

Boys and girls in South Australia



A comparison of gender differences from the early years to adulthood

Report prepared for the Department for Education and Child Development

December 2013

**FRASER
MUSTARD
CENTRE** ■

A COLLABORATION BETWEEN



Government
of South Australia
Department for Education
and Child Development



Telethon Institute for
Child Health
Research

Report prepared by:

Angela Kinnell, Research Fellow

Yasmin Harman-Smith, Research Fellow

David Engelhardt, Director Business Intelligence

Sam Luddy, Manager Strategic Data Development

Sally Brinkman, Senior Research Fellow

Suggested citation:

Kinnell, A., Harman-Smith, Y., Engelhardt, D., Luddy, S. & Brinkman, S. (2013). Boys and girls in South Australia: A comparison of gender differences from the early years to adulthood. Published by the Fraser Mustard Centre. Department for Education and Child Development and the Telethon Institute for Child Health Research. Adelaide.

ISBN 978-0-9876002-2-6

For more information about this report, please contact:

Fraser Mustard Centre

Level 8, 31 Flinders Street

Adelaide, SA 5000

(08) 8226 1206 / (08) 8207 2039

www.frasermustardcentre.sa.edu.au

info.frasermustardcentre@sa.gov.au

CONTENTS	3
LIST OF FIGURES	6
LIST OF TABLES	6
1. EXECUTIVE SUMMARY	7
2. INTRODUCTION	11
3. REASONS FOR UNDERTAKING THIS STUDY	11
4. POSSIBLE CAUSES OF GENDER DIFFERENCES	13
4.1 BIOLOGICAL/GENETIC DIFFERENCES.....	13
4.2 EVOLUTIONARY DEVELOPMENTAL DIFFERENCES.....	14
4.3 EARLY ENVIRONMENTAL DIFFERENCES	14
4.4 INTERACTION BETWEEN BIOLOGY/GENES AND THE ENVIRONMENT	15
5. HEALTH	16
5.1 BIRTH WEIGHT.....	16
5.2 DEVELOPMENTAL DISORDERS.....	17
5.2.1 Congenital abnormalities	19
5.2.2 Intellectual disability	20
5.2.3 Reading disability (dyslexia)	20
5.2.4 Attention Deficit Hyperactivity Disorder	21
5.2.5 Autism Spectrum Conditions	22
5.3 MENTAL HEALTH CONDITIONS	22
5.3.1 Depressive disorders.....	22
5.3.2 Anxiety disorders	22
5.4 SUICIDE.....	23
6. SOCIAL AND EMOTIONAL DEVELOPMENT	24
6.1 BEHAVIOUR	24
6.1.1 Aggression.....	24
6.1.2 Bullying.....	24
6.1.3 Disruptive classroom behaviour	24

6.2 SELF-ESTEEM	25
6.3 TEMPERAMENT	25
6.3.1 Negative Affectivity.....	25
6.3.2 Surgency.....	26
6.3.3 Effortful Control	26
Box 1. What is an effect size?	27
7. LANGUAGE AND COGNITIVE SKILLS.....	28
7.1 LANGUAGE EXPOSURE	28
7.2 VERBAL COMMUNICATION	28
7.3 READING LITERACY	30
7.4 NUMERACY AND MATHEMATICS	33
8. EDUCATION.....	37
8.1 GRADE REPETITION	37
8.2 HIGH SCHOOL COMPLETIONS	37
8.3 UNIVERSITY ENTRANCE SCORES	39
8.4 SUBJECT CHOICES.....	39
8.5 UNIVERSITY ENROLMENT.....	40
8.6 APPRENTICESHIPS AND TRAINEESHIPS.....	41
9. EMPLOYMENT.....	41
9.1 DOMAIN OF EMPLOYMENT	41
9.2 WORKFORCE PARTICIPATION	41
9.3 SALARY	42
10. CRIME	44
10.1 CRIME RATES	44
10.2 JUVENILE DELINQUENCY	44
10.3 CRIMES COMMITTED	45
11. SUMMARY OF THE RESEARCH LITERATURE AND LOOKING FORWARD.....	46

12. POLICY IMPLICATIONS 50
REFERENCES 53

List of Figures

FIGURE 1. PERCENTAGE OF LOW BIRTH WEIGHT (< 2500 G) BOYS AND GIRLS BORN IN SOUTH AUSTRALIA FROM 2006-2009. SOURCE: (35)	16
FIGURE 2. PERCENTAGE OF BOYS AND GIRLS WITH IDENTIFIED SPECIAL NEEDS UPON SCHOOL ENTRY IN 2009 (AS IDENTIFIED BY THEIR TEACHERS WHEN COMPLETING THE AUSTRALIAN EARLY DEVELOPMENT INDEX). SOURCE: (4)	18
FIGURE 3. PERCENTAGE OF BOYS AND GIRLS BORN IN SOUTH AUSTRALIA WITH A CONGENITAL ABNORMALITY FROM 2001 – 2007. SOURCE: (39).....	19
FIGURE 4. CROSS-SECTIONAL AGE GROUP DATA FROM 2003 SHOWING THE PREVALENCE (%) OF INTELLECTUAL DISABILITY IN AUSTRALIA ACROSS THE LIFESPAN. (NOTE THAT INTELLECTUAL DISABILITY HERE ALSO INCLUDES THOSE WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD), AUTISM AND DEMENTIA). SOURCE: (41) 20	
FIGURE 5. PERCENTAGE OF BOYS AND GIRLS VULNERABLE ON THE AEDI COMMUNICATION SKILLS AND GENERAL KNOWLEDGE DOMAIN IN 2009. SOURCE: (4).....	29
FIGURE 6. PERCENTAGE OF BOYS AND GIRLS SCORING BELOW THE 15TH PERCENTILE ON THE PPVT-III IN THE LSAC STUDY. SOURCE: (94).....	29
FIGURE 7. PISA READING TREND FOR 15 YEAR OLDS 2000 TO 2009. SOURCE: (97-100).....	30
FIGURE 8. SOUTH AUSTRALIAN YEAR 3 (8 YEARS OLD) READING TREND FROM 2008-2011. SOURCE: (102-105)	31
FIGURE 9. SOUTH AUSTRALIAN YEAR 5 (10 YEARS OLD) READING TREND FROM 2008-2011. SOURCE: (102-105) ..	32
FIGURE 10. SOUTH AUSTRALIAN YEAR 7 (12 YEARS OLD) READING TREND FROM 2008-2011. SOURCE: (102-105) 32	
FIGURE 11. SOUTH AUSTRALIAN YEAR 9 (14 YEARS OLD) READING TREND FROM 2008-2011. SOURCE: (102-105) 33	
FIGURE 12. PISA MATHEMATICS TREND 2000 TO 2009. SOURCE: (97-100).....	35
FIGURE 13. YEAR 3 (8 YEARS OLD) NUMERACY TREND FROM 2008-2011. SOURCE: (102-105)	35
FIGURE 14. YEAR 5 (10 YEARS OLD) NUMERACY TREND FROM 2008-2011. SOURCE: (102-105)	36
FIGURE 15. YEAR 7 (12 YEARS OLD) NUMERACY TREND FROM 2008-2011. SOURCE: (102-105)	36
FIGURE 16. YEAR 9 (14 YEARS OLD) NUMERACY TREND FROM 2008-2011. SOURCE: (102-105)	37
FIGURE 17. PERCENTAGE OF 20 TO 24 YEAR OLDS WITH YEAR 12 OR HIGHER FORMAL QUALIFICATION FROM 2002 TO 2011. SOURCE: (114)	38
FIGURE 18. FIELD OF STUDY BY GENDER. SOURCE: (118)	40
FIGURE 19. PERCENTAGE OF 15 TO 19 AND 20 -24 YEAR OLDS NOT FULLY ENGAGED IN EDUCATION OR EMPLOYMENT. SOURCE: (114)	42
FIGURE 20. STARTING SALARY WITH BACHELOR DEGREE 2001 – 2011. SOURCE: (114).....	43
FIGURE 21. AVERAGE STARTING SALARY (\$'000) OF BACHELOR QUALIFIED MALES AND FEMALES FROM 2001 – 2011. SOURCE: (124).....	43
FIGURE 22. NUMBER OF RECORDED CRIME OFFENDERS IN SOUTH AUSTRALIA FROM 2008-09 TO 2010-11 BY GENDER AND AGE	45
FIGURE 23. PERCENTAGE OF BOYS AND GIRLS IN SOUTH AUSTRALIA VULNERABLE ON THE AEDI COMMUNICATIONS SKILLS AND GENERAL KNOWLEDGE DOMAIN BY SEIFA QUINTILE IN 2009. SOURCE: (4)	48

List of Tables

TABLE 1. SUMMARY OF GENDER DIFFERENCES	47
--	----

1. Executive Summary

The results of the 2009 Australian Early Development Index (AEDI) highlighted large differences between South Australian boys and girls in child development outcomes at school entry. The Department for Education and Child Development commissioned this report to understand how such gender differences in early childhood may influence outcomes later in life. The report includes gender differences in education, health and social circumstances across the life-course. Knowledge of this evidence base is crucial if we are to improve outcomes for all children and young people and reduce inequity.

This report is a review of selected research studies and reports on gender differences across the lifespan. South Australian data is considered where it is available.

Much time and research has been devoted to identifying the differences between males and females and the potential reasons for these differences. Within the literature, four possible reasons for gender differences are generally cited. These are:

- Biological/genetic differences – sex hormones and chromosomes help to shape our neural systems which may in turn limit the future capabilities of males and females.
- Evolutionary developmental differences – males and females are predisposed to interact differently with their early environments leading to the development of different strengths and weaknesses.
- Early environmental differences – different preferences and developmental outcomes emerge as a result of differences in the early environments of boys and girls.
- Interaction between biology/genes and the environment – termed epigenetics, this explanation incorporates differences in both the biology of males and females and the differences in the environments in which they are raised.

We next turn to the research literature and review the published findings regarding the differential performance of males and females across a number of domains – health, social and emotional, language and cognitive skills, education, employment and crime.

Health

Differences in health are observed between boys and girls from birth with more girls born at low birth weight than boys. However, boys tend to be more likely to suffer from congenital abnormalities, and are more likely to have developmental disorders, including intellectual disability, reading disability (dyslexia), attention deficit and hyperactivity disorder, and autism spectrum conditions. A higher proportion of girls are reported as suffering from mood and anxiety disorders than are boys. Suicide rates show that more females attempt suicide but more males commit suicide.

Social and Emotional Development

There are also differences in the social and emotional development of males and females. Boys are more likely to have problems with their behaviour – they are more likely than girls to bully and to be disruptive in the classroom environment.

Males tend to have higher self-esteem than females and there are also gender differences in temperament. Gender differences are prominent for effortful control of emotions, attention and behaviour – areas where girls tend to score more highly. Boys score more highly on aspects of surgency, including deriving more pleasure from high intensity activities and games, and having higher levels of activity and impulsivity than girls.

Language and Cognitive Skills

The language domain is one in which it is generally assumed that girls outperform boys. Research has shown that in the first 30 months of life, girls are exposed to more language than are boys. In terms of verbal communication, however, while girls usually do outscore boys, the size of this difference is actually very small with researchers generally concluding that there is no practical difference in verbal ability between boys and girls. On average, females tend to outscore males on tests of reading literacy. However, it has been noted that it is not a case of all females outscoring all males, but rather there are more males at the lower end of the distribution, dragging down their overall mean score relative to that of females.

Tests of numeracy tend to show a different result to that of reading literacy with males, on average, outscoring females. Again, the distribution of the scores can help to explain this result. For numeracy, there are more males scoring at the top end of the scale, this time raising the mean score of males relative to that of females. Research suggests that the size of any difference between the mathematics performance of males and females is small.

Educational outcomes

Females tend to do better than males on a range of educational outcomes. Girls are less likely to repeat school grades and are more likely to complete school than are boys. For those who do finish school, it is girls who tend to obtain the highest university entrance scores. Relatedly, females are also more likely than males to enrol in undergraduate university courses, but this trend reverses in terms of postgraduate enrolment. Males may be the minority in undergraduate university degrees but they dominate in apprenticeship enrolments.

The subject choice of males and females at school also vary with males more likely to be enrolled in advanced mathematics courses, the physical sciences and technology. Girls tend to enrol in basic mathematics courses, biological sciences and humanities subjects. These subject choices flow on into employment domains for males and females and can influence their employment outcomes.

Employment

Males tend to earn higher salaries than females though this is likely the result of the domains of employment into which men and women enter. The subject choices preferred by males at school and university tend to lead them into careers which attract higher salaries than the career paths favoured by women. There is not a consistent difference in the rate of unemployment for males and females month to month. However, as more males participate in the labour force, greater numbers of men are unemployed than women (2). Whilst fewer women are unemployed, lower workforce participation contributes to lower life-time earnings for females and lower economic productivity.

Crime

Males are far more likely to be the perpetrators of crime than are females. The arrest and conviction rates of both adult and juvenile males are much higher than for their female counterparts. When the trajectories of male and female offending are examined it is evident that for males offending rates are trending downwards or remaining constant for some types of crimes. For females, offending rates seems to be increasing for a number of types of crimes.

Summary

The research literature suggests that in some domains females are doing better than males but in other domains the reverse is true. In other areas, researchers generally find that there are no meaningful differences between the genders.

When we look across the lifespan we see that females are doing better in terms of educational outcomes. Females are completing high school, attending university and obtaining degrees in higher proportions than are males. However, many more males are completing apprenticeships. In employment, it is males who are doing better than females, with more men in employment and earning higher salaries than women.

On the negative side, it is males who are more likely than females to have special needs and experience developmental disorders. More boys also have behavioural problems, including bullying and disruptive classroom behaviour, and are more likely to repeat grades at school and to be perpetrators of crime.

Of the domains considered in this report, the evidence suggests that few of the differences between males and females are caused by unmodifiable genetic or biological differences (exceptions include some specific developmental disorders such as Autism Spectrum Disorder). Therefore, there is reason to consider how the 'social pathways' operating through families, early childhood settings and education system could be modified through interventions. Evidence suggests that interventions do not need to be gender specific and that the 'dosage' of positive interventions provided should be equivalent for males and females.

The research literature also suggests that gender at best explains a small amount of variation in the differential outcomes of individuals. Rather than intervene on the basis of gender alone, efforts to intervene and improve the life outcomes for those from low socioeconomic status backgrounds and ethnic minorities, in some instances in combination with gender, may be more worthwhile. The service mix should be proportional to the distribution of need. If a larger number of boys than girls are struggling in a particular domain and the rate is higher in areas with low socioeconomic status, the access to and the uptake of services should reflect this distribution of need.

2. Introduction

Investigating differences between males and females has been the focus of much research over the years. While males and females are biologically different, researchers are interested in whether, and in what domains, these biological differences translate into other areas of life.

What follows is a review of a sample of the published literature on research into gender differences across the lifespan in a number of domains – health; social and emotional; language and cognitive skills; education; employment; and crime. We seek to summarise these findings, with the aim of establishing the domains in which males and females differ or, alternately, are similar.

If it is established that either males or females are disadvantaged relative to the other we can consider potential avenues for future research, policy, or practice initiatives in an attempt to ‘level the playing field’ between men and women.

We will also examine the extent to which gender differences or similarities prevail in the research literature and whether these differences or similarities are also present in South Australia (where possible).

The literature covering gender difference across the lifespan is vast and it should be noted that the literature covered here is not exhaustive. Existing reviews of literature and meta-analyses have been summarised where appropriate and interested readers are directed to consult these for further detail. Additionally, the recent worldwide focus on improving educational outcomes for boys, culminating in Australia with a Parliamentary Inquiry into boys education in 2002 called *Boys: Getting it Right* (3), has also produced some thorough literature reviews on gender differences in educational outcomes for boys and girls.

3. Reasons for undertaking this study

In 2002 the Commonwealth Employment, Education and Workplace Relations Committee released its report, *Boys: Getting it right, Report on the inquiry into the education of boys* (3). The report noted the gap between boys and girls in academic achievement, school participation and higher education. Australian and international data shows that there is still a gap in educational outcomes between boys and girls.

For instance, large differences are observed between South Australian boys and girls in child development outcomes at school entry. The 2009 Australian Early Development Index (AEDI) census collected data on approximately 97% of South Australian children in their first year of formal schooling over May – July 2013 (4). Across the five developmental domains assessed, the data showed a difference in the proportion of ‘developmentally vulnerable’ boys and girls (i.e. scoring at the 10th percentile or below) ranging from 2.5 to 11.2 percentage points. Furthermore, whilst there is a socioeconomic gradient which affects all children, the developmental differences between boys and girls appear to be further compounded by children’s socioeconomic background. For example, on the emotional maturity domain, the difference in developmental vulnerability between girls living

in the wealthiest 20% of suburbs and boys living in the poorest 20% of suburbs is 19.9 percentage points.

These results prompted us to ask whether these gender differences were apparent across the lifespan, whether they were observed across different domains of development and across life outcomes. Further, we wanted to know what the existing evidence base could tell us about the delivery of interventions to maximise child development outcomes overall and reduce inequities.

This Fraser Mustard Centre project was commissioned by the Office for Strategy and Performance in the Department for Education and Child Development to document this trend in South Australia, understand the trajectories of boys as compared with girls, identify the drivers of these developmental pathways and identify potential strategies for intervention. The project has aimed to test whether there is a sufficient policy rationale for government to implement new strategies to respond to this issue and, if so, present options forward.

The aims of the project were to:

- 1. Undertake a critical literature review of the potential impacts of developmental and educational gaps between boys and girls, including an assessment of the scale of the issue, covering:**
 - Health, including mental health
 - Social and emotional development
 - Language and cognitive skills, including NAPLAN
 - Further education pathways
 - Employment options
 - Crime
- 2. Undertake a critical literature review of the primary causal drivers of developmental and educational gaps between boys and girls, considering:**
 - To what extent is the evidence base clear about the causes and/or risk factors underlying the gap between boys and girls?
 - To what extent does the evidence base explain why some boys and some girls are struggling whilst others are thriving? Are the causes of poor outcomes qualitatively different for boys and compared to girls?
 - Is there a strong rationale for further investigating responses to boys in the schooling system
 - Is there a strong rationale for further investigating the drivers of the gap between boys and girls outside the school system?
- 3. Undertake and present data analysis which further investigates potential drivers of the gap between boys and girls and describes the scale of the issue relative to other factors.**

4. Possible causes of gender differences

Before considering the domains in which males and females may differ it is first helpful to understand the causal pathways to later developmental and educational differences. The influence of biological differences between the sexes, social gender constructs, early environmental differences, and an interaction between genes and environment have all been studied by way of explaining developmental and educational outcomes.

4.1 Biological/genetic differences

There is a growing literature about biological sex differences that are proposed to contribute to gender differences in performance on measures of developmental and educational success (5). Primarily this literature has focused on the role that sex hormones and sex chromosomes play in the formation of neural systems (6).

Basically, this line of research investigates the role that genetic, neural (brain) and biochemical differences between males and females play in producing differences in abilities and behaviours. Whilst this body of research is relatively large, four factors limit the generalisation of the findings to neurotypical development in boys and girls. First, brain imaging research that has reported functional (7, 8) and structural (9) differences in boys and girls has relied on relatively coarse measurement of brain structure and function that are not well suited to measuring subtle differences in the development of neural networks. Recent research has begun to utilise more detailed brain imaging techniques (such as diffusion tensor imaging) that are able to map neural networks at a level not previously possible (6). Second, human studies examining the influence of hormones on development have generally used samples of convenience (e.g., high risk pregnancies, children with autism) that are not representative of the broader population (often the same sample is used across a multitude of studies) (10-12). Third, it has not been possible to ethically measure specific concentrations of sex hormones during key stages of brain development (8 – 24 weeks gestation) and instead research has relied on available measures (e.g., levels in amniotic fluid) that have not been reliably linked to actual foetal hormone levels (10). Finally, biological research is often cross-sectional and is therefore unable to provide a clear picture about developmental progress across the lifespan. Longitudinal research is needed to better differentiate between the effects of genes and the environment in order to gain a better understanding of the effect of early biological differences on later measures of educational success.

One study investigating the effects of testosterone on brain development shows some potential for explaining delayed development in some boys (10). This literature suggests that very high levels of foetal testosterone might be problematic for the development of language systems in boys, and this avenue of biological research warrants further investigation. In the first instance this research needs to be replicated in an unbiased sample rather than in a sample of convenience that is made up of a high risk population.

4.2 Evolutionary developmental differences

Related to the biological differences perspective is the evolutionary differences debate.

Evolutionary researchers posit that developmental differences between boys and girls result from different and innate predispositions to interact with early environments (13, 14). As a result of these different predispositions and early experiences, boys and girls are thought to develop differing strengths and weaknesses. For example, different toy and play preferences, as well as differences in social orienting, are thought to lead boys to be better at spatial orientation and working out the physical world and to make girls more socially astute and empathic. Researchers have proposed that a tendency of girls to gravitate to social forms of play results in acquisition of language earlier than their male counterparts and that boys' interest in functional aspects helps to ready them for male oriented work (13-15).

Research fails to definitively 'prove' the role of innate differences produced by evolutionary processes and is limited in a number of ways. First, most research is cross-sectional; therefore differences between early preferences should not be assumed to be the cause of later preferences or abilities. Second, early human infant research that has reported gender differences in toy preferences has not been replicated and suffers potential bias (16). Third, findings on predispositions have not been related to substantial and reliable later differences in the abilities of men and women (17). Finally, the reliance on animal research to demonstrate human behavioural differences born from evolutionary pressures is problematic when generalising findings to the more complex development of language systems in humans (16).

4.3 Early environmental differences

In contrast to evolutionary researchers, social researchers have proposed that differences in the preferences and developmental outcomes of boys and girls relate to differences in their early experiences. Longitudinal research consistently identifies children's early environments as being of vital importance to their development and later life outcomes (18).

Knowing how important early environments can be for children's development, researchers have begun to examine whether there are differences, on average, in how boys and girls are parented and treated that might account for later differences in outcomes. A range of research has studied gender differences in interactions between parents and their children and their relation to child behaviour and later outcomes (e.g., 19, 20-22). A comprehensive meta-analysis of this body of research is needed to bring together and better understand the implications of this diverse field of research.

In addition to reporting gender differences in parenting style, research has reported gender difference in parents' language usage with their children and the amount of talk between parents and children (23). This research has demonstrated that on average mothers speak more to their daughters than they do to their sons, and that on average girls have a more developed vocabulary

than boys. A gap in this research is analysis of gender differences in language outcomes of boys and girls with similar language exposure. Presently, a finding of an average difference in both environment and outcomes offers no understanding of causal pathways. For instance, more language exchanges between girls and mothers might be a result of characteristics of girls that contribute to both greater parental talk elicitation and increased language development.

Taken together, findings from parenting research generate questions about whether boys and girls who are exposed to similar early environments develop similarly. Although there is a large literature about the role of the environment in child development, there is much more to be done to understand the ways in which environments differ for boys and girls, why they differ, the extent to which this is true across cultures, and the extent to which these differences affect girls and boys. Especially vital is longitudinal research to better understand the long-term contribution of any gendered parenting differences to the developmental and educational outcomes for boys and girls.

4.4 Interaction between biology/genes and the environment

Although we know that early environments are very important for children's outcomes, most of the variation in outcomes cannot be explained by the environment alone. Increasingly, researchers are seeking to understand the interaction between genes and the environment, termed epigenetics (24). In relation to differences between boys and girls and their outcomes, epigenetic research has the potential to help us understand which girls and boys will do well or poorly given particular types of environments. This line of research, however, is still emerging and there is some way to go before any conclusions can be drawn about the interactions between genes and the environment.

Interactions between biology and the environment have also been studied by way of measuring the interaction between child temperament and parenting (21, 22, 25). However, gender effects are often not reported separately (e.g., 26, 27). This line of parenting research has generally focused on outcomes related to poor or negative parenting practices and, therefore, an understanding of how positive parenting practices enhance outcomes, rather than how negative parenting restricts outcomes, is needed (for a comprehensive review see 28).

We now turn to reviewing the literature on gender differences in a number of domains across the lifespan, beginning with the health literature.

5.1 Birth weight

Children are commonly classified as being born with ‘low birth weight’ if they are born weighing less than 2500 grams (29). Low birth weight is associated with increased risk of later life health problems, such as hypertension, diabetes (30), and cardiovascular disease in women (31), and with poorer educational outcomes, including lower IQ, school completion rates, post school study and higher rates of repeating school grades (32).

In their classic paper, Naeye and colleagues (33) found that more boys than girls were born with low birth weight, a finding they termed the ‘male disadvantage hypothesis’. More recent research has found that it is actually girls who are born with significantly lower birth weight than boys and that more girls are classified as “very low birth weight” than are boys (see, for example, 34).

Figure 1 shows that in South Australia between 2006 and 2009, a greater percentage of girls were born with low birth weight than were boys.

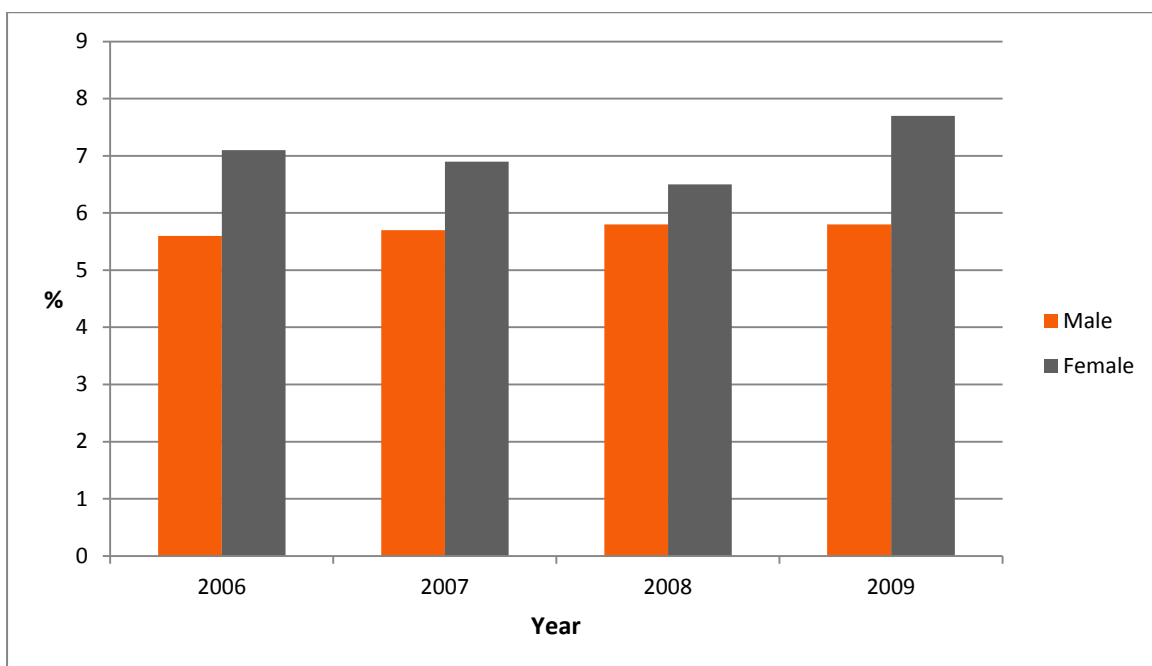


Figure 1. Percentage of low birth weight (< 2500 g) boys and girls born in South Australia from 2006-2009. Source: (35)

5.2 Developmental disorders

A broad range of disorders emerging in early childhood are grouped together and referred to as Developmental disorders (36). Developmental disorders include (note: the following list is provided by means of example and is not intended to be exhaustive):

1. Learning disorders (disorders affecting the brain's ability to receive and process information)
 - a. Dyslexia
 - b. Dyspraxia
 - c. Dysgraphia
 - d. Dyscalculia
 - e. Central auditory processing disorder
 - f. Non-verbal learning disorders
 - g. Visual perceptual/visual motor deficits
2. Language disorders
3. Motor disorders
4. Neurodevelopmental disorders
 - a. Attention Deficit Disorder / Attention Deficit Hyperactivity Disorder
 - b. Autism Spectrum Conditions
 - c. Childhood Schizophrenia
 - d. Foetal alcohol syndrome
 - e. Genetic disorders
 - f. Down Syndrome
 - g. Traumatic brain injury
5. Behavioural disorders
 - a. Oppositional defiant disorder
 - b. Conduct disorder

Figure 2 shows the proportion of boys and girls in each Australian state and territory who were identified by their teachers in the Australian Early Development Index (AEDI) 2009 data collection as having diagnosed special needs upon school entry. Special needs status in the AEDI refers to children with chronic physical, intellectual and/or medical needs (4).¹

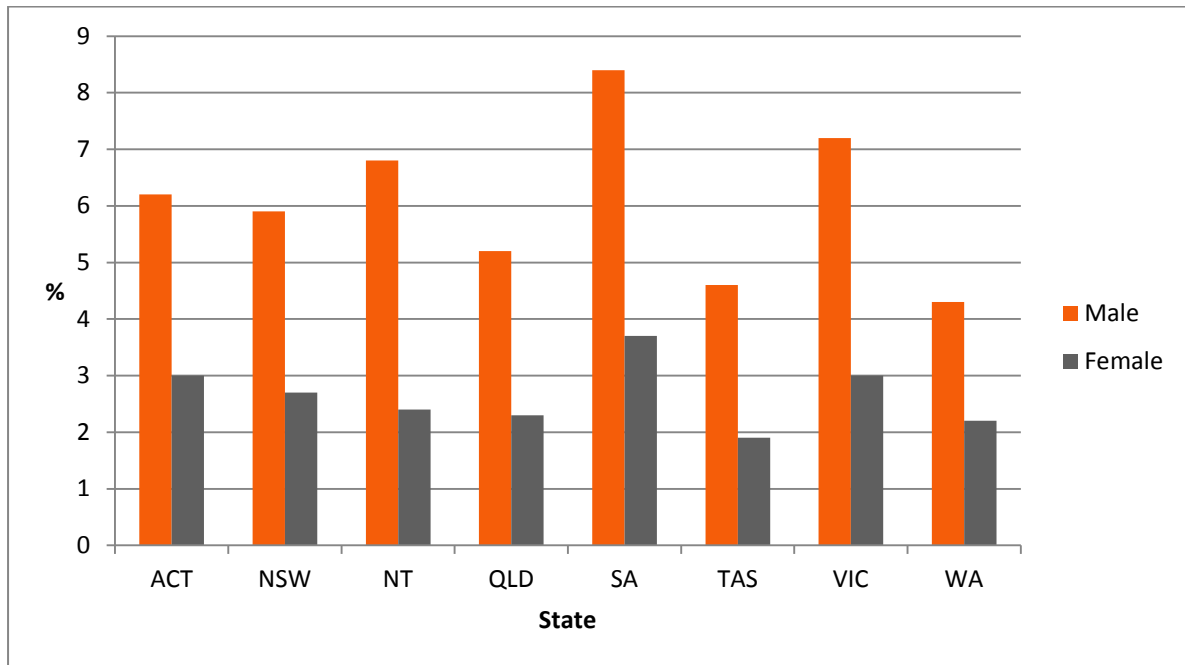


Figure 2. Percentage of boys and girls with identified special needs upon school entry in 2009 (as identified by their teachers when completing the Australian Early Development Index). Source: (4)

There is no population prevalence data for developmental disorders. A number of studies have, however, estimated prevalence rates for specific disorders, and these are outlined below.

¹ It should be noted that different jurisdictions and school systems have different criteria for determining whether a child has 'special needs' or a disability.

5.2.1 Congenital abnormalities

Congenital abnormalities are conditions which are present from birth. These can be chromosomal or they may involve a specific physical structure, such as the brain, heart, circulatory system, renal system, nervous system, gastrointestinal system, or limbs. Congenital abnormalities tend to be more common in boys than in girls, though there are a minority of congenital abnormalities for which the prevalence is higher for girls (37, 38). South Australian prevalence data from 2001-2007 shows that a higher proportion of males have congenital abnormalities than females (see Figure 3).

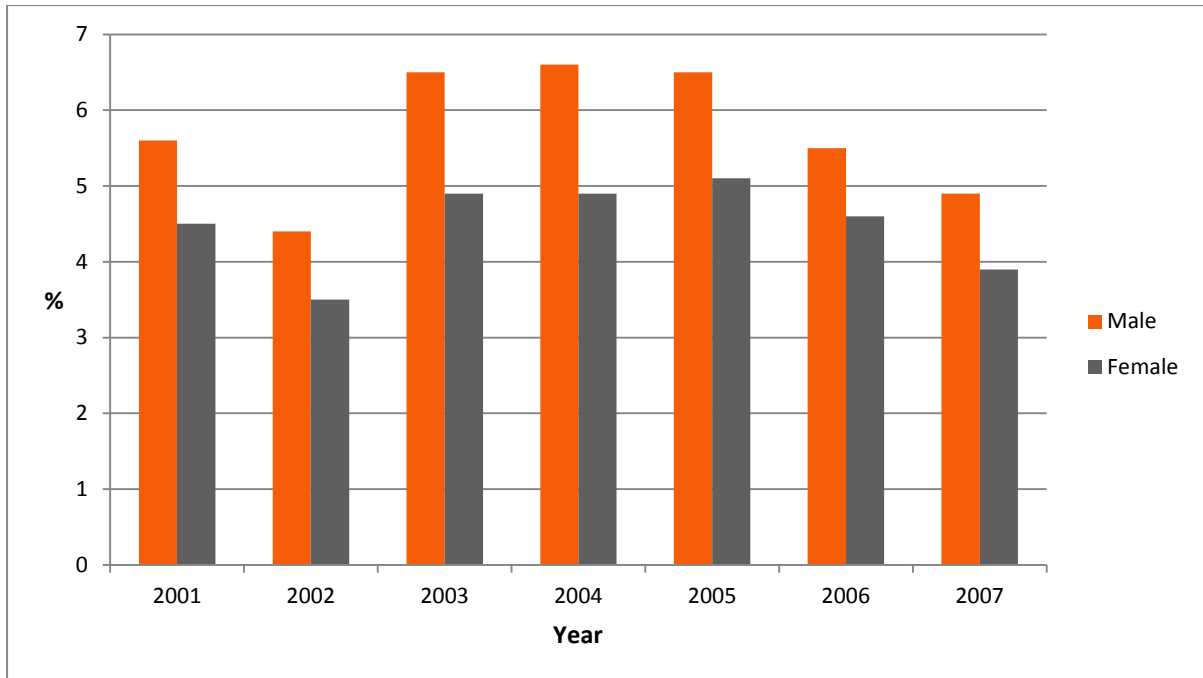


Figure 3. Percentage of boys and girls born in South Australia with a congenital abnormality from 2001 – 2007. Source: (39)

5.2.2 Intellectual disability

The World Health Organization defines intellectual disability as “a significantly reduced ability to understand new or complex information and to learn and apply new skills” (40, para. 1). An intellectual disability often involves problems with communication and it is this that differentiates it from other forms of disability (41). Estimating prevalence rates for intellectual disability has been complicated by potential underreporting in some age groups (e.g., children under the age of 5) but in Australia, the prevalence of males with an intellectual disability was higher than for females (41). Cross-sectional data of intellectual disability in Australia in 2003 demonstrates variability of rates across the age groups (see Figure 3). Early in life the largest gender differences are between the ages of 5 and 14 and this difference is subsequently reduced. The increased prevalence of intellectual disability in the later years (from age 75) is driven primarily by the increase in dementia and associated conditions, with higher prevalence for women.

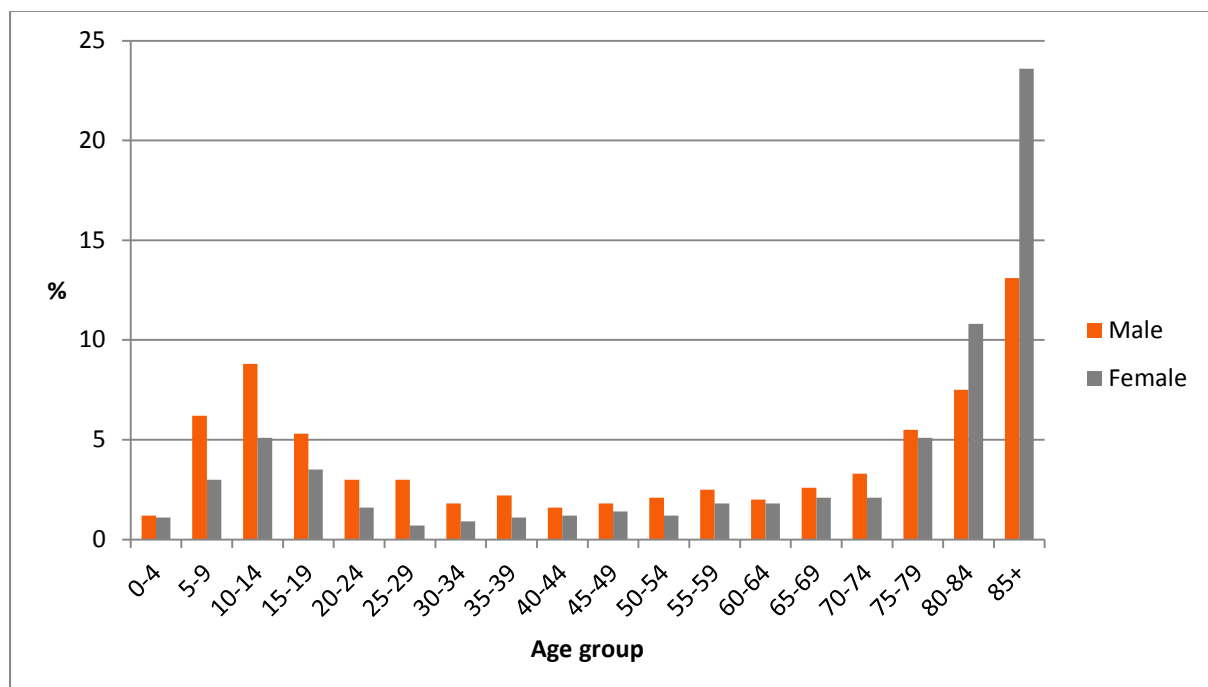


Figure 4. Cross-sectional age group data from 2003 showing the prevalence (%) of intellectual disability in Australia across the lifespan. (Note that intellectual disability here also includes those with Attention Deficit Hyperactivity Disorder (ADHD), autism and dementia). Source: (41)

5.2.3 Reading disability (dyslexia)

Boys are more likely to suffer from reading disability (or dyslexia) than are girls (42-45). However, the definition of what constitutes reading disability differs widely between studies and some previous meta-analytic² work has been criticised for ignoring this variation (44, 46). Although there are differences between studies in the definition of reading disability, the results from larger scale

² See box on page 27 for a definition of meta-analysis.

and total population epidemiological studies strongly suggest that there are many more boys with reading disability than girls (45, 47).

In response to this problem of differing definitions, Siegel and Smythe (46) analysed longitudinal data from a large Canadian sample. They found that girls outperformed boys in Grade 1 tests of letter identification and word and pseudoword reading scores but that on all other reading tests between Grades 1 and 5, there was no significant difference in reading performance between boys and girls (with the exception of word identification scores in Grade 4). When the authors looked at data just from those children who had been identified as having reading disability they found no significant difference in the proportions of boys and girls beyond Grade 1.

This finding is consistent with other research which has suggested that the often reported overrepresentation of boys with reading disability may be the result of referral bias related to behavioural problems rather than a meaningful difference (48, 49). When schools were asked to identify children with reading disabilities, boys were two to four times more likely to be identified than girls. When research methods examining the discrepancy between ability, as measured by the Wechsler Intelligence Scale for Children, and reading performance were used to identify children with reading disability in schools no gender difference was identified (48).

However, Rutter and his colleagues (45) argued that the sample used in the study of Shaywitz and colleagues (48) was too small to conclude that there was no significant gender difference in reading disability.

5.2.4 Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) has an estimated prevalence of 3–7% in children of school age. There are three subtypes of ADHD: Predominantly Inattentive Type, Predominantly Hyperactive-Impulsive Type, and Combined Type (36). It is widely accepted, and research has consistently found, that boys are more likely than girls to be diagnosed with ADHD (50-52), with the gender ratio reported to vary between 2:1 and 9:1 (52). A recent Australian study found that in a clinical sample the gender ratio was 4:1 (53).

However, research on gender differences in ADHD has been severely limited by the smaller number of girls who are diagnosed with the disorder (51, 52, 54). Research that has looked at gender differences in ADHD suggests that girls are more likely to have the Predominantly Inattentive subtype of ADHD and as a result exhibit far fewer disruptive behaviours than boys (51). This lack of disruptive behaviours in girls with ADHD makes them less likely to be referred by their teachers and parents for assessment and as a result a substantial number of girls who meet the criteria are not being diagnosed with ADHD. In addition, there has been some concern that the diagnostic criteria for ADHD are worded in a way that more closely represents the behaviours of boys with ADHD than girls with ADHD, again resulting in the under-diagnosis of girls with this disorder.

Children with ADHD are more likely than others to experience a wide range of other conditions that can influence their later health and development. These conditions include: low self-esteem, poor

coping skills, lower IQ and intellectual functioning, anxiety, depression, oppositional defiant disorder (ODD), conduct disorder (CD) and school suspensions (51, 52).

5.2.5 Autism Spectrum Conditions

Males are much more likely to be diagnosed with an Autism Spectrum Condition (ASC) which includes classic autism and Asperger Syndrome (AS) than are females. The ratio of this gender difference has been reported to be as high as 11:1 for AS specifically (55) and around 4:1 for classic autism (56, 57). Calculating the prevalence rates and gender ratio of ASC in Australia has been problematic but has also been estimated at about 4:1 (58).

The reasons for this gender imbalance in ASC are as yet unknown though it has been suggested that AS may be difficult to diagnose in females as it may present itself as another condition and can often be more subtle in females. It has also been suggested that there may be biological differences between males and females that result in this gender imbalance (5, 59).

5.3 Mental Health conditions

5.3.1 Depressive disorders

Research consistently shows that females are more likely than males to experience depressive disorders with the gender ratio often cited as 2:1 (60-65). The gender difference in depressive disorders is thought to emerge around the onset of puberty, at about 10-12 years of age. Between the ages of 15 and 30 the gender difference in prevalence of depressive disorders is thought to be at its greatest, and gradually diminishes, though never completely disappears, with increasing age (65).

A large body of research has been devoted to investigating the reasons for the observed gender difference in depressive disorders. In particular, researchers have tried to establish whether this gender difference is a real phenomenon or is rather the results of artefacts such as an underreporting of depressive symptoms by males, an increased likelihood for females to seek help for their symptoms and the use of depression scales which describe symptoms that better reflect the female experience of depressive disorders in the diagnosis (60, 61, 64). While it is acknowledged that factors such as these may exacerbate gender differences in the prevalence of depressive disorders they do not explain the difference in its entirety and the difference is real (64).

5.3.2 Anxiety disorders

It is a well-accepted finding in the research literature that more females suffer anxiety disorders than do males (66-68). The *Diagnostic and Statistical Manual of Mental Disorders*, a commonly used resource for classifying mental disorders, covers several different types of anxiety disorders, including: generalized anxiety disorder, panic disorder, agoraphobia, specific phobia, social phobia, obsessive-compulsive disorder, posttraumatic stress disorder, and acute stress disorder (36). For

each of these types of anxiety disorders, the prevalence rates are higher for females than for males (66).

The gender difference in anxiety disorder prevalence begins from a young age. By age 6, research has found that girls are twice as likely as boys to have experienced an anxiety disorder (68).

There is not a strong body of research on the potential reasons that may lie behind this gender difference in anxiety disorders and those described in section 4 of this report have been suggested. An additional hypothesis is that the reported prevalence rates for each gender are distorted because it is females who are more likely to seek help for their anxiety disorders and there is therefore an underreporting of males who suffer anxiety disorders (67).

5.4 Suicide

Suicide is a leading cause of death among young adults (69, 70) and the suicide rate is higher for males than for females (71, 72). However, there is what has been termed the 'gender paradox in suicide' (72). The paradox is that while males are more likely than females to commit suicide, females are more likely to experience suicidal ideation and to attempt suicide than are males (71, 72). This gender paradox has also been identified within different cultural groups (70). The gender gap in suicide attempts is highest in adolescence and closes slightly in early adulthood (71, 73).

It is consistently found that females tend to choose less violent methods that are less likely to be immediately lethal for their suicide attempts than men. For women the more common methods for suicide attempts include carbon monoxide poisoning, overdose and drowning, while men are more likely to die from cutting, jumping, hanging, or the use of a firearm (72, 74). Reasons for this gender difference in method of suicide attempts remain largely unknown (70).

The fact that the suicide attempts of women are less likely to be immediately fatal has two major consequences. First, the methods generally favoured by females lend themselves to being misclassified as accidental death rather than suicide in coroner's reports which may mean there has been an underreporting of female deaths by suicide (72). Second, to the extent that the methods used for female suicide attempts are not immediately fatal, it is more likely that females will survive their suicide attempts than males will. The best predictor of future suicide attempts and completions is a prior suicide attempt (73, 75, 76). Therefore, it may be that because females are more likely to survive their suicide attempts they are also more likely to attempt suicide again, thus driving the finding that females attempt suicide more than males.

6.1 Behaviour

6.1.1 Aggression

Hyde (77) carried out a meta-analysis involving 143 studies that had looked at gender differences in aggression. Various types of aggression were considered and collapsed in the meta-analysis, including, physical, verbal, fantasy, mock-fighting, willingness to shock or otherwise hurt, imitative, and hostility. The meta-analysis resulted in a small overall mean weighted effect size of 0.5, indicating a medium effect where males are more aggressive than females (see Box 1 on page 27 for an explanation of effect sizes). The analysis was also calculated separately for those studies involving children under six years of age (effect size = 0.58) and college students (effect size = 0.27), with males the most aggressive in each age group.

6.1.2 Bullying

Relatedly, research has found that boys are more likely to bully than are girls. The mechanism of bullying is also different for boys and girls. Boys are more likely to be the victims and perpetrators of direct bullying, e.g. physical confrontations, and girls are more likely to be the victims and perpetrators of indirect bullying e.g. name calling (78, 79). Other research finds that boys are also more likely to cyberbully (a new form of online bullying) than are girls (80).

6.1.3 Disruptive classroom behaviour

The research literature is divided about whether or not there are gender differences in disruptive classroom behaviour. Some researchers report finding that boys are more disruptive than girls while others report similar levels of disruption and inattention related to language ability (81). It has been suggested that disruptive classroom behaviour may be an indication that a child requires additional learning help, particularly with language skills, and that it is boys who are more likely to require this assistance (81).

Analysis of data from a large longitudinal cohort in New Zealand found that teachers reported that their male students at ages 6, 8, 10 and 12 were more likely than their female counterparts to engage in distractible, restless and inattentive behaviour, as well as aggressive anti-social or oppositional behaviour. The effect sizes were moderate (0.34 to 0.63) (82).

6.2 Self-esteem

A 1999 meta-analysis looking at gender differences in self-esteem identified a small difference (effect size = 0.21) across 216 independent effects in favour of males (83). For the purposes of this meta-analysis, self-esteem was looked at in a global sense rather than domain-specific self-evaluations. Global self-esteem can be defined as “the level of global regard that one has for the self as a person” (Harter, 1993, p.88 cited in 83). Not only was a significant gender difference identified overall across the included studies, but male self-esteem was consistently higher – in 83% of the samples.

6.3 Temperament

There are several theoretical models of temperament that differ in their focus and the dimensions used to define the concept of temperament. To explore gender differences in temperament, we focus on the Psychobiological Approach of Rothbart (84) as this model focuses on both emotional reactivity and self-regulation. Emotional reactivity refers to differences between children in their emotional and physical (motor) reactions to people, places and objects. Self-regulation refers to differences in children’s ability to regulate or control these dispositions. Both aspects of temperament are important and have been shown to predict a range of outcomes in childhood and adolescence including externalising and internalising behaviour problems and poor cognition (85-87).

A recent meta-analysis explored gender differences in temperament among children aged 3 months to 11 years (88) and grouped results for each of the three main temperament models, including the Psychobiological Approach. Gender differences in two aspects of emotional reactivity (negative affectivity, surgency) and one aspect of self-regulation (effortful control) are presented below for the Psychobiological Approach.

6.3.1 Negative Affectivity

Negative affectivity refers to the tendency to experience negative emotions such as fear, anger/frustration, sadness, irritability, frustration and discomfort. In this meta-analysis, nine dimensions of negative affectivity were included within the psychobiological model: anger/frustration, difficult, discomfort, distress to limits, fear, negative affectivity, pleasure, sadness, and soothability. Small gender differences were identified for the fear dimension with girls scoring slightly higher than boys on fear (effect size = 0.12). Overall there were minimal gender differences in negative affectivity.

6.3.2 Surgency

Surgency refers to a combination of positive emotions (laughing, smiling), rapid approach and high activity levels. In this meta-analysis, seven dimensions of surgency were included within the Psychobiological model: activity level, approach, high-intensity pleasure, impulsivity, shyness, smiling and surgency. Boys showed significantly higher mean scores on surgency (effect size = 0.55), high intensity pleasure (effect size = 0.30), activity (effect size = 0.23) and impulsivity (effect size = 0.18). Most of these differences are related to high activity levels rather than differences in the presence or absence of positive emotions (e.g., smiling, shyness).

6.3.3 Effortful Control

Effortful control is an aspect of self-regulation that enables a child to control their emotions, attention and behaviour. In this meta-analysis, seven dimensions of effortful control were measured within the Psychobiological model: attention focus, attention shifting, effortful control, inhibitory control, interest, low intensity pleasure, and perceptual sensitivity. Statistically significant gender differences, all in favour of girls, were identified for six of the seven dimensions (no gender difference was evident for interest). The effect sizes were small for most dimensions (ranging from 0.16 for attention focus to 0.41 for inhibitory control) but were large for effortful control with girls scoring a full standard deviation higher than boys on this dimension.

Overall, there was limited evidence of any gender differences in negative affectivity, both boys and girls seem to have a similar tendency to experience negative emotions in infancy and childhood. Similarly there was little difference in the positive emotional aspects of surgency (e.g., smiling). However, boys were much more likely to have high levels of activity, impulsivity and experience pleasure from high intensity activities and games. This is consistent with previous research showing that boys are much more likely to be diagnosed with ADHD (as discussed in section 4.2.4). Girls appear to be much better at regulating and controlling their natural tendencies to respond in specific ways. Thus, even if girls have levels of emotional reactivity that may be problematic in social situations, at school or at home, they seem to have better impulse control and are better able than boys to regulate their behaviour.

Box 1. What is an effect size?

An effect size is a statistic which estimates the size of a phenomenon, such as the magnitude of the relationship between two variables (for example, between gender and oppositional behaviour) or differences in scores between groups (e.g. the difference between boys and girls on tests of literacy).

Where statistical significance tells us that there is a meaningful association or meaningful difference between two groups, as the names suggests, an effect size tell us about the magnitude of this effect.

Calculating statistical significance involves consideration of the size of the sample whereas calculation of an effect size does not. A result can be statistically significant when the sample size is very large even when the actual magnitude of the effect is very small. Therefore, effect sizes allow us to judge a result based on its practical, rather than statistical, significance.

Cohen's d

There are several different types of effect size statistics that can be calculated. Unless otherwise specified, effect sizes in this report are *Cohen's d*. *Cohen's d* is calculated by subtracting one mean (e.g. girls' literacy score) from the other mean (e.g. boys' literacy score) and then dividing this difference by an estimate of the standard deviation of the population. *Cohen's d* is therefore in standard deviation units. Cohen (1) recommended guidelines for the interpretation of effect sizes. He suggested that an effect size of 0.2 should be considered a small effect, 0.50 a medium effect and 0.8 a large effect.

Meta-analyses

A meta-analysis involves combining together the effect sizes reported in several studies that all look at the same outcome/s (e.g. literacy) for the same groups (e.g. males and females). Some of these reported effect sizes may be large and others may be small differences. A weighted effect size across all studies is then calculated. By combining the range of effect sizes, we can get a better idea of the true effect size.

Much research has been devoted to investigating gender differences in language and cognitive skills. In the literature and in text books it is generally acknowledged as fact that there are gender differences within these domains. While many papers have indeed published results showing statistically significant gender differences, the magnitude of these differences is generally small and some researchers have questioned whether these differences are practically significant and whether we should instead be talking about gender similarities (89).

7.1 Language exposure

There is some research evidence that girls are, on average, spoken to more than boys are. Gilkerson and Richards' (23) US study using data obtained with the Language Environment Analysis (LENA) system reported that girls hear 724 more words than boys within the first 30 months of their lives - approximately 5.8% more words. They also found that mothers speak significantly more to their daughters than to their sons (8.9% more words to girls) and that the reverse is true for fathers (3.2% more words to boys). Given that mothers are generally the primary caregivers of these children, and in this study contributed to 75% of the words heard by children overall, girls are hearing many more words early in their lives than are boys.

7.2 Verbal Communication

Studies which have looked at verbal communication abilities generally find a gender gap, with females outperforming males (e.g., 17, 90, 91, 92). Gender differences are reported in vocabulary growth and the size of vocabulary in children under 20 months of age (93). It is unclear whether this is the result of adult talk input or whether this difference reflects "early capacity differences" between boys and girls (93, p.245).

Many studies of verbal ability have found either no gender difference or a small advantage for females. In their 1988 meta-analysis of 165 studies which looked at gender differences in verbal ability, Hyde and Linn (92) concluded that such differences no longer exist. While three quarters of the studies analysed found that females outperformed males, the difference was only statistically significant in 27% of these. Two thirds of the studies reported no difference. Interestingly, when Hyde and Linn calculated the weighted effect size, it was small in magnitude and in favour of superior male performance. More recently, Weiss and colleagues (90, p.872) also noted the small effect size of gender difference in verbal ability, stating that "men and women overlap enormously" in their abilities.

In contrast to these findings, data from the AEDI shows that in South Australia and all other Australian states, there are more boys than girls who are developmentally vulnerable in the Communication and general knowledge domain (Figure 5). Similarly, more boys than girls in the Longitudinal Study of Australian Children (LSAC) score below the 15th percentile on the Peabody Picture Vocabulary Test (PPVT-III), see Figure 6.

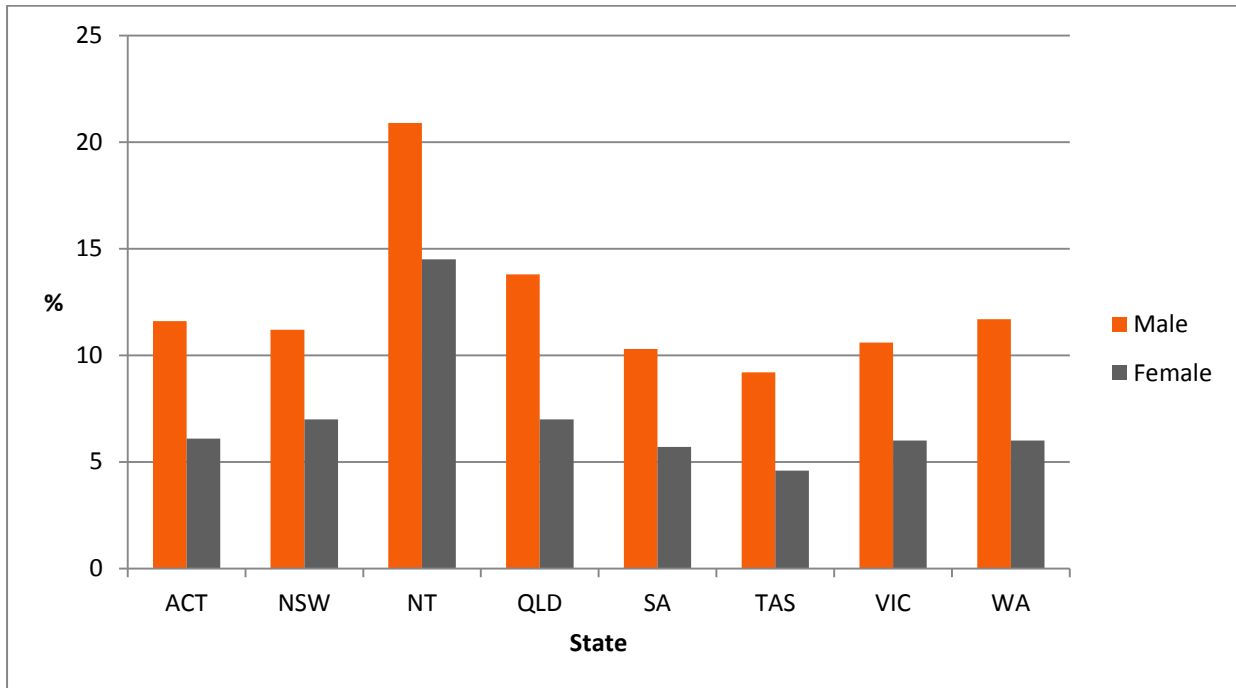


Figure 5. Percentage of boys and girls vulnerable on the AEDI communication skills and general knowledge domain in 2009. Source: (4)

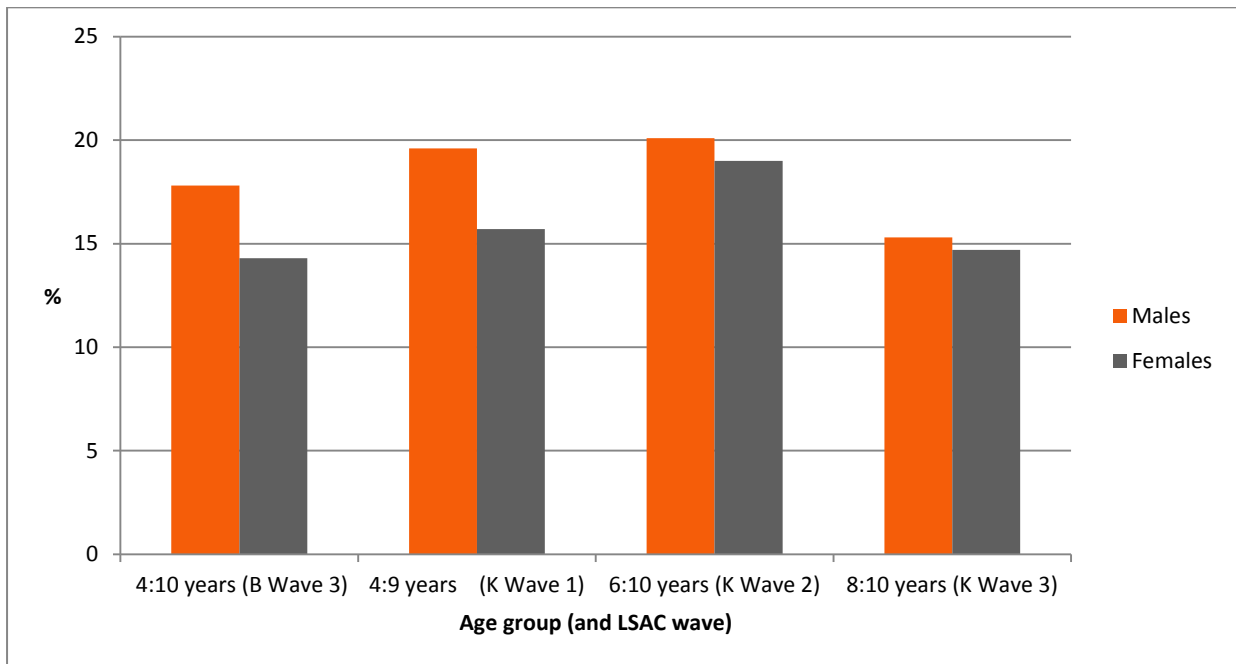


Figure 6. Percentage of boys and girls scoring below the 15th percentile on the PPVT-III in the LSAC study. Source: (94)

These contrasting research findings may be due to boys and girls developing at different rates. Bornstein, Hahn and Hayes (91) analysed data from four prospective longitudinal studies of young children. They concluded that girls' language performance is superior to boys' between the ages of 2 and 6. At the younger end of this age range, girls were outperforming boys on measures of vocabulary, communication, verbal comprehension, expressive language, and mean length of utterance, among others. Very few of these differences were still statistically significant as children approached age 6. It was also noted that on none of the measures in these studies did boys outperform girls.

7.3 Reading literacy

The majority of studies find that there is a significant gender difference in reading ability. Among OECD countries, it has been found that at age 15, girls outperform boys by 38 points on the print reading component of the Programme for International Student Assessment (PISA, 2009 data), a difference equivalent to one year of formal schooling (95). Figure 7, below, shows the consistency of this result in data from 2009 and previous years. In both Australia and across OECD countries girls are consistently outperforming boys. However, Machin and Pekkarinen (96) note that this finding refers to mean differences between girls and boys and when the entire distribution of scores is examined we see greater variability in the scores of boys. This means that it is not the case that all girls are outscoring all boys. But, for reading, there is a greater proportion of boys at the lower end of the distribution, reducing their overall mean and driving this finding of mean difference.

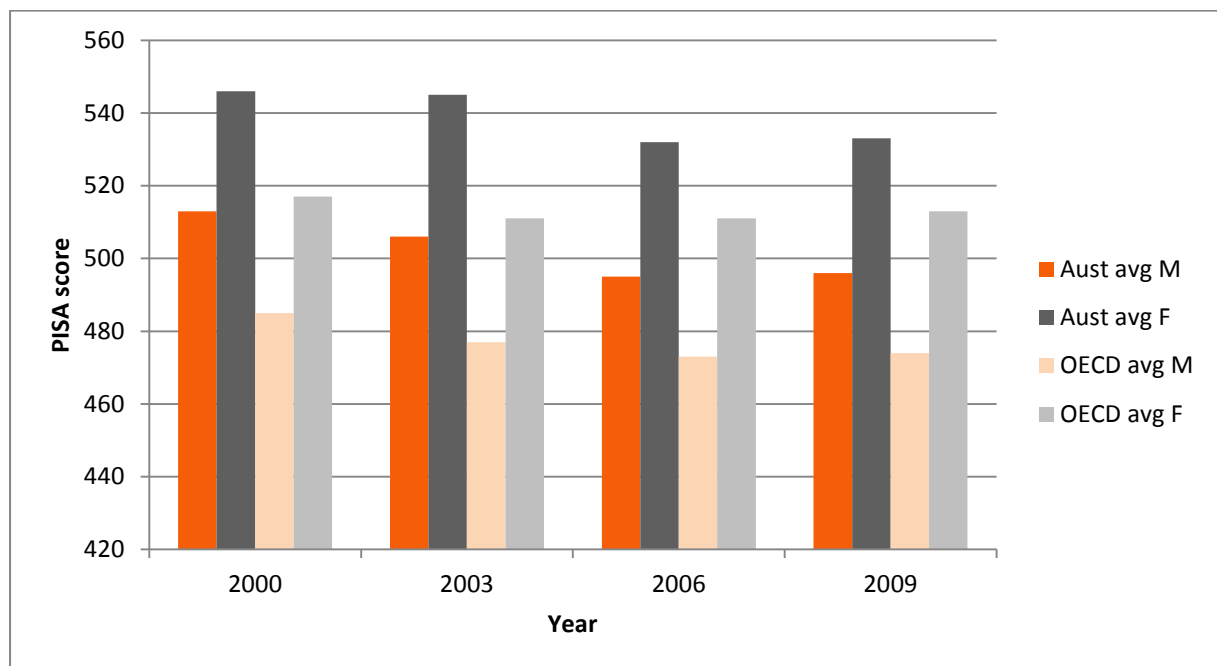


Figure 7. PISA Reading trend for 15 year olds 2000 to 2009. Source: (97-100)

In Australia, research using the Australian National Assessment Plan – Literacy and Numeracy (NAPLAN) data has shown that girls consistently outperform boys on the reading component at each time point (Years 3, 5, 7 and 9). However, these results should be interpreted with some caution. Using the May 2008 NAPLAN data, Limbrick, Wheldall and Madelaine (101) reported that while girls' reading scores were significantly higher than boys' scores throughout school, the magnitude of this effect was small in size (ranging from 0.09 to 0.18) and was smaller at higher year levels. They concluded that despite boys consistently scoring lower than girls, in practical terms any effect of gender on reading performance is negligible.

Figures 8 to 11 show the trend in NAPLAN reading performance between 2008 and 2011 at Years 3, 5, 7 and 9 for South Australian students. Consistent with Limbrick et al.'s (101) analysis for 2008, we can see that in all years and across all year levels more girls than boys are represented in the higher score categories, but it is boys who dominate in the lower score categories, in particular in the *Below national minimum standard* and *At national minimum standard* score categories.

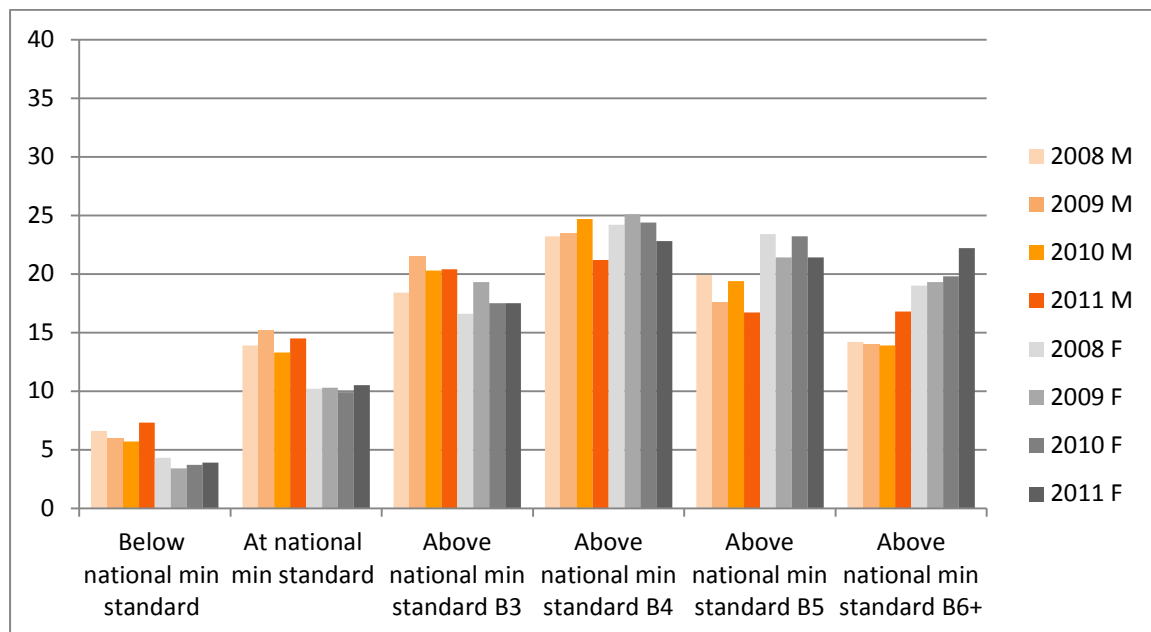


Figure 8. South Australian Year 3 (8 years old) Reading trend from 2008-2011. Source: (102-105)

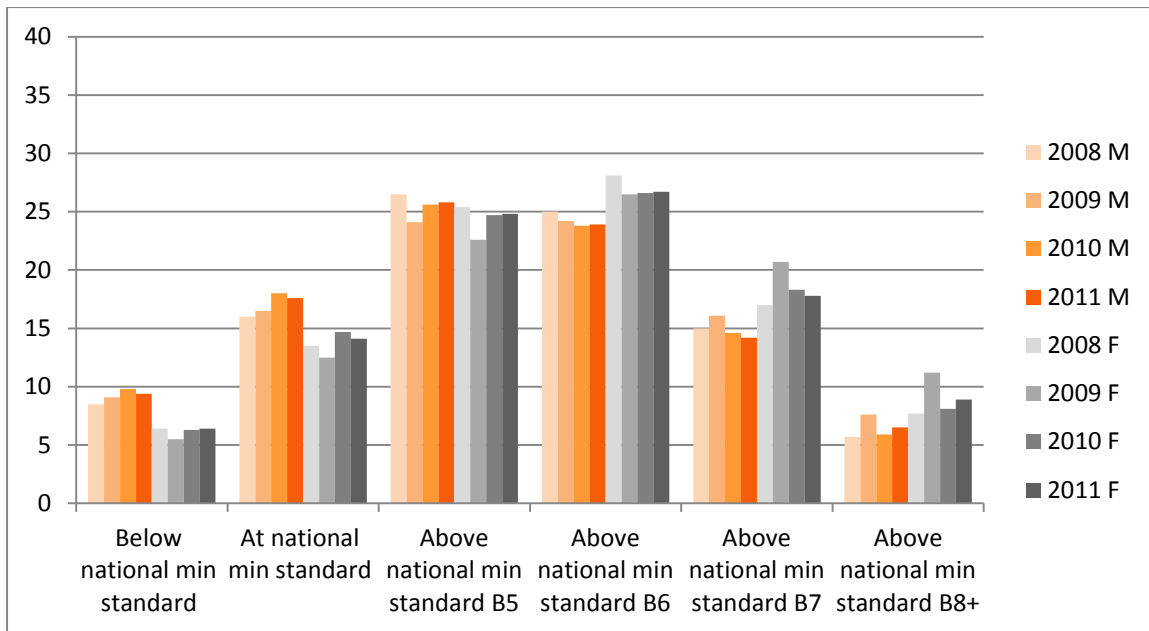


Figure 9. South Australian Year 5 (10 years old) Reading trend from 2008-2011. Source: (102-105)

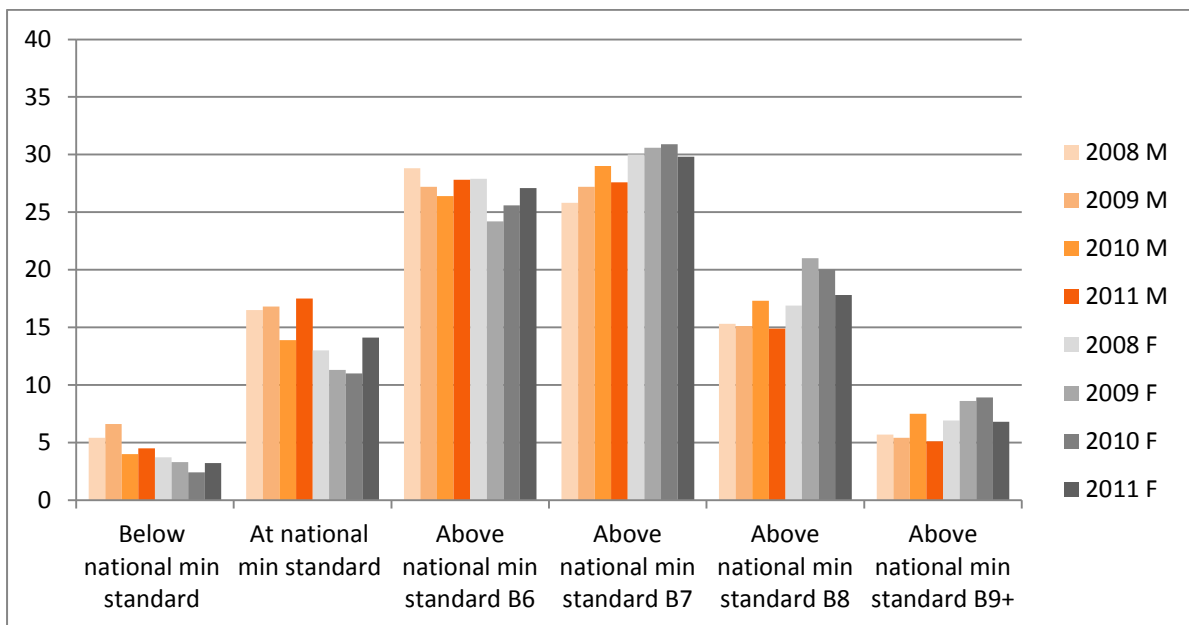


Figure 10. South Australian Year 7 (12 years old) Reading trend from 2008-2011. Source: (102-105)

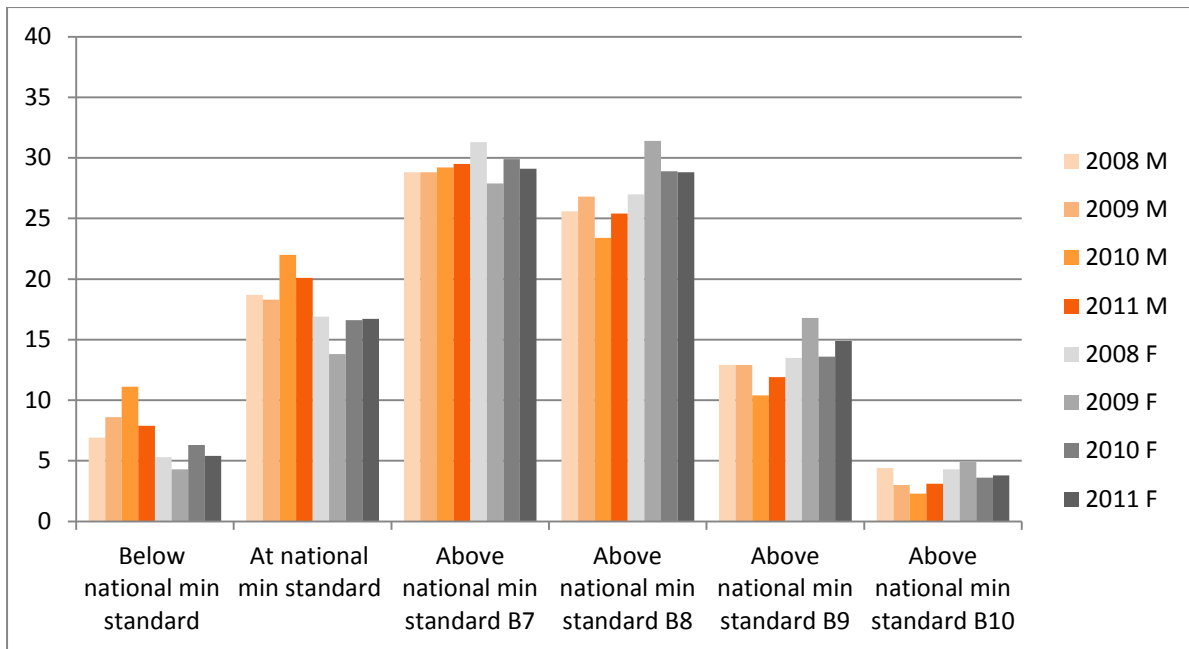


Figure 11. South Australian Year 9 (14 years old) Reading trend from 2008-2011. Source: (102-105)

The finding that girls' reading performance is superior to boys' is not solely confined to printed text. PISA also provides data on digital reading performance. These results also show that, on average, girls outperform boys in digital reading, though the difference is smaller (24 points on the PISA scale) than for printed text. These results have led to suggestions that boys may be more at ease with digital media with more boys in the 'top-performer' category for digital reading than for print reading in each of the 16 participating OECD countries. Only in Australia, Korea and New Zealand was girls' performance in digital reading superior to their performance in print reading. On the basis of these results it has been suggested that encouragement of digital reading among boys may lead to improved reading performance of boys overall.

Cohen and colleagues (106) reviewed gender differences in adult literacy using data from 1992 and 2003 from the United States. They report that in 1992 the gender gap in adult literacy was in favour of males but by 2003 the trend had reversed and it was females who were showing higher literacy levels.

7.4 Numeracy and Mathematics

Mathematics is frequently considered to be a subject area dominated by males, both in terms of the number of students taking advanced mathematics courses and making a career in the area, as well as in terms of their performance (16, 107). However, the research literature tends to suggest that there is no intrinsic biological difference in the capacity for males and females to excel in

mathematics (16) and that the magnitude of any gender difference in either direction is small (107, 108).

It has been suggested that the prevailing view of male superiority in mathematics may be a consequence of there being greater variability in males' mathematics scores than in females'. In contrast to reading data in which boys dominate the lower end of the scale, in mathematics, boys dominate the top end of the scale (96, 107, 109) which may drive any finding of mean gender differences in mathematics performance.

A 1990 meta-analysis of gender differences in mathematics performance examined 100 studies and more than 259 independent effects. Across these studies the overall mean effect size was small (0.20) and in favour of males (108). This effect size included data from a wide range of samples, including general national or classroom populations, college students, those selected based on their poor performance, remedial students or low socioeconomic status samples. When the meta-analysis was restricted to include only the general population samples, the effect size of the gender difference in mathematics performance was notably smaller (0.05) and in the opposite direction, with females outperforming males.

The same authors more recently carried out another meta-analysis again looking at gender effects in mathematics performance noting that in the intervening period between their two publications there had been a cultural shift that had seen girls more involved in advanced mathematics than they had been in 1990 (107). In their new meta-analysis of 242 studies, the authors found an overall effect size of 0.05 which was again negligible and favoured males. They also found that while effect sizes were negligible for primary, middle school, college and adult samples, the effect was largest, though still relatively small (0.23), for high school students.

Lindberg et al. (107) also performed some analyses using large longitudinal datasets. The effect size across these datasets was again negligible (0.07) and in favour of boys. They argued that this result was not the artefact of greater variability in the mathematics scores of boys.

Data from PISA (Figure 12) and from the numeracy section of the Australian NAPLAN assessments between 2008 and 2011 (Figures 13 – 16) show more similar performance between boys and girls than was the case for the reading assessment. For mathematics, boys tend to score more highly than girls, with the effect more pronounced at later years of schooling. Consistent with the research literature, boys dominate at the higher end of the scoring spectrum.

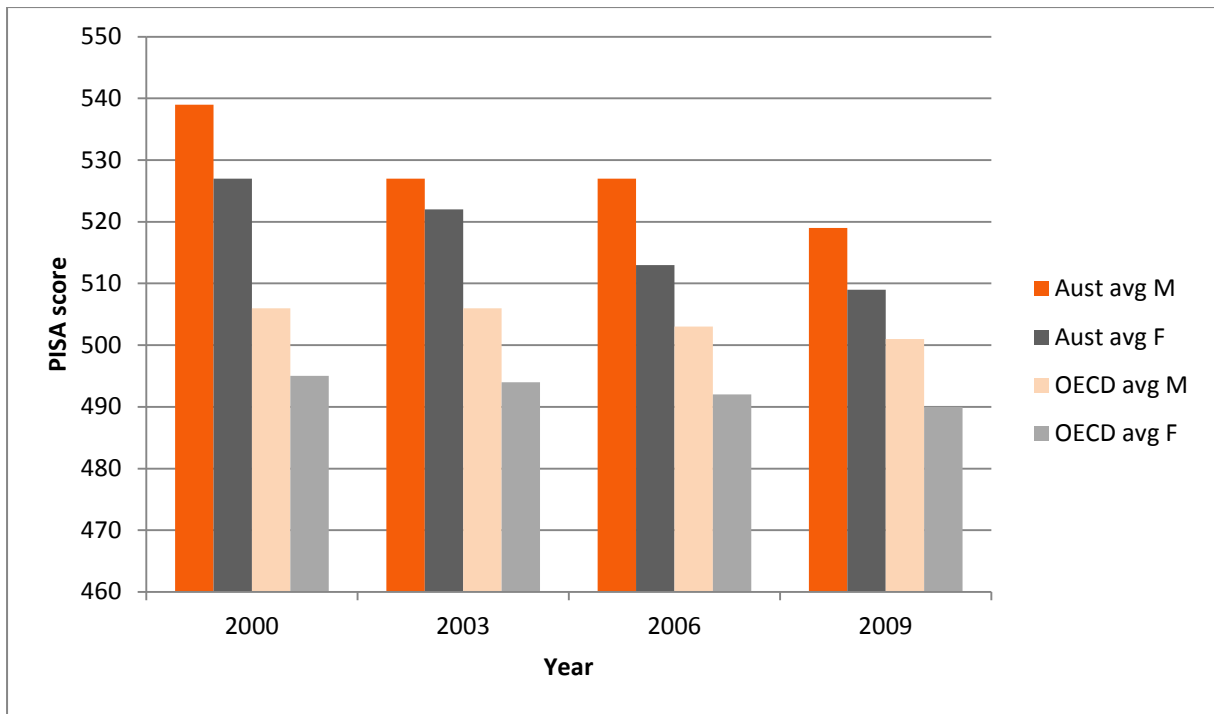


Figure 12. PISA Mathematics trend 2000 to 2009. Source: (97-100)

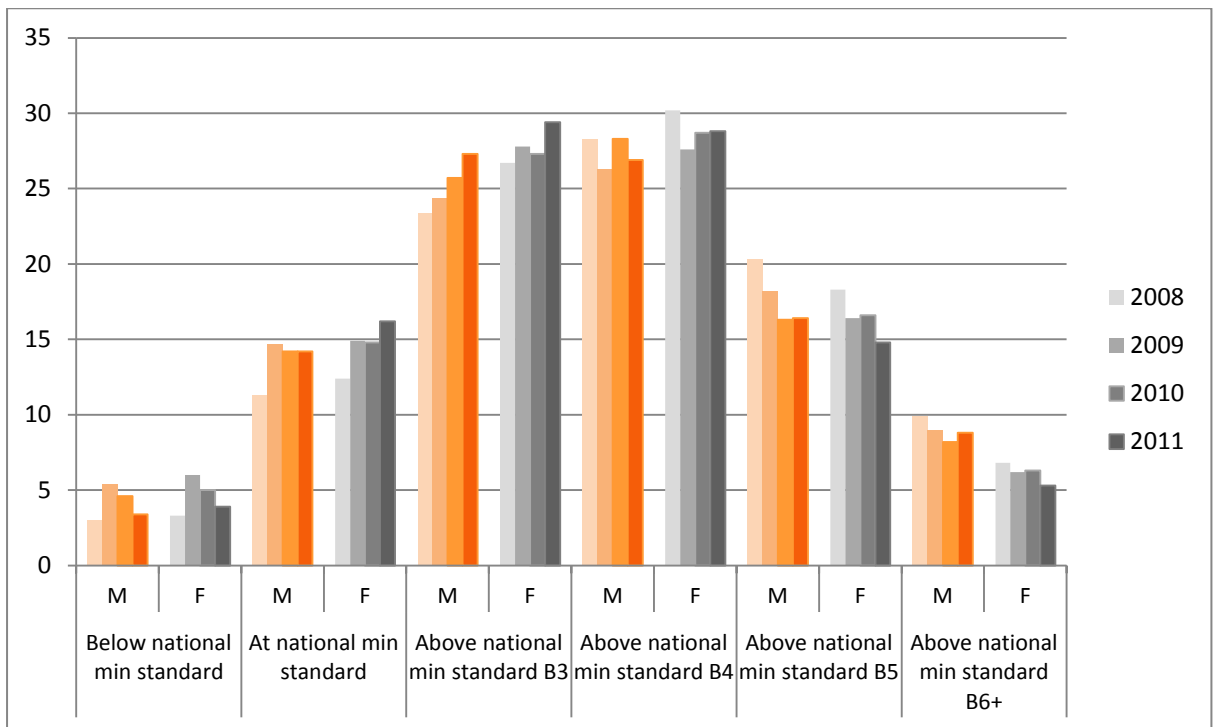


Figure 13. Year 3 (8 years old) Numeracy trend from 2008-2011. Source: (102-105)

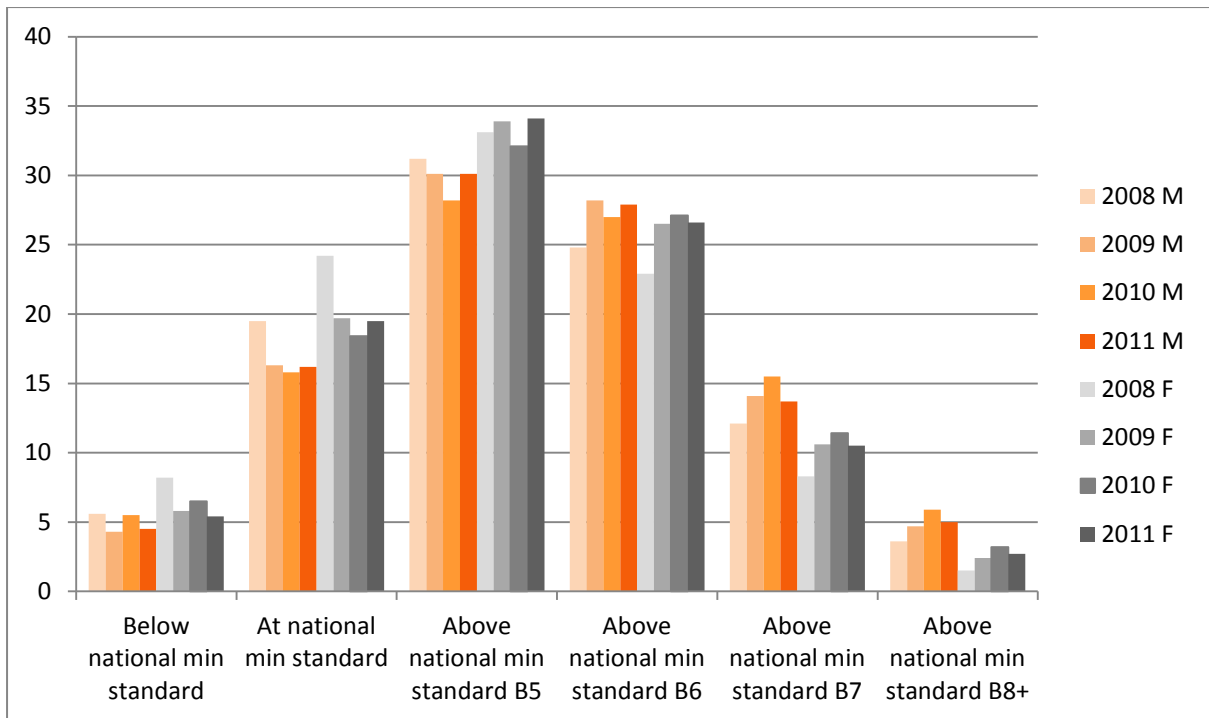


Figure 14. Year 5 (10 years old) Numeracy trend from 2008-2011. Source: (102-105)

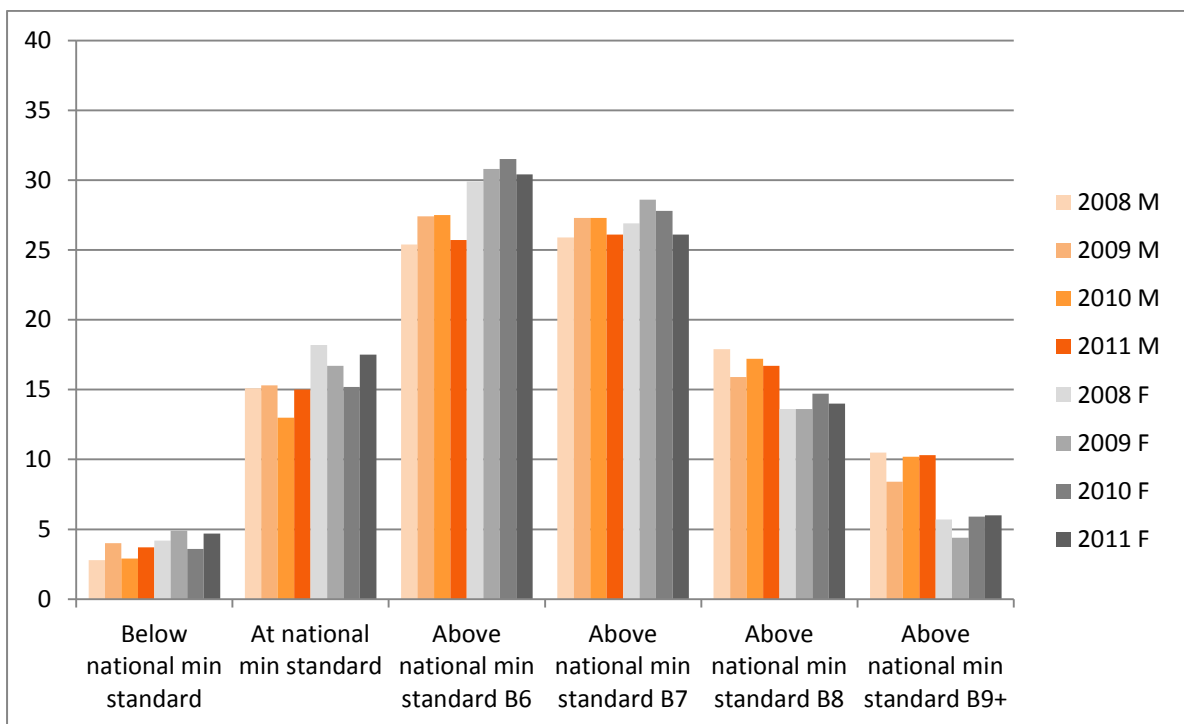


Figure 15. Year 7 (12 years old) Numeracy trend from 2008-2011. Source: (102-105)

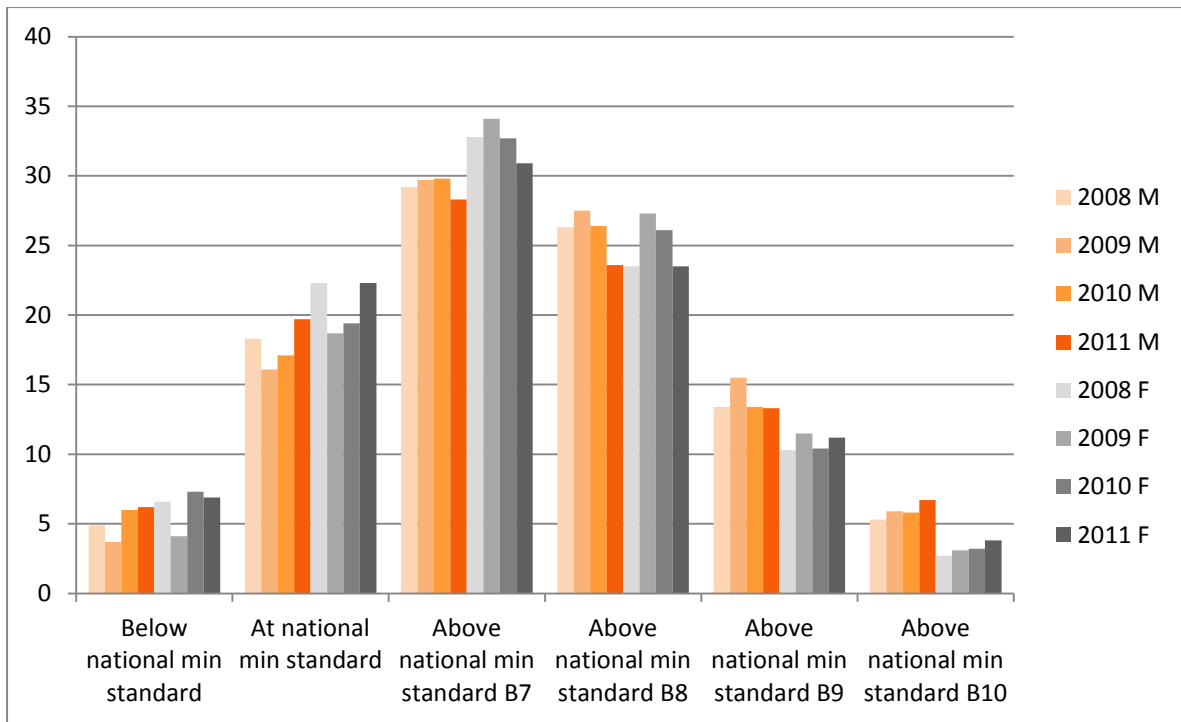


Figure 16. Year 9 (14 years old) Numeracy trend from 2008-2011. Source: (102-105)

8. Education

Common areas of investigation within the domain of education are grade repetition, high school completion rates, subject choices, and university and vocational education entries and completions.

8.1 Grade repetition

A large analysis of gender differences in education in Europe has been compiled by Eurydice (110). They found that in every European country for which there are data, boys are repeating school grades more than girls. In addition, they reported that there was at most a relatively small gender difference in the proportion of children in primary school and lower secondary school when 80% of their peers are in lower secondary and upper secondary school, respectively.

8.2 High school completions

An investigation by McMillan and Marks (111) looking at Australian high school completion data in the 1980s and 1990s found that more boys were leaving school without completing Year 12 than

were females. They also found gender differences in the reasons offered by those who had not completed their high school education. Boys tended to provide work related reasons for their decision to leave high school early, for example, to begin looking for a job, to start earning money, or to begin an apprenticeship (111, 112). The girls who did not complete high school were more likely to blame their dislike of school for their decision to leave early (111). Additional research using the Longitudinal Surveys of Australian Youth (LSAY) has found that gender differences in high school completion rates may be due to boys having lower aspirations for further education (113). This trend, wherein more girls are completing high school than boys, has continued into the last decade. Figure 17 uses data from 2002-2011 and shows the proportions of males and females aged between 20 and 24 who have completed high school.

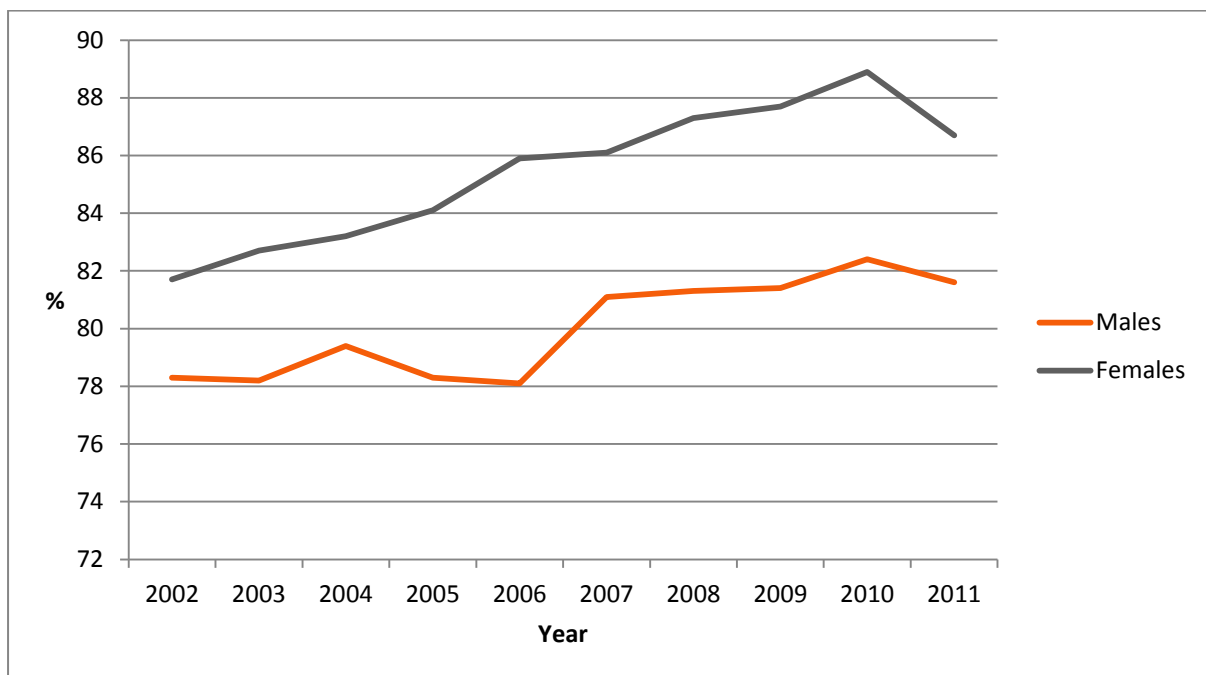


Figure 17. Percentage of 20 to 24 year olds with Year 12 or higher formal qualification from 2002 to 2011. Source: (114)

A similar pattern exists for high school completions in Europe (110). A higher proportion of males (17% vs. 13%) aged 18-24 years had not completed high school and were not enrolled in another form of continuing education. In every European country for which there were data, regardless of the overall level of high school completions, it was always boys who were less likely to complete their secondary education. However, this is a relatively recent finding. Data from two years prior, in 2008, indicated that more males than females in the included countries had completed high school.

8.3 University entrance scores

In Australia, girls tend to have slightly higher tertiary entrance ranks (TER) than boys (115, 116). At the top end of the scale, boys and girls tend to score quite similarly. However there is more variance in boys' scores, with them contributing more to the lower end of the distribution, and reducing the average score of boys. Girls tend to score more similarly to each other and, generally, score around or above the overall average score (116).

8.4 Subject choices

In Australian high schools, boys and girls tend to make different subject choices. Boys tend to enrol in advanced mathematics courses, the physical sciences and technology related subjects while girls are generally enrolled in basic mathematics, biological sciences, languages, humanities and arts subjects (116, 117). The subject choices of boys tend to be more career-focused and are more likely to benefit them in their post-high school pathways than are the subject choices of girls (116).

The Eurydice report identified gender differences in the subject selections of males and females in higher education. The majority of graduates are female in education and training (80%), health and welfare (76%), humanities and arts (70%) and social science, business and law (60%) (110). Males are the dominant graduates in engineering, manufacturing and construction (75%) and in science, mathematics and computing (60%) (110). Australian research shows a similar pattern with girls dominant in education, social science and hospitality subjects and males making up the majority of students in engineering, computing, mathematics and science subjects. Figure 18 shows the gender split across a number of vocational education and training subjects.

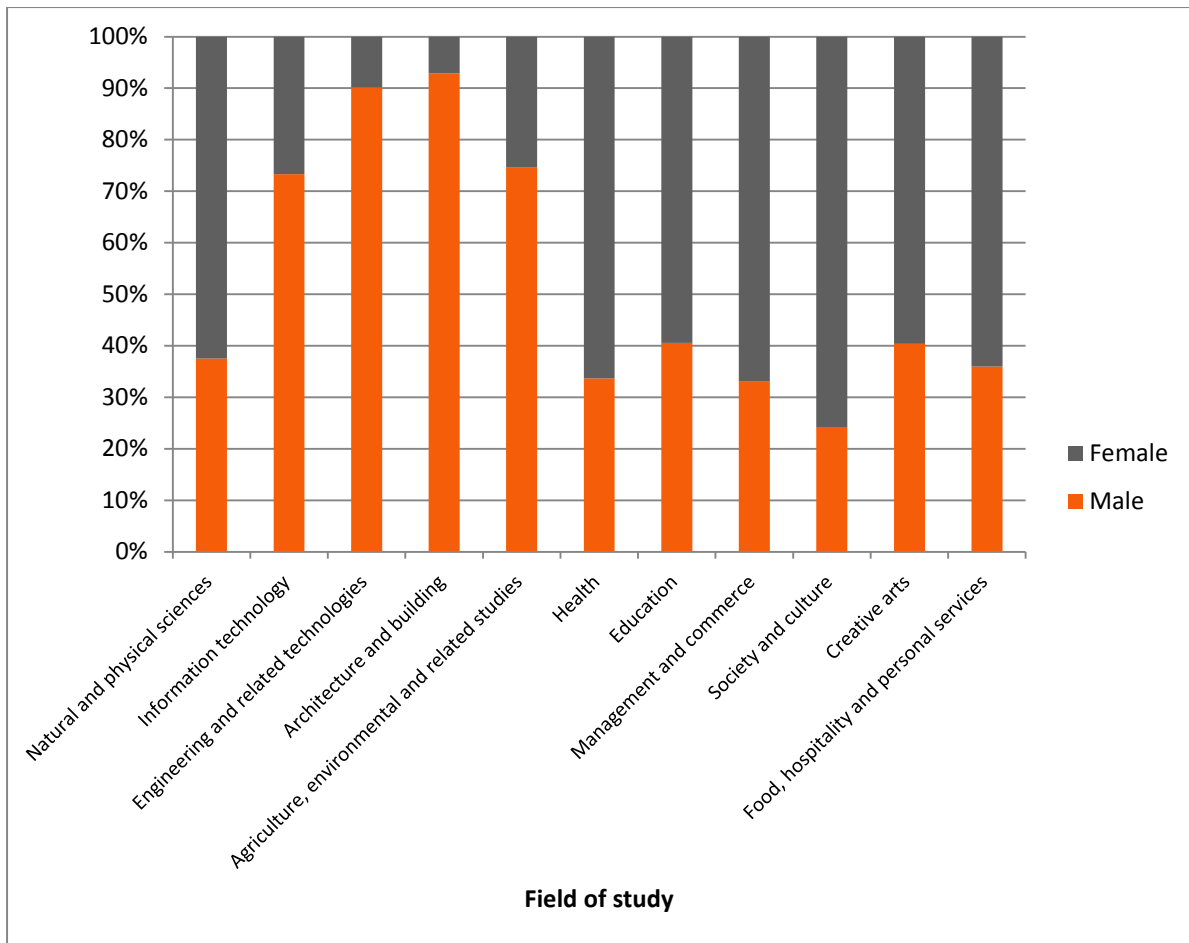


Figure 18. Field of study by gender. Source: (118)

8.5 University enrolment

There is a slight majority (55%) of females enrolled in tertiary education courses throughout Europe and the majority of tertiary education graduates are also female (59%). However, at higher levels of tertiary education the pattern is reversed and there are more male than female doctoral students and 56% of all doctoral graduates in Europe are male. This pattern continues into academic roles within tertiary institutions, with the majority of academics male (110).

In both Australia and New Zealand, females are more likely to enrol in university courses than are males. As a result, females are also more likely than males to have a university degree. As in Europe, there are more male than female postgraduate and doctoral students in Australia (82, 119).

8.6 Apprenticeships and traineeships

The Australian Bureau of Statistics (119) reports that in 2011 similar numbers of males and females enrolled in Vocational Education and Training (VET) programs (52% males). VET includes apprenticeships, traineeships as well as certificates and diplomas. Of these options, the proportion of males was highest in apprenticeships (116, 120). Of the more than 200,000 people enrolled in the Australian Apprenticeship Scheme in 2011, approximately 79% were male (119).

Furthermore, males and females also embark on apprenticeships in different domains. Males are well represented in construction, automotive and engineering trades, and in electro technology and telecommunications. Females are generally enrolled in apprenticeships in community and personal service, and clerical and administrative apprenticeships (119).

9. Employment

9.1 Domain of employment

The employment domains that males and females enter follow the same pattern as their educational subject choices. Eccles (121) attempted to explain possible reasons behind the gendering of certain occupations. She suggested that this was to do with males and females having different personal values and motives for their life decisions. So, for example, if a woman values her culture's gender roles and it is important to her to fulfil these roles, then she is more likely to go into a traditionally female occupation than is a woman who does not value these cultured gender roles.

9.2 Workforce participation

Figure 19 shows the percentage of 15-19 and 20-24 year olds who are not fully engaged in employment or education. In both age groups, it is females who have lower rates of workforce participation. This is likely due, at least in part, to females stepping out of the workforce to care for their family.

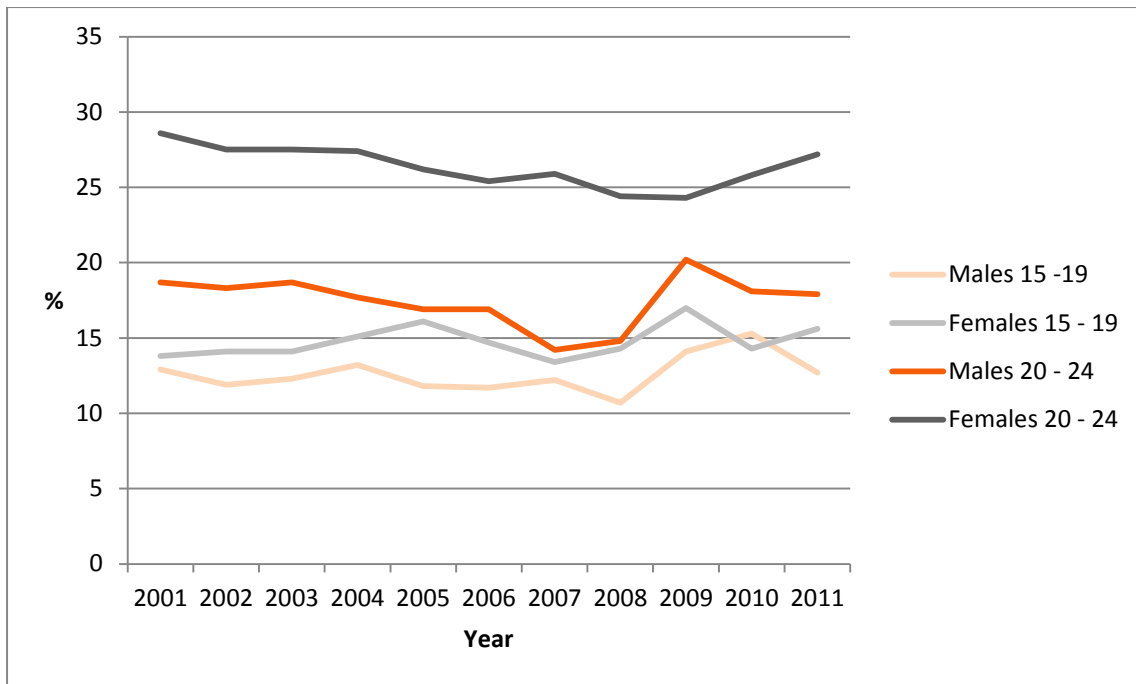


Figure 19. Percentage of 15 to 19 and 20-24 year olds not fully engaged in education or employment. Source: (114)

9.3 Salary

On average, men earn more than women. In Australia, this has been true for at least the last 10 years. In 2011, female university graduates earned 96% of the salary of male graduates (a difference of \$2,000 per annum) (119). Figure 20 shows the starting salaries for men and women with a Bachelor degree in every year from 2001 to 2011. Figure 21 shows the average starting salaries for the same period split by university degree. Among those graduating with a Masters by coursework degree, females earned approximately 83% of the wage of male graduates (a difference of \$15,000 per annum) (119). Across all adults working in any industry, average full-time weekly earnings in May 2013 were \$1516 for males and \$1250 for females (122).

The gender gap in salary is generally thought to be closely related to the domains of employment in which males and females choose to work (119, 123). As noted earlier, traditional males jobs are in areas such as engineering and IT in which all employees, male and female, are generally paid more than those in traditionally female occupations such as health and education. So, when we look at average salaries of males and females, the results are biased by the dominance of males in the higher paid occupations.

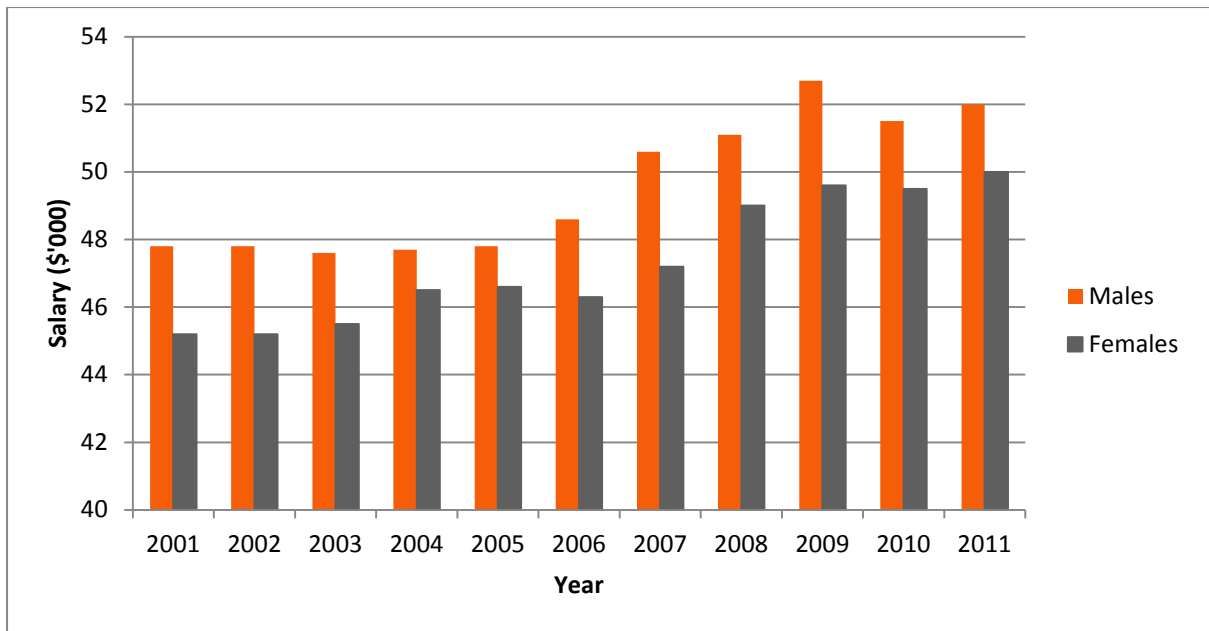


Figure 20. Starting salary with Bachelor degree 2001 – 2011. Source: (114)

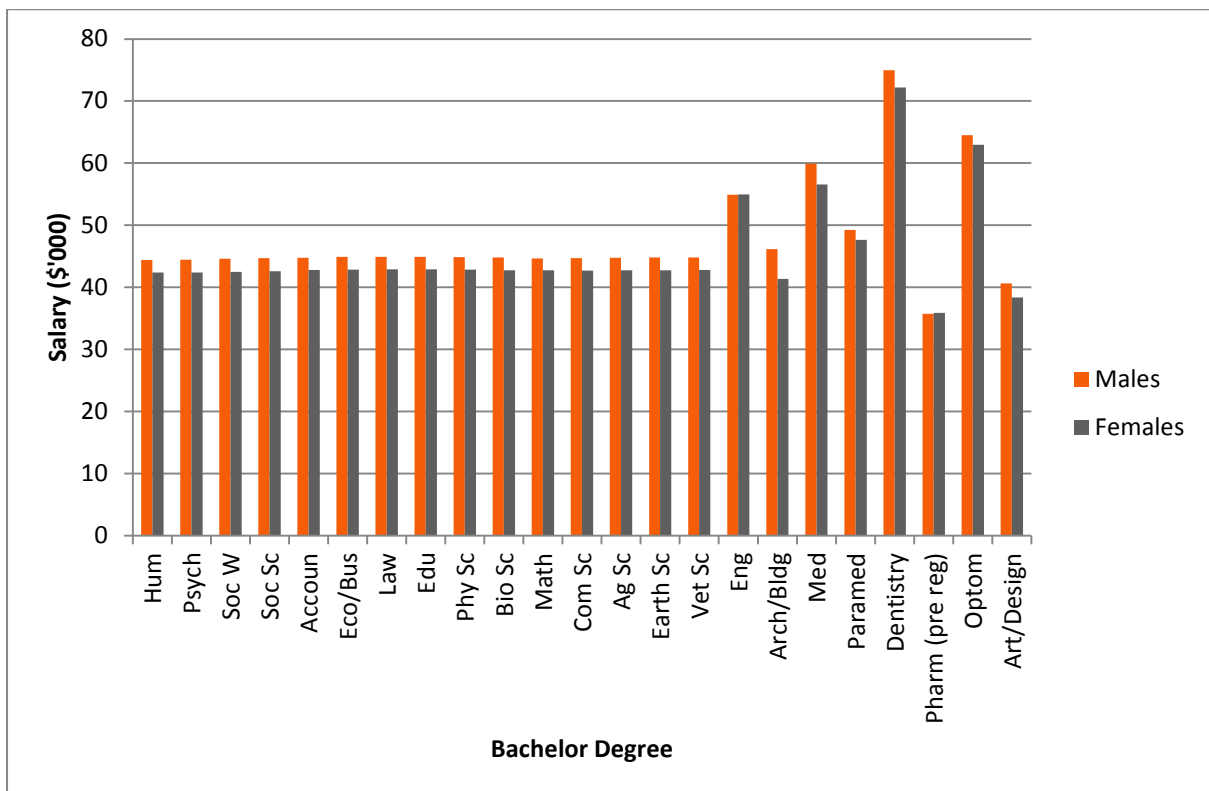


Figure 21. Average starting salary (\$'000) of Bachelor qualified males and females from 2001 – 2011. Source: (124)

10.1 Crime rates

“Gender unequivocally is the most discriminating factor associated with crime” (125, p. 172) with males far more likely to offend than females.

Several studies have looked at the trajectories of arrest rates across time periods. For example, Tracy, et al. (125) looked at juvenile arrest rates for males and females in the United States between 1989 and 2006 both generally and for specific crimes, such as aggravated assault, burglary and larceny. They found that while the arrest rate for males across this time period was always higher than the female arrest rate, the trends differed between genders. In general, across all the arrest rates examined, the rate of male offending was decreasing while the female arrest rate either remained constant or increased. Lauritsen, et al. (126) looked at US crime victim reports of offender gender for crimes including aggravated assault, simple assault, and robbery. They similarly found that the gender gap was narrowing with male offending rates decreasing notably and female rates decreasing to a smaller extent or remaining relatively stable. On this basis, the authors suggest that additional intervention may be required to further reduce female offending rates.

Australian data shows similar trajectories of adult male and female offending. Research looking at New South Wales police person of interest data between 1999 and 2009 showed that males offended far more than females (82% of offenders were male). However, across the 10 years of data, offending by females increased by approximately 15% while the trajectory for males remained relatively stable (127).

10.2 Juvenile delinquency

In South Australia, Australia and internationally, males are overrepresented at all levels of the juvenile justice system – from being proceeded against by police to being sentenced to detention (125, 128, 129). Of all juveniles held in detention in Australia over the period 2008 to 2012, approximately 95% were males (130). Female offending rates have been increasing, whilst male offending rates have been more varied. Between 1999 and 2009 juvenile offending rates for females in New South Wales increased by 36% while the male rate increased by 8%. However, the overall rate of offending was, and continues to be, higher for males (127). Similarly in South Australia, between 1994 and 2003, there was a decline in the apprehension rates of juvenile males while the rate for females remained relatively stable, see Figure 22 (129)..

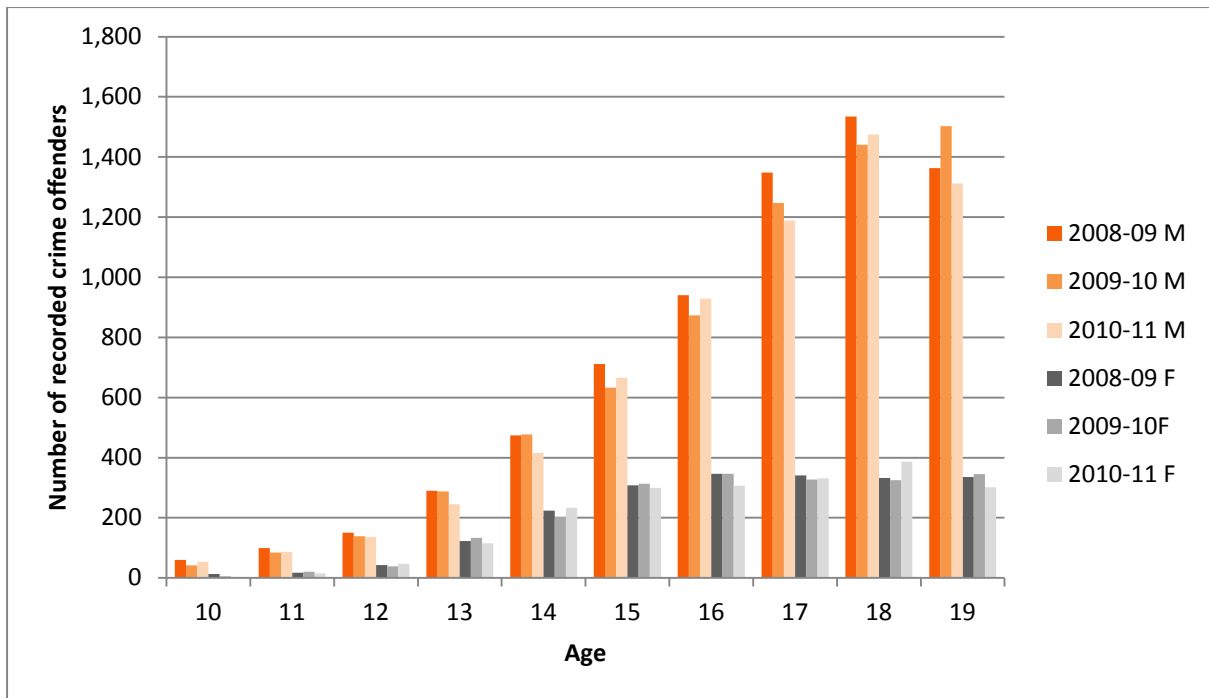


Figure 22. Number of recorded crime offenders in South Australia from 2008-09 to 2010-11 by gender and age

It has been suggested that the reason for the general finding of an increase in female offending is not necessarily that juvenile females are committing more crimes than they have previously, but perhaps the safety nets that were once in place to intervene for high risk females before they offended have diminished as a result of social changes within society (128).

10.3 Crimes committed

There are also differences in the crimes committed by males and females. Males are more likely to be the perpetrators of, among others, violent crime, rape and sexual assault (126), assault, offensive behaviour, drug offences (127) and damage of property (129). Female offenders are most likely to have committed non-violent crimes such as shoplifting and fraud (however, males are more likely to still commit these offences on a per 1,000 individual-basis) (127-129).

11. Summary of the research literature and looking forward

Looking at the research literature on gender differences across the lifespan, it is evident that, with a few exceptions, the literature tends to be divided on whether or not there are gender differences in a particular domain. At times, a statistically significant mean gender difference is identified, but when the magnitude of these effects is considered, the difference is considered to be negligible in practical terms. On this basis, Hyde (89) questioned whether researchers should change their focus from gender differences to gender similarities.

Table 1 summarises the gender differences reviewed in this report. This table does not factor in the fact that the magnitude of gender differences in reading and mathematics are generally found to be negligible in the research literature and can therefore be placed in the *No difference* column. It is evident that in some domains females are advantaged relative to males but in other areas the reverse is true. It is apparent, however, that males are overrepresented across the 'negative factors' considered in this review.

There have been numerous calls in recent years to improve educational outcomes for boys. Girls are completing high school at a higher rate than are boys, achieving higher university entrance scores and enrolling in university courses in greater numbers than are boys. But we must also take into account the fact that more boys than girls are enrolling in apprenticeships and pursuing a pathway through vocational education and that in employment males are earning more than females.

It is true that "certain differences do convert into certain disadvantages" in later life, though these are not clear and straightforward pathways (116, p.5). For males, their disadvantage tends to be that their post-school pathways are restricted somewhat by their poorer literacy skills, they have reduced employability as a result of leaving school early, and their greater focus on vocational subjects at school means they are missing out on a diversity of skills and experiences that girls tend to access, though this has little effect on their employability. For females, their disadvantage seems to be that the combinations of subjects they choose in school do not lead to higher-paying occupations. Among those students who do not complete high school, it is girls who are less likely to gain full-time employment, meaning that the consequences of not finishing school are more severe for girls than for boys (116).

It has been noted that this emphasis on improving educational outcomes for boys began in the 1990s following a 20 year period in which boys were seen to dominate girls educationally (49). One view which has been put forward is that the initial focus to improve the educational outcomes of girls has now "tipped the scales" too far in their direction with the result being that boys are now disadvantaged (131, p.86). If this is true, the risk in focussing attention on improving the outcomes of boys is that the pendulum swings back the other way and girls once again experience disadvantage.

There have also been claims that the classroom has become increasingly feminised and alien for boys and that the school curriculum, assessment procedures and learning environments are much

Table 1. Summary of gender differences

	Females	Males	No difference
Positive factors			
Self-esteem		✓	
Effortful control	✓		
Language exposure	✓		
Verbal communication			✓
Reading literacy	✓		
Numeracy and Mathematics		✓	
High school completion	✓		
University entrance scores	✓		
University enrolment	✓		
Postgraduate enrolment		✓	
Apprenticeships and Traineeships		✓	
Salary		✓	
Negative factors			
Low birth weight	✓		
Congenital abnormalities		✓	
Intellectual disability		✓	
Reading disability		✓	
ADHD		✓	
Autism Spectrum Conditions		✓	
Depressive disorders	✓		
Anxiety disorders	✓		
Suicide attempts	✓		
Suicide completions		✓	
Aggression		✓	
Bullying		✓	
Disruptive classroom behaviour		✓	
Surgency		✓	
Negative affectivity			✓
Grade repetition		✓	
Workforce participation	✓		
Arrest rates		✓	
Juvenile delinquency		✓	

more designed for girls (82, 132). For example, a focus on literacy in schools and the use of continuous assessment is perceived as playing to the strengths of girls to the disadvantage of boys (131). This argument assumes that girls who struggle with literacy will also be disengaged and that boys with strong literacy skills will be engaged in school.

Related to this is the idea that the ideal student is female with teachers preferring the less disruptive classroom behaviour and acquiescence of girls (49, 112, 133). It has been argued that these factors in combination may have led to the superior high school outcomes that we see for girls. Indeed when IQ and classroom behaviour scores were controlled for in analysis of longitudinal data from New Zealand, the gender differences in various standardised tests and in later qualifications were drastically reduced (82). The authors suggest that finding ways to improve the classroom behaviour of boys may lead to improved educational outcomes for them. Though interestingly, it has also been hypothesised that while the better behaviour and acquiescence of girls seems to benefit them within the classroom, these characteristics are less valued in the workforce and are more likely to hinder girls later in their lives (134).

Figure 23, below, shows male and female performance on the AEDI communication skills and general knowledge domain, split into quintiles of socioeconomic advantage and disadvantage (SEIFA). As we saw earlier, more boys than girls are considered developmentally vulnerable on this domain. However, there is also a socioeconomic gradient in developmental vulnerability for both boys and girls.

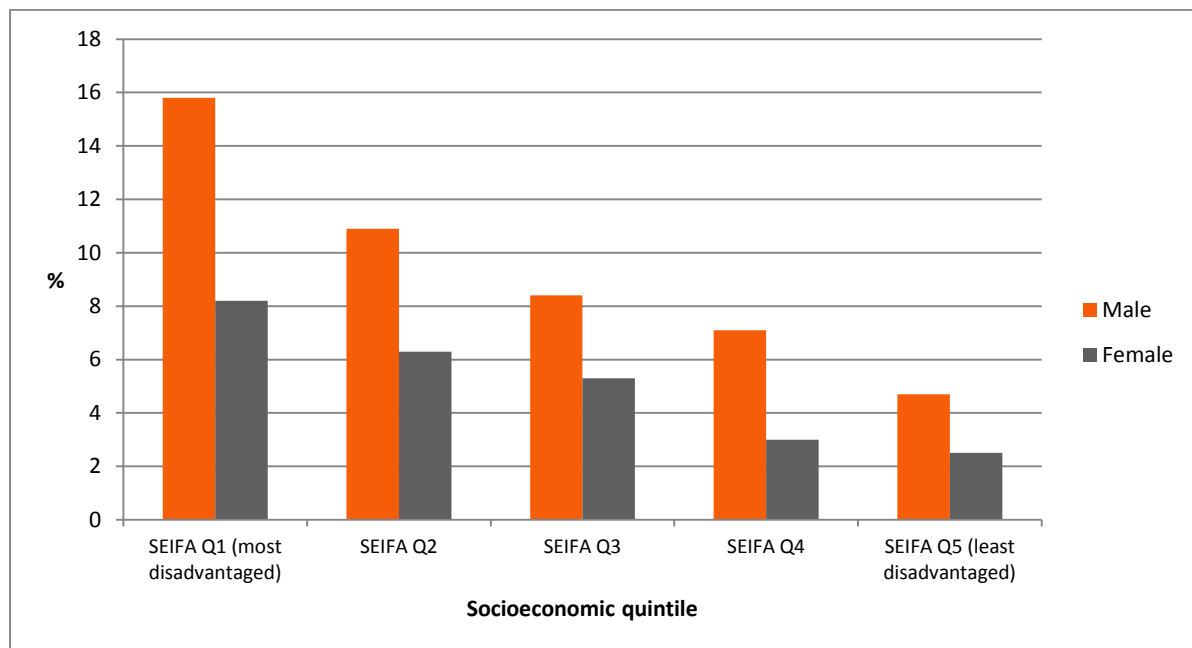


Figure 23. Percentage of boys and girls in South Australia vulnerable on the AEDI communications skills and general knowledge domain by SEIFA quintile in 2009. Source: (4)

Despite the perceived disadvantage experienced by boys at school, males still tend to be advantaged relative to females when it comes to employment. Males tend to enter occupations are paid higher

salaries than the occupations which females tend to enter. Females are also underrepresented in senior and managerial positions. Based on data from the UK, Gorard (135, p.236) noted that the gender difference in educational qualifications, which sees a higher number of girls with high school qualifications “declines and reverses among adults in later life”.

Aside from employment outcomes, gender differences in crime rates remain stark with males offending at much higher rates than are females. This may suggest intervention to reduce male crime levels would be worthwhile. However, the research literature tells us that the rate of male offending is on the decline and it is females who are offending at increasing rates, suggesting that despite their lower rate, they are most in need of intervention.

In light of the apparent evening out and/or reversing of employment outcomes for males and females in adulthood, this evidence could suggest that no additional intervention is required to improve the educational outcomes of boys. For example, although boys may lag behind girls in reading performance, this does not seem to impact their ability to find employment and earn higher salaries than females later in life. Alongside these later life and career outcomes is the consideration about gender roles within our society and the reality that more females than males will take time out from the workforce when starting a family.

Having established that females and males have the advantage in different domains and that educationally boys are falling behind girls, we must next consider whether these gender differences are severe enough to require action in an attempt to correct them. Specifically, would it be advantageous to intervene at an early age, either pre-school or during the school years in an attempt to improve life outcomes for boys?

There has also been an issue with the ways in which the majority of studies looking at gender difference have gone about calculating this. The vast majority of these studies consider only mean differences between the genders with little regard for the distribution of scores of males and females on the outcome measures. The finding of a mean difference is often interpreted or discussed in terms suggesting that in a particular domain all males outperform all females or vice versa but the distributions of scores for males and females tell us that this is not the case (96, 107, 109, 136).

Perhaps the answer is to design and target intervention based on factors other than gender which may contribute to differential outcomes for children and look at “which boys and which girls” are disadvantaged and why (82, 116, p.3). Other potential risk factors include socioeconomic status and ethnicity (116, 137, 138), For example, gender has been found to be a weaker predictor of mathematics attainment at age 10 than other demographic factors, such as birth weight, parent education levels, family income and socioeconomic status (139). As Hammersley (140, p.140) noted, “we must remember that to refer to gender inequalities is to assume that gender is the key factor, and at the very least it may not be the only factor involved”.

“Sex is the most pervasive method of categorizing people” (136, p. 385) and as such differences between the sexes have been widely researched, often investigated in isolation from other key demographic factors which may also explain some of the observed differences in outcomes. High

quality longitudinal research (potentially relying on data-linkage across the lifespan) is preferable to begin to answer the question of “which boys and which girls” are disadvantaged. In summary, gender differences research is vast and conflicting with little consensus about real differences between males and females. In deciding whether it is important to intervene, the evidence suggests that acting on the basis of gender alone is not sufficient. A precise understanding of the causal pathways which lead to outcomes is required.

12. Policy implications

In summary, the research and data presented in this report suggest that:

- There are differences between boys and girls in several areas. The size of the gender difference in many domains is not large compared to other factors and it is not the case that *all boys* or *all girls* are at risk. However, from a population-level these differences can amount to large numbers of children and young people experiencing less than optimal development and opportunities. Such disparities are worth intervening on if effective responses are available.
- The findings show that females are doing better in terms of educational outcomes. Females are completing high school, attending university and obtaining degrees in higher proportions than are males. However, many more males are completing apprenticeships. In employment, it is males who are doing better than females, with more men in employment and earning higher salaries than women.
- The findings also show that males are more likely than females to have special needs and experience developmental disorders. More boys also have behavioural problems, including bullying and disruptive classroom behaviour, and are more likely to repeat grades at school and to be perpetrators of crime.

A key question arises as to whether more government services and investment should be focussed specifically on boys than girls, particularly in the areas of early childhood and education. Through a social policy lens, a number of responses to this report’s findings can be explored.

From an economic or workforce perspective, it could be argued that transitions into adulthood and into the workforce see the disadvantages of some males relative to females ‘wash out’. Males are more likely to participate in the workforce and employed males secure higher salaries. From this perspective, there is more ‘lost economic productivity amongst females’. However, increasing higher education enrolment and completion for females may have impacts over the coming decades which could limit the relative advantage of males in this respect.

From the perspective of maximising the wellbeing of individuals and the broader community, domains such as suicide, disruptive behaviour and crime are more common amongst males. The

distribution of non-cognitive and social and emotional development suggests that both females and males are in need of intervention, however, the prevalence is higher among males. To the extent that the development of non-cognitive skills in childhood are precursors of these outcomes (141) then this is a potential area for further policy attention.

From the perspective of minimising costs to the community or costs to government, there is value in reducing the occurrence of poor health and crime and maximising the returns from health and education supports by ensuring a productive and engaged workforce. Again, this would indicate that addressing these issues, which are more prevalent in boys than girls, would be a priority.

From a child development and education perspective, the *Melbourne Declaration on Educational Goals for Young Australians* commits all governments to the vision that all young people are successful learners and engaged citizens, prepared for further learning and employment and civic life. It is established that some of the most powerful influences on development include early health, special needs, early language exposure, hostile or absent parenting, high risk home environments and access to early learning programs (e.g. preschool) (142). In order to act on closing the gender differences noted above, we need to know whether boys are exposed to these protective and risk environments differently compared to girls (this could be the amount of exposure, the quality or their ability to benefit from positive environments). This is the key to creating policies and interventions designed to provide all children the right environment to thrive.

Of the domains considered in this report, the evidence suggests that few of the differences between males and females are caused by unmodifiable genetic or biological differences (exceptions include some specific developmental disorders such as Autism Spectrum Disorder). Therefore, there is reason to consider how the 'social pathways' operating through families, early childhood settings and education system could be modified.

From this review, we can conclude:

1. There is not sufficient evidence to say the type of interventions in the home or parenting sphere should be different for males and females. However, the amount or 'dosage' of positive interventions provided to boys and girls should be equivalent. Whether this in fact is the case in the general population is worthy of further investigation.
2. There is also sufficient evidence to say that the service mix should be proportional to the distribution of need. If a larger number of boys than girls are struggling in a particular domain and the rate is higher in areas with low socioeconomic status, the access to and the uptake of services should reflect this distribution of need. Ideally, parenting or early childhood interventions would reach all of those with established need and the capacity to benefit, say through diagnostic assessment. However, where this is not possible, ensuring the take up or 'coverage' of service mixes is consistent with known risk factors (including gender) may be an appropriate policy goal.

There are two specific responses which would go some way to addressing the issues canvassed in this review.

First, there is a priority to collect improved information about the home/family influences on child development, including establishing Australian baselines on the content, quality and quantity of language in the home. To this end, the Fraser Mustard Centre has commenced field trials of the Learning ENvironment Analysis (LENA) data collection system. Research in this area may answer a critical question raised in this review: What are the outcomes for boys and girls with the *same* levels of language exposure? An answer to this question would tell us (a) that we have the right intervention but need it to be taken up by more parents (with emphasis on addressing the reasons behind why some boys are spoken to less often) or (b) that boys are spoken to in the same quantities as girls but they don't benefit to the same degree – which would require us to either increase the amount of language exposure or seek alternative interventions.

Second, there would be value in commissioning a piece of work to examine whether current early interventions and resources allocated are proportionate to the observed needs across the population of children and young people (i.e. proportionate to the prevalence of issues described in this report).

References

1. Cohen J. *Statistical Power Analyses for the Behavioural Sciences*. 2 ed. New Jersey, USA: Lawrence Erlbaum Associates; 1988.
2. Australian Bureau of Statistics. 6202.0 - Labour Force, Australia. Australian Bureau of Statistics; 2013.
3. House of Representatives Standing Committee on Education and Training. *Boys: Getting it right. Report on the inquiry into the education of boys*. Canberra: The Parliament of the Commonwealth of Australia; 2002.
4. Centre for Community Child Health and Telethon Institute for Child Health Research. *A Snapshot of Early Childhood Development in Australia. Australian Early Development Index (AEDI) National Report 2009*. Canberra: Australian Government; 2009.
5. Baron-Cohen S, Lombardo MV, Auyeung B, Ashwin E, Chakrabarti B, Knickmeyer R. Why Are Autism Spectrum Conditions More Prevalent in Males? *PLoS Biol*. 2011;9(6):e1001081.
6. Cahill L. Why sex matters for neuroscience. *Nat Rev Neurosci*. 2006;7(6):477-84.
7. Anokhin AP, Lutzenberger W, Nikolaev A, Birbaumer N. Complexity of electrocortical dynamics in children: developmental aspects. *Developmental Psychobiology*. 2000;36(1):9-22.
8. Hanlon HW, Thatcher RW, Cline MJ. Gender Differences in the Development of EEG Coherence in Normal Children. *Developmental Neuropsychology*. 1999;16(3):479-506.
9. Cosgrove KP, Mazure CM, Staley JK. Evolving Knowledge of Sex Differences in Brain Structure, Function, and Chemistry. *Biological Psychiatry*. 2007;62(8):847-55.
10. Whitehouse AJO, Mattes E, Maybery MT, Sawyer MG, Jacoby P, Keelan JA, et al. Sex-specific associations between umbilical cord blood testosterone levels and language delay in early childhood. *Journal of Child Psychology and Psychiatry*. 2012;53(7):726-34.
11. Auyeung B, Knickmeyer R, Ashwin E, Taylor K, Hackett G, Baron-Cohen S. Effects of Fetal Testosterone on Visuospatial Ability. *Archives of Sexual Behavior*. 2012;41(3):571-81.
12. Lombardo MV, Ashwin E, Auyeung B, Chakrabarti B, Taylor K, Hackett G, et al. Fetal Testosterone Influences Sexually Dimorphic Gray Matter in the Human Brain. *The Journal of Neuroscience*. 2012;32(2):674-80.
13. Alexander GM, Hines M. Sex differences in response to children's toys in nonhuman primates (*Cercopithecus aethiops sabaeus*). *Evolution and Human Behavior*. 2002;23(6):467-79.
14. Hassett JM, Siebert ER, Wallen K. Sex differences in rhesus monkey toy preferences parallel those of children. *Hormones and Behavior*. 2008;54(3):359-64.
15. Baron-Cohen S, Knickmeyer RC, Belmonte MK. Sex Differences in the Brain: Implications for Explaining Autism. *Science*. 2005;310(5749):819-23.
16. Spelke ES. Sex Differences in Intrinsic Aptitude for Mathematics and Science?: A Critical Review. *American Psychologist*. 2005;60(9):950-8.
17. Wallentin M. Putative sex differences in verbal abilities and language cortex: A critical review. *Brain and Language*. 2009;108(3):175-83.
18. Irwin LG, Siddiqi A, Hertzman C. *Early Child Development: A Powerful Equalizer. Final Report for the World Health Organization's Commission of the Social Determinants of Health*. Vancouver: Human Early Learning Partnership, 2007.
19. Meier M, Slutske W, Heath A, Martin N. The Role of Harsh Discipline in Explaining Sex Differences in Conduct Disorder: a Study of Opposite-Sex Twin Pairs. *J Abnorm Child Psychol*. 2009;37(5):653-64.
20. Rodriguez C. Association Between Independent Reports of Maternal Parenting Stress and Children's Internalizing Symptomatology. *Journal of Child and Family Studies*. 2011;20(5):631-9.

21. Kroneman L, Loeber R, Hipwell A, Koot H. Girls' Disruptive Behavior and its Relationship to Family Functioning: A Review. *Journal of Child and Family Studies*. 2009;18(3):259-73.
22. Marakovitz SE, Wagmiller RL, Mian D, Briggs-Gowan MJ, Carter AS. Lost Toy? Monsters Under the Bed? Contributions of Temperament and Family Factors to Early Internalizing Problems in Boys and Girls. *Journal of Clinical Child & Adolescent Psychology*. 2011;40(2):233-44.
23. Gilkerson J, Richards JA. *The Power of Talk: Impact of Adult Talk, Conversational Turns, and TV During the Critical 0-4 Years of Child Development*. Boulder, CO: LENA Research Foundation, 2009 Contract No.: LENA Technical Report LTR-01-2.
24. Relton CL, Smith GD. Is epidemiology ready for epigenetics? *International Journal of Epidemiology*. 2012;41(1):5-9.
25. De Haan AD, Prinzie P, Deković M. How and why children change in aggression and delinquency from childhood to adolescence: moderation of overreactive parenting by child personality. *Journal of Child Psychology and Psychiatry*. 2010;51(6):725-33.
26. Yaman A, Mesman J, van Ijzendoorn MH, Bakermans-Kranenburg MJ. Parenting and toddler aggression in second-generation immigrant families: The moderating role of child temperament. *Journal of Family Psychology*. 2010;24(2):208-11.
27. Mesman J, Stoel R, Bakermans-Kranenburg M, van Ijzendoorn M, Juffer F, Koot H, et al. Predicting Growth Curves of Early Childhood Externalizing Problems: Differential Susceptibility of Children with Difficult Temperament. *J Abnorm Child Psych*. 2009;37(5):625-36.
28. Smith M. Good parenting: Making a difference. *Early Human Development*. 2010;86(11):689-93.
29. Yerushalmy J, van den Berg BJ, Erhardt CL, Jacobziner HH. Birth weight and gestation as indices of "immaturity": Neonatal mortality and congenital anomalies of the "immature". *American Journal of Diseases of Children*. 1965;109(1):43-57.
30. Curhan GC, Willett WC, Rimm EB, Spiegelman D, Ascherio AL, Stampfer MJ. Birth Weight and Adult Hypertension, Diabetes Mellitus, and Obesity in US Men. *Circulation*. 1996;94(12):3246-50.
31. Rich-Edwards JW, Stampfer MJ, Manson JE, Rosner B, Hankinson SE, Colditz GA, et al. Birth weight and risk of cardiovascular disease in a cohort of women followed up since 1976. *BMJ*. 1997;315(7105):396-400.
32. Hack M, Flannery DJ, Schluchter M, Cartar L, Borawski E, Klein N. Outcomes in Young Adulthood for Very-Low-Birth-Weight Infants. *New England Journal of Medicine*. 2002;346(3):149-57.
33. Naeye RL, Burt LS, Wright DL, Blanc WA, Tatter D. Neonatal mortality, the male disadvantage. *Pediatrics*. 1971;48(6):902.
34. Kirchengast S, Hartmann B. The Male Disadvantage Hypothesis Reconsidered: Is There Really a Weaker Sex? An Analysis of Gender Differences in Newborn Somatometrics and Vital Parameters. *J Life Sci*. 2009;1(1):63-71.
35. Australian Institute of Health and Welfare. *Children's Headline Indicators* n.d. Available from: <http://www.aihw.gov.au/chi/index.cfm>.
36. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders. DSM-IV, 4th edition*. Washington, DC: American Psychiatric Association; 2000.
37. Tennant PWG, Samarasekera SD, Pless-Mulloli T, Rankin J. Sex differences in the prevalence of congenital anomalies: A population-based study. *Birth Defects Research Part A: Clinical and Molecular Teratology*. 2011;91(10):894-901.
38. Lisi A, Botto LD, Rittler M, Castilla E, Bianchi F, Botting B, et al. Sex and congenital malformations: An international perspective. *American Journal of Medical Genetics Part A*. 2005;134A(1):49-57.
39. Gibson CS, van Essen PB, Scott H, Baghurst P, Chan A, Scheil W. 2007 Annual Report of the South Australian Birth Defects Register, incorporating the 2007 Annual Report of Prenatal Diagnosis

in South Australia. Adelaide: SA Birth Defects Register, Children, Youth and Women's Health Service, 2010.

40. World Health Organization. Definition: intellectual disability 2013. Available from: <http://www.euro.who.int/en/what-we-do/health-topics/noncommunicable-diseases/mental-health/news/news/2010/15/childrens-right-to-family-life/definition-intellectual-disability>.
41. Australian Institute of Health and Welfare. Disability in Australia: intellectual disability (Bulletin 67). Canberra: Australian Institute of Health and Welfare, 2008.
42. Liederman J, Kantrowitz L, Flannery K. Male Vulnerability to Reading Disability Is Not Likely to Be a Myth: A Call for New Data. *Journal of Learning Disabilities*. 2005;38(2):109-29.
43. Wheldall K, Limbrick L. Do More Boys Than Girls Have Reading Problems? *Journal of Learning Disabilities*. 2010;43(5):418-29.
44. Chan DW, Ho CS, Tsang S, Lee S, Chung KKH. Prevalence, gender ratio and gender differences in reading-related cognitive abilities among Chinese children with dyslexia in Hong Kong. *Educational Studies*. 2007;33(2):249-65.
45. Rutter M, Caspi A, Fergusson D, Horwood LJ, Goodman R, Maughan B, et al. Sex differences in developmental reading disability: New findings from 4 epidemiological studies. *Journal of American Medical Association*. 2004;291(16):2007-12.
46. Siegel LS, Smythe IS. Reflections on research on reading disability with special attention to gender issues. *Journal of Learning Disabilities*. 2005;38(5):473-7.
47. Flannery KA, Liederman J, Daly L, Schultz J. Male prevalence for reading disability is found in a large sample of Black and White children free from ascertainment bias. *Journal of the International Neuropsychological Society*. 2000;6(4):433-42.
48. Shaywitz SE, Shaywitz BA, Fletcher JM, Escobar MD. Prevalence of reading disability in boys and girls: Results of the Connecticut Longitudinal Study. *JAMA: The Journal of the American Medical Association*. 1990;264(8):998-002.
49. Beaman R, Wheldall K, Kemp C. Differential teacher attention to boys and girls in the classroom. *Educational Review*. 2006;58(3):339-66.
50. Merikangas KR, He J, Brody D, Fisher PW, Bourdon K, Koretz DS. Prevalence and Treatment of Mental Disorders Among US Children in the 2001–2004 NHANES. *Pediatrics*. 2010;125(1):75-81.
51. Gershon J. A Meta-Analytic Review of Gender Differences in ADHD. *Journal of Attention Disorders*. 2002;5(3):143-54.
52. Rucklidge J. Gender Differences in Attention-Deficit/Hyperactivity Disorder. *Psychiatric Clinics of North America*. 2010;33(2):357-73.
53. Efron D, Davies S, Sciberras E. Current Australian Pediatric Practice in the Assessment and Treatment of ADHD. *Academic Pediatrics*. 2013;13(4):328-33.
54. Zelazo PD. The Dimensional Change Card Sort (DCCS): a method of assessing executive function in children. *Nature Protocols*. 2006;1(1):297-301.
55. Gillberg C, Cederlund M, Lamberg K, Zeijlon L. Brief Report: "The Autism Epidemic". The Registered Prevalence of Autism in a Swedish Urban Area. *J Autism Dev Disord*. 2006;36(3):429-35.
56. Bryson SE, Smith IM. Epidemiology of autism: Prevalence, associated characteristics, and implications for research and service delivery. *Mental Retardation & Developmental Disabilities Research Reviews*. 1998;4(2):97-103.
57. Chakrabarti S, Fombonne E. Pervasive developmental disorders in preschool children. *JAMA*. 2001;285(24):3093-9.
58. McDermott S, Williams K, Ridley G, Glasson E, Wray J. The Prevalence of Autism in Australia: Can it be established from existing data? A report prepared for Australian Advisory Board on Autism Spectrum Disorders 2007.
59. Lai M, Lombardo MV, Pasco G, Ruigrok ANV, Wheelwright SJ, Sadek SA, et al. A Behavioral Comparison of Male and Female Adults with High Functioning Autism Spectrum Conditions. *PLoS ONE*. 2011;6(6):e20835.

60. Parker G, H. B. Gender differences in depression. *International Review of Psychiatry*. 2010;22(5):429-36.
61. Sandt AR, Sloan DM. Gender differences in depression. *Women's Health*. 2006;2(3):425-34. English.
62. Leach LS, Christensen H, Mackinnon AJ, Windsor TD, Butterworth P. Gender differences in depression and anxiety across the adult lifespan: the role of psychosocial mediators. *Soc Psychiat Epidemiol*. 2008 2008/12/01;43(12):983-98. English.
63. Wilhelm K, Parker G, Geerligs L, Wedgwood L. Women and depression: a 30 year learning curve. *Australian & New Zealand Journal of Psychiatry*. 2008;42(1):3-12.
64. Piccinelli M, Wilkinson G. Gender differences in depression: Critical review. *The British Journal of Psychiatry*. 2000;177(6):486-92.
65. Parker G, Hadzi-Pavlovic D. Is the female preponderance in major depression secondary to a gender difference in specific anxiety disorders? *Psychological Medicine*. 2004;34(3):461-70.
66. McLean CP, Asnaani A, Litz BT, Hofmann SG. Gender differences in anxiety disorders: Prevalence, course of illness, comorbidity and burden of illness. *Journal of Psychiatric Research*. 2011;45(8):1027-35.
67. Zalta AK, Chambless DL. Understanding Gender Differences in Anxiety: The Mediating Effects of Instrumentality and Mastery. *Psychology of Women Quarterly*. 2012;36(4):488-99.
68. Lewinsohn PM, Gotlib IH, Lewinsohn M, Seeley JR, Allen NB. Gender Differences in Anxiety Disorders and Anxiety Symptoms in Adolescents. *Journal of Abnormal Psychology*. 1998;107(1):109-17.
69. Kaess M, Parzer P, Haffner J, Steen R, Roos J, Klett M, et al. Explaining gender differences in non-fatal suicidal behaviour among adolescents: a population-based study. *BMC Public Health*. 2011;11(1):597.
70. Langhinrichsen-Rohling J, Friend J, Powell A. Adolescent suicide, gender, and culture: A rate and risk factor analysis. *Aggression and Violent Behavior*. 2009;14(5):402-14.
71. Wunderlich U, Bronisch T, Wittchen HU, Carter R. Gender differences in adolescents and young adults with suicidal behaviour. *Acta Psychiatrica Scandinavica*. 2001;104(5):332-9.
72. Canetto SS, Sakinofsky I. The Gender Paradox in Suicide. *Suicide and Life-Threatening Behavior*. 1998;28(1):1-23.
73. Lewinsohn PM, Rohde P, Seeley JR, Baldwin CL. Gender differences in suicide attempts from adolescence to young adulthood. *J Am Acad Child Adolesc Psychiatry*. 2001;40(4):427-34.
74. Denning DG, Conwell Y, King D, Cox C. Method Choice, Intent, and Gender in Completed Suicide. *Suicide and Life-Threatening Behavior*. 2000;30(3):282-8.
75. Lewinsohn PM, Rohde P, Seeley JR. Psychosocial Risk Factors for Future Adolescent Suicide Attempts. *Journal of Consulting & Clinical Psychology*. 1994;62(2):297-305.
76. Leon AC, Friedman RA, Sweeney JA, Brown RP, Mann JJ. Statistical issues in the identification of risk factors for suicidal behavior: The application of survival analysis. *Psychiatry Research*. 1990;31(1):99-108.
77. Hyde JS. How large are gender differences in aggression? A developmental meta-analysis. *Dev Psychol*. 1984;20(4):722-36.
78. Carbone-Lopez K, Esbensen F, Brick BT. Correlates and Consequences of Peer Victimization: Gender Differences in Direct and Indirect Forms of Bullying. *Youth Violence and Juvenile Justice*. 2010;8(4):332-50.
79. Lagerspetz KMJ, Björkqvist K, Peltonen T. Is Indirect Aggression Typical of Females? *Aggressive Behavior*. 1988;14(6):403-14.
80. Li Q. Cyberbullying in Schools: A Research of Gender Differences. *School Psychology International*. 2006;27(2):157-70.

81. Stowe RM, Arnold DH, Ortiz C. Gender Differences in the Relationship of Language Development to Disruptive Behavior and Peer Relationships in Preschoolers. *Journal of Applied Developmental Psychology*. 1999;20(4):521-36.
82. Gibb SJ, Fergusson DM, Horwood LJ. Gender differences in educational achievement to age 25. *Australian Journal of Education*. 2008;52(1):63-80.
83. Kling KC, Hyde JS, Showers CJ, Buswell BN. Gender differences in self-esteem: A meta-analysis. *Psychological Bulletin*. 1999;125(4):470-500.
84. Rothbart MK, Ahadi SA, Evans DE. Temperament and Personality: Origins and Outcomes. *Journal of Personality and Social Psychology*. 2000;78(1):122-35.
85. Poehlmann J, Hane A, Burnson C, Maleck S, Hamburger E, Shah PE. Preterm infants who are prone to distress: differential effects of parenting on 36-month behavioral and cognitive outcomes. *Journal of Child Psychology and Psychiatry*. 2012;53(10):1018-25.
86. Sayal K, Heron J, Maughan B, Rowe R, Ramchandani P. Infant temperament and childhood psychiatric disorder: longitudinal study. *Child: care, health and development*. 2013.
87. Lawson KR, Ruff HA. Early attention and negative emotionality predict later cognitive and behavioural function. *International Journal of Behavioral Development*. 2004 March 1, 2004;28(2):157-65.
88. Else-Quest NM, Hyde JS, Goldsmith HH, Van Hulle CA. Gender differences in temperament: A meta-analysis. *Psychological Bulletin*. 2006;132(1):33-72.
89. Hyde JS. The Gender Similarities Hypothesis. *American Psychologist*. 2005;60(6):581-92.
90. Weiss EM, Kemmler G, Deisenhammer EA, Fleischhacker WW, Delazer M. Sex differences in cognitive functions. *Personality and Individual Differences*. 2003;35(4):863-75.
91. Bornstein M, Hahn C, Haynes O. Specific and general language performance across early childhood: Stability and gender considerations. *First Language*. 2004;24(3):267-304.
92. Hyde JS, Linn MC. Gender differences in verbal ability: A meta-analysis. *Psychological Bulletin*. 1988;104(1):53-69.
93. Huttenlocher J, Haight W, Bryk A, Seltzer M, Lyons T. Early vocabulary growth: Relation to language input and gender. *Dev Psychol*. 1991;27(2):236-48.
94. Taylor CL, Maguire B, Zubrick SR. Children's language development. *The Longitudinal Study of Australian Children Annual Statistical Report 2010*. Melbourne: Australian Institute of Family Studies; 2011. p. 107-21.
95. OECD. Are boys and girls ready for the digital age? *PISA in Focus 12*: OECD; 2012.
96. Machin S, Pekkarinen T. Global sex differences in test score variability. *Science*. 2008;322:1331-2.
97. OECD. *Literacy Skills for the World of Tomorrow: Further Results from PISA 2000* Paris: OECD, UNESCO, UNESCO Institute for Statistics, 2003.
98. OECD. *Learning for Tomorrow's World: First Results from PISA 2003*. Paris: OECD, 2004.
99. OECD. *PISA 2006*. Paris: OECD, 2007.
100. OECD. *PISA 2009 Results: What Students Know and Can Do - Student Performance in Reading, Mathematics and Science*. Paris: OECD, 2010.
101. Limbrick L, Wheldall K, Madelaine A. Estimating Gender Ratios of Poor Reading Using Large-Scale Assessments. *Australian Journal of Education*. 2010;54(2):190-222.
102. Australian Curriculum Assessment and Reporting Authority. *National Assessment Program - Literacy and Numeracy: Achievement in reading, writing, language conventions and numeracy*. Sydney: ACARA, 2008.
103. Australian Curriculum Assessment and Reporting Authority. *National Assessment Program - Literacy and Numeracy: Achievement in reading, writing, language conventions and numeracy*. Sydney: ACARA, 2009.

104. Australian Curriculum Assessment and Reporting Authority. National Assessment Program - Literacy and Numeracy: Achievement in reading, writing, language conventions and numeracy. National Report for 2010. Sydney: ACARA, 2010.
105. Australian Curriculum Assessment and Reporting Authority. National Assessment Program - Literacy and Numeracy: Achievement in reading, persuasive writing, language conventions and numeracy. National Report for 2011. Sydney: ACARA, 2011.
106. Cohen DJ, White S, Cohen SB. Closing the Gender Gap: Improved Performance of U.S.-Born Females on the National Assessment of Adult Literacy. *Journal of Literacy Research*. 2012;44(4):343-63.
107. Lindberg SM, Hyde JS, Petersen JL, Linn MC. New trends in gender and mathematics performance: A meta-analysis. *Psychological Bulletin*. 2010;136(6):1123-35.
108. Hyde JS, Fennema E, Lamon SJ. Gender differences in mathematics performance: A meta-analysis. *Psychological Bulletin*. 1990;107(2):139-55.
109. Hedges LV, Nowell A. Sex Differences in Mental Test Scores, Variability, and Numbers of High-Scoring Individuals. *Science*. 1995;269(5220):41-5.
110. Eurydice. Gender Differences in Educational Outcomes: Study on the Measures Taken and the Current Situation in Europe. In: Commission E, editor. Brussels: Education, Audiovisual and Culture Executive Agency; 2010.
111. McMillan J, Marks G. School leavers in Australia: profiles and pathways. LSAY Research Report 31. Melbourne: ACER, 2003 Contract No.: LSAY Research Report 31.
112. Trent F, Slade M. Declining rates of achievement and retention. Perceptions of adolescent males. A submission to the Parliamentary Enquiry on the Education of Boys 2001.
113. Homel J, Mavisakalyan A, Nguyen HT, Ryan C. School completion: what we learn from different measures of family background. Adelaide: NCVER, 2012.
114. Australian Bureau of Statistics. 6227.0 Education and Work, Australia, May 2011. 2011.
115. Marks G, McMillan J, Hillman K. Tertiary entrance performance: the role of student background and school factors. LSAY Research Report 22. Melbourne: ACER, 2001.
116. Collins C, Kenway J, McLeod J. Factors Influencing the Educational Performance of Males and Females in School and their Initial Destinations after Leaving School. Canberra: Commonwealth Department of Education, Training and Youth Affairs, 2000.
117. Fullarton S, Walker M, Ainley J, Hillman K. Patterns of Participation in Year 12. LSAY Research Report 33. Melbourne: ACER, 2003.
118. NCVER. Students & Courses. Canberra: Department of Industry, Innovation, Science, Research and Tertiary Education, 2011.
119. Australian Bureau of Statistics. Australian Social Trends September 2012: Education differences between men and women (catalogue no. 4102.0). Canberra: Australian Bureau of Statistics; 2012.
120. Lamb S, McKenzie P. Patterns of success and failure in the transition from school to work in Australia. LSAY Research Report 18. Melbourne: ACER, 2001.
121. Eccles J. Gendered educational and occupational choices: Applying the Eccles et al. model of achievement-related choices. *International Journal of Behavioral Development*. 2011 May 1, 2011;35(3):195-201.
122. Australian Bureau of Statistics. 6302.0 - Average weekly earnings, Australia, May 2013. Australian Bureau of Statistics; 2013.
123. Halpern DF. Sex Differences in Cognitive Abilities. 4th ed. New York: Psychology Press; 2012.
124. Graduate Careers Australia. GradStats n.d. Available from: <http://www.graduatecareers.com.au/research/researchreports/gradstats/>.
125. Tracy PE, Kempf-Leonard K, Abramoske-James S. Gender Differences in Delinquency and Juvenile Justice Processing: Evidence From National Data. *Crime & Delinquency*. 2009;55(2):171-215.

126. Lauritsen JL, Heimer K, Lynch JP. Trends in the gender gap in violent offending: New evidence from the National Crime Victimization Survey. *Criminology*. 2009;47(2):361-99.
127. Holmes J. Female offending: has there been an increase? *Crime and Justice Statistics* no. 46. Sydney: NSW Bureau of Crime Statistics and Research, 2010 Contract No.: Crime and Justice Statistics no. 46.
128. Australian Institute of Health and Welfare. *Girls and young women in the juvenile justice system 2010-11 (Bulletin 107)*. Canberra: Australian Institute of Health and Welfare, 2012.
129. Wundersitz J, Hunter N. *Juvenile Justice in South Australia: Where are we now?* Information Bulletin no. 40. Office of Crime Statistics and Research, 2005.
130. Australian Institute of Health and Welfare. *Juvenile detention population in Australia: 2012*. Juvenile justice series no. 11. Cat. no. JUV 11. Canberra: AIHW, 2012.
131. Hodgetts K, Lecouteur A. Gender and Disadvantage in the Australian Parliamentary Inquiry into the Education of Boys. *Feminism & Psychology*. 2010;20(1):73-93.
132. Delamont S. Gender and the discourse of derision. *Research Papers in Education*. 1999;14(1):3-21.
133. Backe-Hansen E, Ogden T. Competent Girls and Problematic Boys?: Sex differences in Two Cohorts of Norwegian 10- and 13-year-olds. *Childhood*. 1996;3(3):331-50.
134. Myhill D. Bad Boys and Good Girls? Patterns of Interaction and Response in Whole Class Teaching. *British Educational Research Journal*. 2002;28(3):339-52.
135. Gorard S. The Role of Secondary Data in Combining Methodological Approaches. *Educational Review*. 2002;54(3):231-7.
136. Carothers BJ, Reis HT. Men and Women Are From Earth: Examining the Latent Structure of Gender. *Journal of Personality & Social Psychology*. 2013;104(2):385-407.
137. Griffin C. Discourses of Crisis and Loss: Analysing the 'Boys' Underachievement' Debate. *Journal of Youth Studies*. 2000;3(2):167-88.
138. Jerrim J. *The Reading Gap: The socio-economic gap in children's reading skills: A cross-national comparison using PISA 2009*. The Sutton Trust, 2013.
139. Melhuish EC, Sylva K, Sammons P, Siraj-Blatchford I, Taggart B, Phan MB, et al. *Preschool Influences on Mathematics Achievement*. *Science*. 2008;321:1161-2.
140. Hammersley M. An evaluation of two studies of gender imbalance in primary classrooms. *British Educational Research Journal*. 1990;16(2):125.
141. Moffitt TE, Arseneault L, Belsky D, Dickson N, Hancox RJ, Harrington H, et al. A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*. 2011 February 15, 2011;108(7):2693-8.
142. Shonkoff JP. Building a New Biodevelopmental Framework to Guide the Future of Early Childhood Policy. *Child Development*. 2010;81(1):357-67.



About the Fraser Mustard Centre

Working together to improve the development, education, health and wellbeing of young Australians, the Telethon Institute for Child Health Research and the South Australian Department for Education and Child Development have joined forces in a unique approach to research translation. The Fraser Mustard Centre collaboration aims to:

- Improve and promote the health and wellbeing of all children and young people in South Australia through the unique application of multidisciplinary research
- Help shift focus from the historical delineation between health and education services to an integrated approach with a focus on child development
- Build capacity amongst public sector staff and academic researchers to design, undertake and use research to improve the environments in which children live and the service systems which support families
- Attract funding for shared priorities for research that leads to improved developmental, education, health and wellbeing outcomes for children

The Fraser Mustard Centre brings forward-thinking policy makers and world class child health researchers. It reflects a shared view of policies and outcomes for children and young people. The Centre is a unique collaboration between two organisations passionate about making a difference.

Fraser Mustard Centre
Level 8, 31 Flinders Street
Adelaide, SA 5000
(08) 8226 1206 / (08) 8207 2039
www.frasermustardcentre.sa.edu.au
info.frasermustardcentre@sa.gov.au

**FRASER
MUSTARD
CENTRE**

A COLLABORATION BETWEEN

