There was a systematic significant decline in reading time as viewing increased in all cases except at 8 years during the week. This provided stronger evidence that viewing was displacing reading, because reading decreased systematically with each increase in viewing time.

However, in the analysis of readers only, while similar negative associations were shown overall, there was little evidence of systematic reductions in reading times with each increase in viewing level. In addition, differences in reading times between nonviewers and those who viewed for 1–24% of their evening were not significant. Because the declines in reading times were not as great in the analysis of readers only as they were in the whole sample analysis this suggests that much of the decline in reading times in the whole sample analysis was due to increased numbers of non-readers rather than children who read, reading for shorter times as viewing levels increased.

Associations between the covariates and evening reading time were in the expected direction. There were few differences in reading times between boys and girls, suggesting gender differences in reading times when children are young are not marked. However, notably, associations between evening viewing and reading persisted, even after the inclusion of key child and family characteristics known to be associated with time spent reading to children and the time they spent viewing.

These analyses do not show that viewing caused the decline in reading times and that a child would read if they were not viewing. However, comparisons of reading times for children who read on the diary day and who viewed for most of their evening suggested there was evidence that viewing times were constricting time for reading. A child who viewed for 75–100% of their evening at 8 years viewed for about 2 hours and 10 minutes. The length of their available evening time was 2 hours and 43 minutes. Reading times for some of these children were 28 minutes. This was much less than the reading time for an 8-year-old child.
who viewed for only 1–24% of their evening, 54 minutes. As these were both children who were sufficiently engaged with reading to read, at least on this day, it was likely that increased viewing time was at the expense of reading time.

Do children who view more and read less, go on to read less over time?

Chapters 5 and 6 found evidence for the assumptions of the displacement hypothesis in the evening. Taken together, results showed that children who viewed were both less likely to read than nonviewers in the evening and that there were close associations between increases in evening viewing and decreased likelihood of reading and decreases in reading times. Children who viewed for more than half their evening appeared to be particularly vulnerable. If increased viewing time is negatively associated with shorter reading times long term then effects are likely to accumulate and become substantial.

Children differed significantly in their reading times at 4 years. This suggested some children had low initial reading times while others had high initial reading times. These initial differences did not change with age during the week and only declined slightly on weekends in this small subsample. However, viewing was negatively associated with reading. Children who had high levels of viewing, on average, over the three measurement occasions, read for about 7 minutes less for each 15-minute increase in viewing time during the week and about 5 minutes less on weekends.

However, the analysis also showed significant within person variance. For every 15 minutes spent viewing, above and beyond the child’s average viewing time, children read for 5 minutes less time on weekend evenings. In addition, the effect of viewing more than usual on initial reading times was different in different children both on weekdays and weekends (Hoffman & Stawski, 2009). However, it could not be shown that the effect of viewing more than usual meant that some individuals reading times declined more rapidly than others over time. In addition, the long-term differences between children were more significant than day-to-day variations in reading times with fluctuations in viewing times.
The analysis in Chapter 7 showed that reading times did not differ for boys and girls, but mother’s education and family activities showed small positive associations with reading time. However, the effect of viewing on reading time was much stronger. This showed that the strongest influence on time spent reading was time spent viewing in the evening.

**Conclusion**

Examining children’s reading and viewing behaviour over the day suggested there was little evidence to support the first assumption, that nonviewers would be more likely to read and viewers would be less likely to read, during the day. The picture was different in the evening. In the evening, on weekends, the majority of nonviewers read and the majority of viewers did not read, consistent with the assumption. However, on weeknights, the majority of both nonviewers and viewers read, so results were only partially consistent with the first assumption. Results comparing the time viewers and nonviewers spent reading suggested there was support for the second assumption, that viewing time was at the expense of reading time. The fine-grained comparison of viewing and reading times suggested that viewing was most likely to be at the expense of reading time at high levels of viewing but not low levels of viewing. Taken together, results suggest that displacement of reading by viewing is more likely to occur in the evening, on weekends and at heavy levels of viewing.

**8.3.3 Factors affecting associations between viewing and reading times**

External constraints on time may mean that children have few opportunities to view or read over the day. However, when children are at home, families are instrumental in structuring time for reading and viewing and the priority given to each. As Bronfenbrenner (1979) emphasizes, the context in which children develop will influence the time they spend in different activities. As described in Chapter 1, families differ widely in how they manage time for reading and viewing. Research has shown clear associations between mother’s education level and reduced viewing time and increased reading time (Bittman & Sipthorp, 2011; Bianchi & Robinson, 1997; Mullan, 2010). Chapter 4 showed children of more highly educated mothers viewed for substantially less time and read for significantly more time in almost all cases.
Results of this study also showed that children in families who engaged them in a variety of family activities also spent more time reading. Families who engage children in a variety of family activities may also be families who spend time reading to their children or structuring time for them to read independently. Consequently, engagement in family activities may serve as a marker for other family characteristics that mean parents also spend time reading to their children or creating opportunities for them to read.

There are a number of ways in which families support time for reading. Studies have shown that families who value reading spend more time reading to their children (Bianchi & Robinson, 1997; Guryan et al., 2008). In addition, they model reading behaviour (Mullan, 2010), ensure there are books in the home and structure time so there are opportunities for reading (Common Sense Media, 2014; Rutherford et al., 2010). It is likely that nonviewers or those who viewed for only short amounts of time in the evening had families who were structuring time for reading and viewing in this way. The significantly higher shared reading times of these children are consistent with this. In addition, these families may limit viewing so that the evening is reserved for reading activities. Many families set limits on the content of what young children can view which means they are limited to viewing during the day or in the early evening (Barradas, Fulton, Blanck & Huhman, 2007; Commonwealth of Australia, ACMA, 2007).

Results in the present study also suggest that families may structure time for reading and viewing in the evening differently on weekdays and weekends. In the present study, the majority of children who were viewing were also reading on weeknights. Chapter 4 showed that children in the present study spent more time reading during the week. Most families with young children develop daily routines that cover children’s bedtime, mealtime, household chores, family contact, and watching television (Fiese & Wamboldt, 2000). Bedtime reading is a central part of the evening routine in many families particularly for very young children (Mindell et al., 2009). Weeknight routines are mainly work nights for parents and school nights for children. It is important that the process of getting children into bed goes smoothly and bedtime reading is often used to help children make this transition easily. The high number of families who engaged in shared reading with their children at 4 years during the week was consistent with this. In addition, the association was strongest at 4 and 6
years when lots of families were still reading to kids and so families were still influencing the evening reading routine.

In addition, parents may be more likely to emphasise educational activities on school nights as part of the evening routine (Baxter & Hayes, 2007, see also Fiorini & Keane, 2013). Because of its recognised educational value reading may be a central part of leisure activities on school nights. In addition, older children, particularly 8-year-olds, may have reading set for homework. Parents would then be likely to ensure these children spent some time reading, even if this is not the child’s preferred evening activity.

While many families emphasise reading as part of children’s bedtime routine, this is not always the case. One study found that 30% of pre-schoolers and 43% of school-aged children have a television in their bedroom (Mindell, 2009). These families may use television viewing to help children make the transition to sleep. It is possible that the children who were viewing for very long times in the evening in the present study were those who had a television in their bedroom and had families who used viewing as part of their bed-time routine.

Family routines around reading seemed to differ on weekdays and weekends. On weekends the majority of children in the current study viewed and did not read. Chapter 4 showed children had much higher viewing times on weekends and that this was the case in families whose mothers had more years of education and in those whose mothers had less years of education. Weekend routines may be more flexible reflecting less pressure to be ready for school and work the next day. In addition, parents may feel less need to focus family routines around activities with educational value. Parents who focus on educational activities during the week, may prefer to focus on leisure activities, such as family movie nights, on the weekends or give their children more freedom to choose what to do on weekend evenings. In addition, weekend routines may be less consistent if the family is engaged in social activities.

Families not only structure time for reading but may also foster children’s enjoyment of reading. Mol and Bus (2011) suggest that early shared reading might develop not only children’s language skills, but also their interest in and enjoyment of books and they may, therefore, go on to do more independent reading (see also Baker et al., 1997). A few studies
have shown positive associations between early shared reading time and later time spent reading independently (Neuman, 1986; Shapiro and Whitney, 1997). This study also found positive associations between families who engage in family activities with their children and reading time. Activities that involve close interactions between parents and children have been shown to improve emergent literacy skills (Foster et al., 2005). These associations may come about because these activities develop children’s language skills and increase their general knowledge. Both of these skills facilitate learning to read and comprehension skills and may predispose children to spend more time reading. The positive associations between children’s receptive language skills and evening reading time found in Chapter 6 are consistent with this.

It is also the case that families that do not foster children’s enjoyment of reading in this way may have children who go on to read less over time. Mol and Bus (2011) describe associations between earlier and later reading as a positive causal spiral where children who read more often improve reading skills, comprehension and vocabulary further, which motivates them to spend more time reading. The process by which the gap in reading achievement between children with better reading skills and children with weaker reading skills widens over time has been called the Matthew effect (Stanovich, 1986). One factor that may contribute to widening gaps in reading outcomes for good and poor readers may be differences in time spent reading independently (Cain & Oakhill, 2011). Reading times did not decline in the small subsample on which MLM analysis was conducted here, however, consistently heavy viewers read for less time in the evening across the 4 years studied. Further, there is evidence heavy viewing behaviours remain stable over time (Certain & Khan, 2002; Christakis & Zimmerman, 2006; Ennemoser & Schneider, 2007; Hands et al., 2011) meaning these children were likely to maintain their trajectory of lower reading times. While some studies have found evidence consistent with Matthew effects for reading achievement (Juel, 2011; McNamara, Scissons & Gutknecht, 2011) others have not (Shaywitz et al., 1995; Protopapas, Sideridis, Mouzake & Simos, 2011) or have found evidence only in relation to some skills related to literacy, such as vocabulary development (Cain & Oakhill, 2011). Protopapas, and colleagues note that studies that do not find evidence for the Matthew effect may nevertheless be regarded as partially supporting the hypothesis, as while they do not show the gap between good and poor readers increase, they do not show that poor readers close the gap either. They also note that predictions of the
hypothesis regarding additional time good readers spend reading is well supported (see also the meta-analysis by Mol & Bus, 2011). Sustained reading practice is even more important for children who are behind other children in the development of reading skills. Mol and Bus note that leisure reading at home explains more variance in the reading skills of less skilled readers (15%) than children with typically developing reading skills (4%). The results here suggested that children with low initial reading times and heavy viewing times continued to read less than their peers. So while the associations between viewing and reading described here could not be regarded as evidence of a negative causal spiral, the fact that heavy viewers had sustained low levels of reading suggest that their reading development may be affected and that they will be unlikely to catch up.

8.4 Future Research

There is evidence that associations between viewing and reading achievement become linear, negative and larger as children get older (Neuman, 1988). This may be because screen media use has been shown to increase as children get older, peaking at about 15 years of age (Bucksch et al., 2015) while average reading times have been shown to decline once children reach tween and adolescent years (Common Sense Media, 2014). Further, negative associations have been shown between screen time in childhood and adolescence and the chances of obtaining school and university qualifications (Corder et al., 2015; Hancox et al., 2005; Johnson, Cohen, Kasen & Brook, 2007). Using the results of the present study, it would be possible to explore when viewing is most likely to be negatively associated with time spent reading and in other activities that are likely to compete with viewing time, such as homework, in adolescents. It would then be possible to examine whether this has negative associations with school achievement more broadly.

Television is currently the dominant form of screen media use in Australia. However, the trend is for viewing to be spread across multiple devices (Regional TAM, OzTAM, Nielsen, 2017). Originally this study intended to examine computer use as well as television viewing. However, computer use was very low at the ages studied here when the LSAC data were collected. However, the methods used in the current study, closely examining patterns of viewing behaviour across the day to identify points of competition and trade-offs between
reading and viewing, could be broadened to include other types of screen exposure in addition to television viewing. Such a study would need to separately examine different types of screen exposure and also examine different types of use. For example, there is evidence that television viewing and computer use have different impacts on reading and intellectual outcomes (Attewell, et al., 2003; Fiorini, 2010). Fiorini found the effect of television viewing on school readiness skills and vocabulary was negative, however the impact of computer-use (excluding game consoles) was positive. Attewell et al. found that while television viewing was associated with reduced amounts of reading in children 4- to 13-years-of-age in a representative national sample of American families, home computer use that did not exceed 1 hour 30 minutes per day, was associated with increased leisure time reading and with modest improvements in letter/word recognition and reading comprehension scores. Another study showed improvements in the reading achievement of low income African-American students, 10 to 18 years of age, who used the internet at home, perhaps because web pages are heavily text based (Jackson et al., 2006). However, use of computers for gaming has been found to be associated with reductions in reading time (Cummings & Vanderwater, 2007). These issues are only beginning to be examined by researchers, however given the ubiquity and popularity of computers and mobile technology among young people and adolescents, this is an area that is ripe for further investigation.

If the methods of closely examining reading and viewing patterns over the day, developed in the current study, were used to examine displacement of educational activities more broadly, by a broader range of screen-based devices, additional days of data would be desirable. The current study showed behaviour patterns around reading and viewing differed on weekdays and weekends. It is very likely behaviour patterns will also differ on different days during the week and on different weekend days. If children’s time spent on reading and homework and time spent using screen-based media were tracked over a week, rather than a single weekday and weekend day, this would go some way to addressing the issues around the day-to-day variation in children’s time use.

Although the methods used in the current study have shown when displacement of reading by viewing is more likely to occur, these methods cannot show definitively whether viewing was displacing reading. In order to examine if viewing has a causal role in displacing reading or other activities, it would be necessary to conduct a quasi-experimental or experimental study.
If a quasi-experimental study were conducted, data for two groups of children and their families could be collected, matched for important individual and family characteristics. The intervention group would have viewing limited for the duration of the study while the control group would be allowed unlimited viewing time. The study would also need to limit the intervention groups access to other forms of screen media, in addition to television. Reading and homework times for the two groups could be compared. Using insights gained from this study, the study would need to control for the time children had available for reading and viewing. A potential problem with this type of study is that behaviour change may be a short-term response to the novelty of the intervention and not be sustained long term. If the intervention were ended and then reinstated this would increase confidence that other factors were not producing the effects on reading time. While it would be preferable to continue the intervention long term, this may not be practicable

### 8.5 Strengths and Limitations of the Current Study

#### 8.5.1 Strengths

The use of LSAC conferred a number of benefits on the current study. LSAC is a large longitudinal study designed to be broadly representative of the Australian population. The time use diaries collected as part of LSAC provided estimates of viewing and reading times that are relatively free from social desirability bias (Frazis & Stewart, 2012) and have been found to provide accurate estimates of viewing times (Anderson et al., 1985). In addition, the diaries collected information on other activities children engaged in over the 24 hours making it possible to examine associations between a range of activities and viewing and reading times. LSAC also collects a wide variety of background information about children and their families which enabled this study to examine associations between viewing and reading in the context of these characteristics.

#### 8.5.2 Limitations

**Data Attrition**

Loss of cases from the current study was substantial and has been described in Chapter 4. Loss of cases is an issue because it can affect the representativeness of the final sample. In
particular, children in the retained sample had mothers who were more highly educated than children who were lost from analysis. This may mean estimates of time spent reading were higher while estimates of viewing times were lower than in the original sample. This means results should be interpreted with caution.

There were also relatively few cases with data for all three ages in the multilevel linear analysis, as described in Chapter 7. Children in both the weekday and weekend subsamples had higher receptive language scores and had mothers with higher levels of education. The severe reduction in sample size will affect the generalizability of the results and mean that the sample can no longer be regarded as representative. These analyses should therefore be regarded as exploratory only. The analysis would benefit from replication with a larger sample.

In addition, cases had data for only one weekend and one weekday. Results would have been stronger if each child had provided diary data for a week at each age, particularly given the variability of reading and viewing behaviours from day-to-day. However, given the demands on families in filling out the daily diary, if diary data were collected for a week, the sample size would undoubtedly be smaller.

**Ordinary Day**

While the considerable day-to-day variation in children’s time use mean a single day diary may not be representative of a child’s long run time use (Frazis & Stewart, 2012), aspects of the way the analysis was conducted in this study increase confidence that results may be generalised beyond these 3 days. The analysis was limited to ordinary days. This meant a considerable number of cases were lost from the analysis. However, this also meant the single day provided a sounder basis for generalising as more of children’s days will have a similar balance of activities to an ordinary day. Even on ordinary days children’s days are likely to differ greatly in content. For example, different activities such as ballet and sport occur on different days. However, the analysis focussed on the evening when most of the variation associated with these constraints on time use would not occur. This provided a surer basis for suggesting that time spent on reading and viewing in the evening could be generalised to other evenings. In addition, the evening is a common time for families to have
routines around behaviour which also means behaviour at this time is likely to be more consistent across study days (Mindell et al., 2009).

**School**

The home environment is not the only influence on time spent reading. Another critical influence on reading will be the experiences children have at school. Children who are given independent reading time at school are more likely to spend time reading at home and are more likely to say they enjoy reading (Scholastic, 2015). There are also wide differences between schools in the amount and variety of print exposure they provide to students and the way literacy is taught (Duke, 2000a, Duke, 2000b). These factors will also likely influence children’s reading development and therefore the amount of time they spend reading. The current study had no information on children’s school experiences, however these would be likely to influence associations between viewing and reading times.

**8.6 Practical Implications of research**

While it is difficult to modify factors such as mother’s education, families may be able to modify viewing time to create opportunities for children to read. Results suggested that low levels of viewing did not inhibit reading time. The evidence here suggests that families do not need to prohibit viewing entirely in the evening to protect reading. Rather, if viewing is managed so that it does not occupy more than half of a child’s evening, reading time is unlikely to be negatively affected. While there are Australian and United States guidelines for media use, these were not developed with regard to reading development. The current study suggests that rather than laying down general limits on viewing time, it may be more useful to consider the proportion of their leisure time that children devote to viewing. Viewing that does not exceed overall limits may nonetheless inhibit reading time if it takes up most of children’s leisure time. The fine-grained analysis conducted in this study yields results that may form the basis of very specific advice to parents. This may be more useful than advising parents to “balance media with other activities” which has been criticised for being vague and ineffective (Sigman, 2012).
This study also showed that children from families who are well educated and invested in meeting their needs may still benefit from mediation of viewing times by parents. While mother’s education had positive associations with reading times, viewing remained associated with reading times even when factors such as parent’s education was controlled. It may be that for many of these children viewing would not reduce reading times to a level that would hinder reading development, however, there may be some who even with a highly involved family may have reading times that may put their reading development at risk.

The analyses in this study focussed on the evening as that was the time viewing was most likely to displace reading. While some children read during the day, for most children the evening was likely to be the only opportunity to engage in reading activities. This was particularly the case because results showed there was little evidence families were balancing reading and viewing across the day. A child with low evening reading times was not likely to compensate for this loss of reading time by reading more during the day. This means that anything that hinders opportunities to read at this time is a concern. Evidence suggests that even small increases in reading time may benefit reading development. If families were able to structure time for viewing so that it did not take up the majority of children’s leisure time in the evening, this study suggests it is likely that children would read for more time. If small daily increases in reading time were consistently maintained then there would likely be long-term benefits to children’s reading development (Mol & Bus, 2011).

**8.7 Conclusion**

Many studies have examined displacement (Attewell et al., 2003; Ennemoser & Schneider, 2007; Hofferth, 2010; Neuman, 1988; Shin, 2004; Vandewater et al., 2006). However, studies have been criticised for failing to consider how the methods used to test the hypothesis fit the assumptions that underpin the hypothesis (Mutz et al., 1993). This study sought to fill this gap. It used new methods to examine whether there was evidence children’s reading and viewing behaviour was consistent with the assumptions of the displacement hypothesis directly. That is that nonviewers would read and viewers would not
read and that time for reading and viewing is ‘zero-sum’ so that time spent viewing will force out time for reading.

While it is not possible to show if a particular child would read if they were not viewing using survey data, examining the assumptions of the displacement hypothesis provided the means to develop models that could be compared with children’s actual reading and viewing behaviour to see if displacement was a good description of their behaviour. Taking this approach also clarified when displacement was most likely to occur. In particular this study found that the likelihood of displacement of reading by viewing depended on the time of day, the type of day and the extent to which viewing took up children’s time at home in the evening. In addition, children with weaker language skills and those from families with less education and less involvement with them were all identified by this study as being vulnerable to spending less time reading. Results of the longitudinal analysis provided tentative support for models of reading development that suggest that children’s early patterns of reading and viewing behaviour persist. Those who start out with higher reading times continue to read more while those who spend less time in reading activities, continue to read less and that the differences in time spent reading are likely to have substantial implications for reading development long term. This suggests the importance of increasing families understanding of how to mediate viewing to protect reading time.
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Appendix A

Invitation to Participate in LSAC

GROWING UP IN AUSTRALIA

You may have heard about a new study called Growing Up in Australia, being run by the Australian Institute of Family Studies on behalf of the Australian government. The study will involve thousands of Australian children (babies and 4 year olds) and will look at these children's development, health, education and family life over a period of time. The research will be used to develop better support for children and their families in areas like child care, pre-schools and medical services.

The Health Insurance Commission (HIC) administers Medicare and the Pharmaceutical Benefits Scheme. We have agreed to assist the study by writing to families with babies and 4 year old children and forwarding the enclosed information.

Your child <Child's First Name> has been selected as a child in one of these age groups.

We wish to assure you that HIC has not disclosed any of your details to the Australian Institute of Family Studies. If you agree to be involved in this study, the only information the Institute will then receive from HIC is your name, address and the age group of your child.

If you do not wish to take part in the study, please either phone free-call 1800 005 749 between 9am and 5pm Monday to Friday (Eastern Standard Time) or return the form provided by 18 July 2003, so that we can ensure your details are not released.

If you wish to take part in the study, you need do nothing further. An interviewer from NCS Pearson (who will collect the information on behalf of the Institute) will be in contact to arrange a time to speak with you. You can also tell the Interviewer at that time if you choose not to take part.

Please see the enclosed pamphlet for more information about the study and what is involved if you choose to take part.

Yours sincerely

Dr Brian Richards
Chief Information Officer
Appendix B

Letter to Participating Families

Dear Parent

Recently you will have received a letter from the Health Insurance Commission (HIC) about an exciting national study called Growing Up in Australia, the first of its kind in Australia (some information has also been included on the back of this letter). The HIC letter will have mentioned that your child has been selected to take part in this study and that an interviewer from NCS Pearson would be in touch.

This is to let you know that an interviewer from NCS Pearson will be in your area during August (September) and will call at your address and arrange a convenient time to visit. It would be very helpful if you could have your child's Health Record Book close to hand for that visit.

All the information you provide will remain totally confidential. This means that it will never be used in any way that identifies individuals, children or families.

The first few years in a child's life are very important. Most experts say these years make a big difference to children's health and happiness as they grow up. This new study will help to develop better support for children in areas like child care, pre-schools and medical services.

If you would like more information about the study, or have any problems with the interviewer's visit, please telephone Freecall 1800 005 508 and mention Growing Up in Australia. Alternatively you could visit the website at www.aihs.gov.au/growingup.

Yours sincerely,

Kylie Brosnan
Project Manager
Appendix B continued: Letter to Participating Families

What is Growing Up in Australia?

_Growing Up in Australia_ is a new national study about the development of children. It aims to ensure that every child in Australia has the best possible start in life by helping us understand what happens for children as they grow up— and why.

Over the next eight years the study will follow the development of around 10,000 Australian children— both babies and four-year-olds. We will be collecting information from parents, child care workers, teachers and, in time, the children themselves. We will be interested in children’s health, education, emotional development and social skills.

_Growing Up in Australia_ is unique. There has been no study like this in Australia ever before.

Who is running the study?

_Growing Up in Australia_ is being run by the Australian Institute of Family Studies and a group of leading researchers from eight other research institutions and universities around Australia. The information is being collected by experienced interviewers from NCS Pearson, an independent social research company, in collaboration with Colmar Brunton Social Research.

_Growing Up in Australia_ is funded by the Commonwealth Department of Family and Community Services as part of the Government’s _Stronger Families and Communities Strategy_.

What about my privacy?

Very strict procedures will be followed to make sure that only authorized persons will have access to your information. The study has been approved by the Institute’s Ethics Committee, and all interviewers and researchers involved must comply with the Privacy Act 1988.

How will the information be used?

Before any of the information is analysed, all of the details which could identify you will be removed. The information will then be available to researchers and policy makers to answer questions like:

- How are children in Australia progressing in terms of health, learning skills, and emotional wellbeing?
- How do child care, preschool/kindergarten and the early school years contribute to their development?
- What problems are their families facing?
- What services help children who have problems in their early years?
- How can governments make sure all children have a good start in life?

The information you give us will help provide an overall picture of how Australia’s children are getting on these days, and point the way to what can be done to improve the wellbeing of all children and their families.

_Being part of Growing Up in Australia will be interesting and fun!_
### Time Use Diary, Example Page, 4 Years

#### DIARY for four-year-olds

<table>
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<th>Morning</th>
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</thead>
<tbody>
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<td>6 AM</td>
</tr>
<tr>
<td>1 AM</td>
<td>7 AM</td>
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<td>2 AM</td>
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</tr>
<tr>
<td>3 AM</td>
<td>9 AM</td>
</tr>
</tbody>
</table>

#### What was the child doing
- not sure what child was doing
- sleeping, napping
- awake in bed
- eating, drinking, being fed
- bathe, dress, hair care, health care
- do nothing, bored / restless
- crying, upset, tantrum
- destroy things, create mess
- held, cuddled, comforted, soothed
- being reprimanded, corrected
- watching TV, video, DVD, movie
- listening to tapes, CDs, radio, music
- use computer / computer games
- read a story, talk / sing, talked / sung to
- colour, look at book, educational game
- being taught to do chores, read, etc.
- walk for travel or for fun
- ride bicycle, trike, etc. (travel or fun)
- other exercise – swim / dance / run about
- visiting people, special event, party
- other play, other activities
- travel in pusher or on bicycle seat
- travel in car / other household vehicle
- travel on public transport, ferry, plane
- taken places with adult (e.g. shopping)
- organised lessons / activities

#### Where was the child
- own home (indoors)
- other person’s home (indoors)
- day care centre, playgroup
- other indoors
- other outdoors

#### Alone
- alone
- mother, step-mother
- father, step-father
- grandparent(s) / other adult relative(s)
- brother(s), sister(s), other children
- other adults(s)
- dog, cat or other pet (not fish)

#### Paid
- someone paid for this activity
Appendix C continued: *Time Use Diary, Example Page, 6 years*

<table>
<thead>
<tr>
<th>Night</th>
<th>Morning</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 am</td>
<td>0 5 10 15 30 45</td>
</tr>
<tr>
<td></td>
<td>4 am</td>
</tr>
<tr>
<td></td>
<td>4 am</td>
</tr>
</tbody>
</table>

**What was the child doing?**

- Not sure what child was doing: A01
- Sleeping, napping: A02
- Awake in bed: A03
- Eating and drinking: A04
- Bathing, dressing, hair care, health care: A05
- Doing nothing, bored/restless: A06
- Crying, upset, tantrum: A07
- Arguing, fighting, destroying things: A08
- Being held, cuddled, comforted, soothed: A09
- Being reprimanded, corrected: A10
- Watching TV, video, DVD, movie: A11
- Listening to tapes, CDs, radio, music: A12
- Using computer/computer game: A13
- Being read to, told a story, or sung to: A14
- Reading or looking at book by self: A15
- Quiet free play (e.g. board game, craft, dress-ups): A16
- Active free play (e.g. running, climbing, ball game): A17
- Helping with chores, jobs: A18
- Visiting people, special event, outing: A19
- Organised sport/physical activity (e.g. swim, dance,Auskick): A20
- Other organised lesson/activity (e.g. music, drama): A21

**Travel**

- Walking (for travel or fun): B01
- Riding bicycle, scooter, roller blades etc. (for travel or fun): B02
- Travel in car: B03
- Travel on public transport: B04
- Being taken places with adult (e.g. shopping): B05

**Where was the child?**

- Own home, indoors: C01
- Own home, outdoors: C02
- School, after-before school care: C03
- Other, indoors: C04
- Other, outdoors: C05

**In the same room, nearby or outside**

- Alone: D01
- Mother, step mother: D02
- Father, step father: D03
- Grandparent(s)/other adult relative(s): D04
- Brother(s), sister(s), other children: D05
- Other adult(s): D06
- Dog, cat or other pet (not fish): D07
- Was this activity done for or as part of homework: E01
Appendix C continued: *Time Use Diary, Example Page, 8 years*

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity Description</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-15</td>
<td>Not sure what child was doing</td>
<td>A01</td>
</tr>
<tr>
<td>15-30</td>
<td>Sleeping, napping</td>
<td>A02</td>
</tr>
<tr>
<td>30-45</td>
<td>Awake in bed</td>
<td>A03</td>
</tr>
<tr>
<td>0-15</td>
<td>Eating and drinking</td>
<td>A04</td>
</tr>
<tr>
<td>15-30</td>
<td>Bathing, dressing, hair care, health care</td>
<td>A05</td>
</tr>
<tr>
<td>30-45</td>
<td>Doing nothing, bored/restless</td>
<td>A06</td>
</tr>
<tr>
<td>0-15</td>
<td>Sulk, upset</td>
<td>A07</td>
</tr>
<tr>
<td>15-30</td>
<td>Arguing, fighting</td>
<td>A08</td>
</tr>
<tr>
<td>30-45</td>
<td>Being hugged, comforted, helped to calm down</td>
<td>A09</td>
</tr>
<tr>
<td>0-15</td>
<td>Being reprimanded, corrected</td>
<td>A10</td>
</tr>
<tr>
<td>15-30</td>
<td>Watching TV, video, DVD, movie</td>
<td>A11</td>
</tr>
<tr>
<td>30-45</td>
<td>Listening to tapes, CDs, radio, music</td>
<td>A12</td>
</tr>
<tr>
<td>0-15</td>
<td>Using computer/computer game</td>
<td>A13</td>
</tr>
<tr>
<td>15-30</td>
<td>Being read to or told a story</td>
<td>A14</td>
</tr>
<tr>
<td>30-45</td>
<td>Reading or looking at book by self</td>
<td>A15</td>
</tr>
<tr>
<td>0-15</td>
<td>Quiet free play (e.g. board game, craft, dress-ups)</td>
<td>A16</td>
</tr>
<tr>
<td>15-30</td>
<td>Active free play (e.g. running, climbing, ball game)</td>
<td>A17</td>
</tr>
<tr>
<td>30-45</td>
<td>Helping with chores, jobs</td>
<td>A18</td>
</tr>
<tr>
<td>0-15</td>
<td>Visiting people, special event or outing</td>
<td>A19</td>
</tr>
<tr>
<td>15-30</td>
<td>Organised sport/physical activity (e.g. swim, dance, Auskick)</td>
<td>A20</td>
</tr>
<tr>
<td>30-45</td>
<td>Other organised lesson/activity (e.g. music, drama)</td>
<td>A21</td>
</tr>
<tr>
<td>0-15</td>
<td>Walking (for travel or fun)</td>
<td>B01</td>
</tr>
<tr>
<td>15-30</td>
<td>Riding bicycle, scooter, roller blades etc. (for travel or fun)</td>
<td>B02</td>
</tr>
<tr>
<td>30-45</td>
<td>Travel in car</td>
<td>B03</td>
</tr>
<tr>
<td>0-15</td>
<td>Travel on public transport</td>
<td>B04</td>
</tr>
<tr>
<td>15-30</td>
<td>Being taken places with adult (e.g. shopping)</td>
<td>B05</td>
</tr>
<tr>
<td>30-45</td>
<td>Own home (indoors)</td>
<td>C01</td>
</tr>
<tr>
<td>0-15</td>
<td>Own home (outdoors)</td>
<td>C02</td>
</tr>
<tr>
<td>15-30</td>
<td>School, after/before school care</td>
<td>C03</td>
</tr>
<tr>
<td>30-45</td>
<td>Other (indoors)</td>
<td>C04</td>
</tr>
<tr>
<td>0-15</td>
<td>Other (outdoors)</td>
<td>C05</td>
</tr>
<tr>
<td>15-30</td>
<td>Alone</td>
<td>D01</td>
</tr>
<tr>
<td>30-45</td>
<td>Mother, step-mother</td>
<td>D02</td>
</tr>
<tr>
<td>0-15</td>
<td>Father, step-father</td>
<td>D03</td>
</tr>
<tr>
<td>15-30</td>
<td>Grandparent(s)/other adult relative(s)</td>
<td>D04</td>
</tr>
<tr>
<td>30-45</td>
<td>Brother(s), sister(s)</td>
<td>D05</td>
</tr>
<tr>
<td>0-15</td>
<td>Other children</td>
<td>D06</td>
</tr>
<tr>
<td>15-30</td>
<td>Other adult(s)</td>
<td>D07</td>
</tr>
<tr>
<td>30-45</td>
<td>Dog, cat or other pet (not fish)</td>
<td>D08</td>
</tr>
<tr>
<td>0-15</td>
<td>Was this activity done for, or as part of, homework?</td>
<td>E01</td>
</tr>
</tbody>
</table>
Appendix D

Example SAS Code to Create Tempogram of Number of Children Watching Television

data diary4years;
    set mtud. diaryk4;
    array x [96,40] k1da0101—k1dd0196;
    array TV [96];
    do i=1 to 96;
        if x[i,12]=1 then TV[i]=1;
        else if (x[i,12]=0) and x[i,1] ^= 1 then TV[i]=0;
    end;
run;
    proc means data=diary2;
    var TV1-TV96;
run