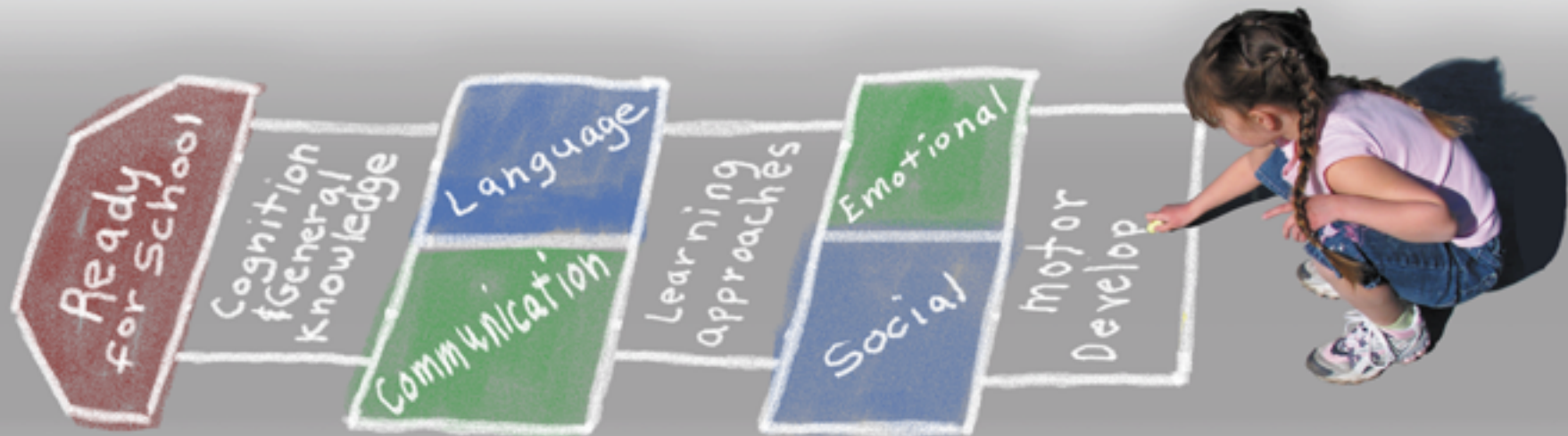


Exploring gender differences in literacy and mathematical understandings in the early years of school: Can differences be explained by behaviours in the classroom?

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Background and Rationale

- Children's first years in school are fundamentally important for their later learning. Success in the early years of school has implications for future achievement in school and beyond (e.g., Doherty 1997; Kurdek & Sinclair 2000; Lonigan 2006; Snow 2006).
- Early school success has been linked to the abilities, behaviours and attitudes that young children bring with them as they enter school for the first time (Denton & West 2002; Ladd 2003; Lonigan 2006; Rathburn & West 2004; Rouse, Brooks-Gunn & McLanahan 2005).
- Information about children's competences as they begin formal schooling can provide important insights for developing educational policies and practices in this country.

Gender Differences in Learning Competence

- Some research suggests that gender differences are not present in the early years of school while other studies have indicated that, on average, girls possess more skills than boys, particularly in literacy (e.g., Coley, 2001; Phillips, Norris, Osmond & Maynard, 2002; Ready, LoGerfo, Burkham & Lee, 2005).
- Explanations for girls' advantage include biological differences in physical maturation and the different social expectations placed on girls and boys from an early age. Differences in behaviours in the classroom may also explain gender differences in early learning (Gresham & Elliot, 1996; Ready et al., 2005).
- Relevant classroom behaviours that can enhance learning include attentiveness and abilities to stay on task, as well as general behaviours in the classrooms in relation to peers and adults (Ready et al., 2005).

Research Questions

- Are there gender differences in language and literacy competence and mathematical understanding in the early years of school?
- Can any gender differences be accounted for by level of children's language and emergent academic skills at age 4 years?
- Are gender differences in language and literacy competence and mathematical understanding accounted for by differences in boys' and girls' behaviours in the classroom?

Analyses use data for the Kindergarten cohort, primarily from Wave 2 (2006), for children in Year 1 at school

Sample Demographics

Number of children in analyses - 2315

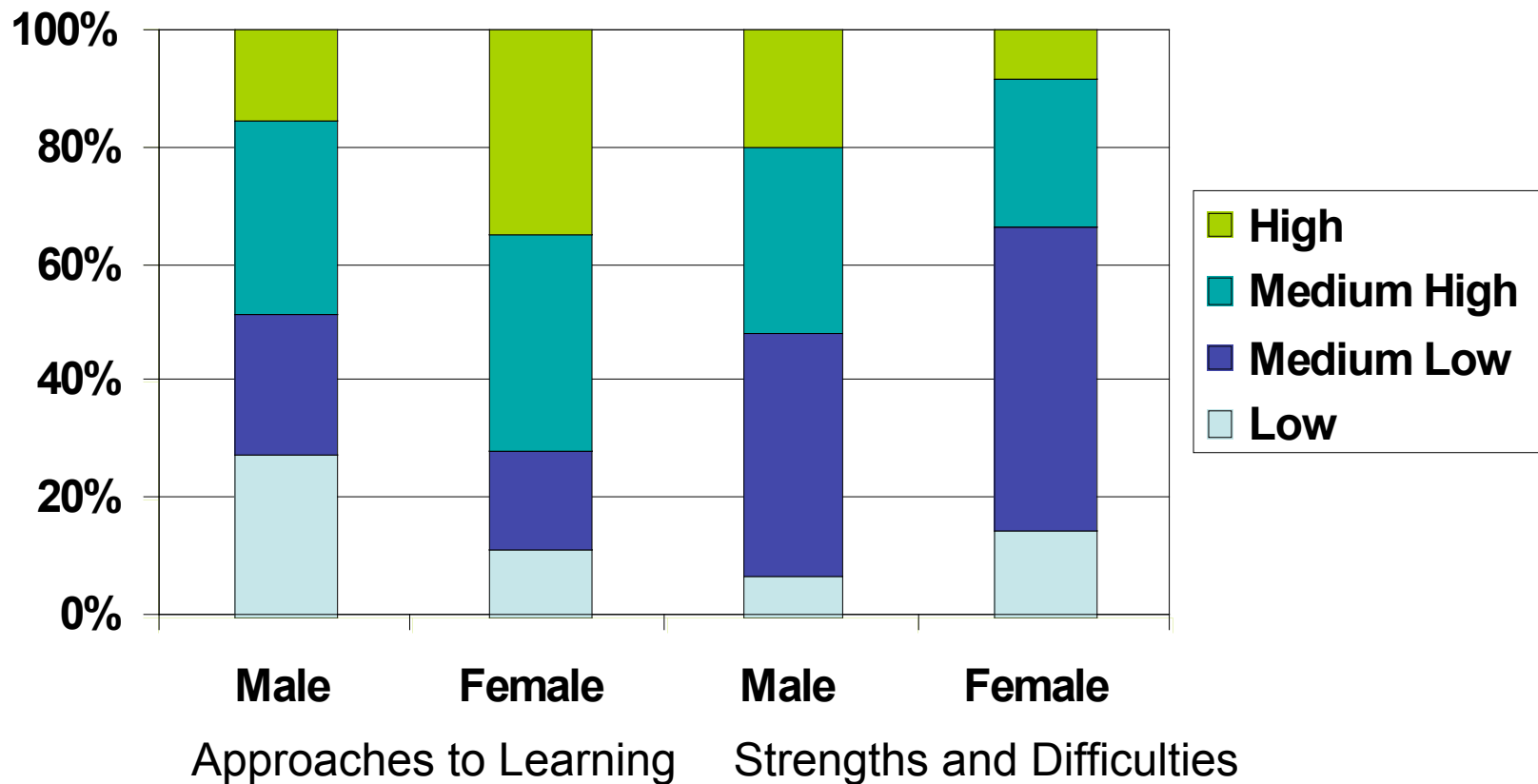
- *Mean age:* 6 years 9 months (SD = 2.56)
- *Sex:* 51% male and 49% female
- *CALD status:* 23%
- *Aboriginal and Torres Strait Islander Children:* 3%
- *Family type:* two-parent family – 88%; single parent - 13%
- *Number of siblings:* none - 9%; 1– 45%; 2 – 30%; 3 or more – 15%
- *Mother's education:* less than Year 12 - 16%; complete Year 12 - 19%; completed tertiary qualification – 65%
- *Combined parental income:* lowest quintile - 18%; highest quintile - 34%

Classroom behaviours at age 6 years (LSAC Wave 2 data)

- **Approaches to learning:** a subscale (6 items) of the ECLS-K Social Rating Scale used in *Early Childhood Longitudinal Study - Kindergarten (ECLS-K)*. National Center for Education Statistics (n.d.). Washington, DC: Department of Education. ($\alpha = .92$)
- **Strengths and Difficulties Questionnaire (SDQ):** Respondents use a 3-point Likert scale to indicate how 25 attributes apply to the target child: 5 subscales of 5 items each (Emotional symptoms; Conduct problems; Hyperactivity; Peer problems; and Prosocial behaviours).



Percentage distribution of males and females by assessment category: Approaches to Learning and Strengths and Difficulties in Year 1 (Wave 2)



What do children know as they begin formal schooling?

Language and literacy (ARS) Teacher ratings (*examples for all items are included in the rating scale*)

- Contributes relevant information to classroom discussions.
- Understands and interprets a story or other text read to him/her.
- Reads words with regular vowel sounds
- Reads words with irregular vowel sounds
- Reads age appropriate books independently with comprehension
- Reads age appropriate books fluently
- Able to write sentences with more than one clause.
- Composes a story with a clear beginning, middle and end
- Demonstrates an understanding of some of the conventions of print
- Uses the computer for a variety of purposes

($\alpha = .94$)



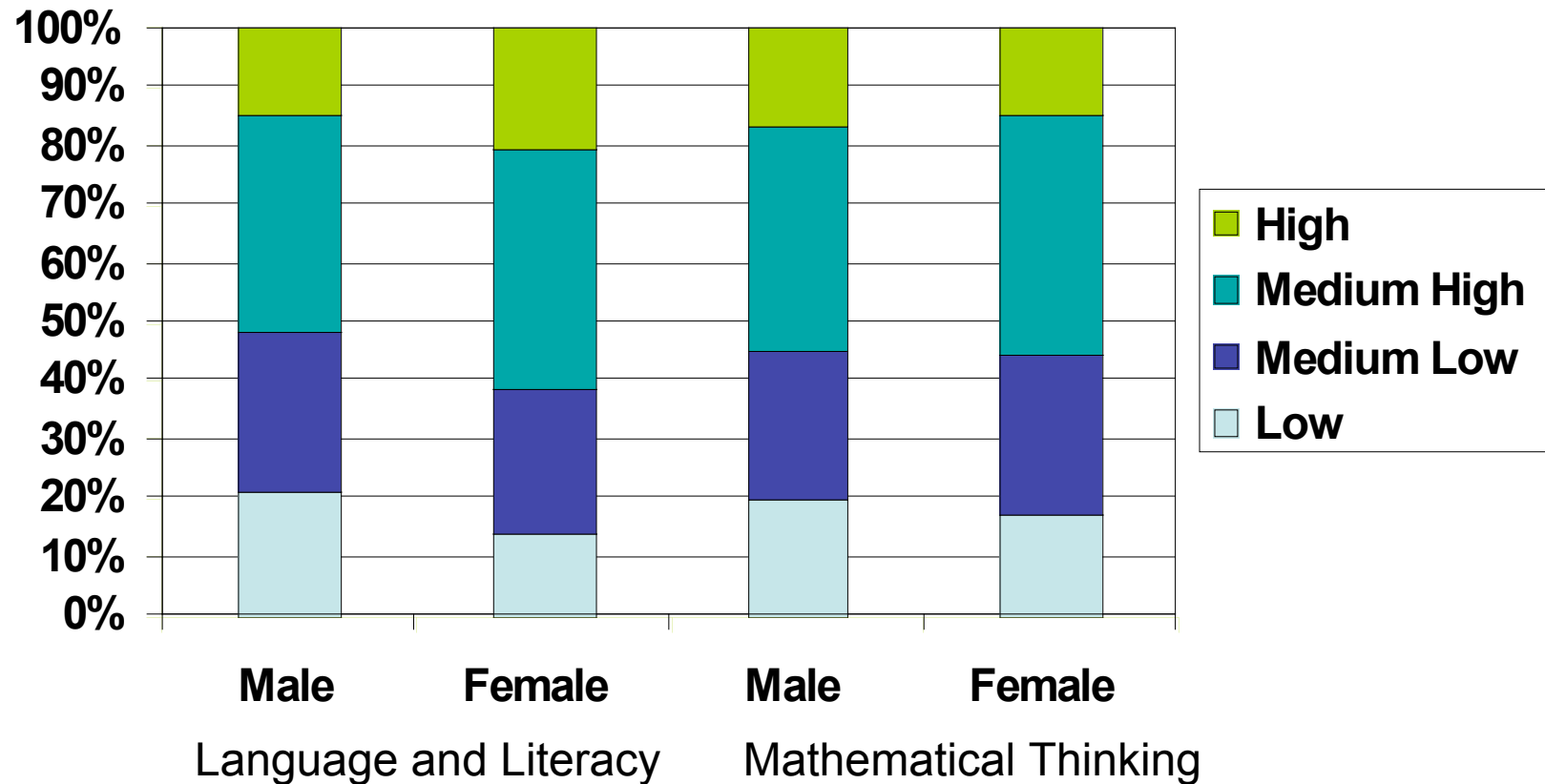
What do children know as they begin formal schooling?

- **Numeracy and Mathematical thinking (ARS) Teacher ratings** (*examples for all items are included in the rating scale*)
- Can continue a pattern using three items.
- Demonstrates an understanding of place value.
- Models, reads, writes and compares whole numbers.
- Counts change with two different types of coins.
- Surveys, collects and organises data into simple graphs.
- Makes reasonable estimates of quantities.
- Measures to the nearest whole number using common instruments.
- Uses a variety of strategies to solve maths problems.

($\alpha = .91$)



Percentage distribution of males and females by assessment category: Literacy and Mathematical Thinking (ARS scores) in Year 1 (Wave 2)



Children's language and emergent academic skills at age 4 years (LSAC Wave 1)

- **PPVT:** Standardised Rasch-modelled score based on direct assessment of an abbreviated form of Peabody Picture Vocabulary Test (PPVT-III Form IIA, 1997), a measure of receptive language.
 - Full scale PPVT-III scores have high reliability and concurrent validity with measures from intelligence scales that related to verbal and language competence.
- **Who Am I? (WAI):** Standardised score based on direct assessment of the 'Who Am I?' (ACER, 1999), an Australian measure which assesses a child's ability to perform a range of tasks such as:
 - reading, writing, copying, and symbol recognition, as a measure of school readiness.



How boys and girls differ

	Total <i>N</i> = 2315 <i>M</i> (<i>SD</i>)	Girls (<i>n</i> = 1133) <i>M</i> (<i>SD</i>)	Boys (<i>n</i> = 1182) <i>M</i> (<i>SD</i>)
ARS – Lit	3.66 (1.00)	3.78 (0.95)	3.54 (1.04)
ARS – Maths	3.54 (0.98)	3.55 (0.95)	3.53 (1.00)
SDQ (total)	5.96 (5.40)	4.71 (4.60)	7.15 (5.82)
App Learn	3.28 (0.70)	3.47 (0.61)	3.10 (0.72)
PPVT (Wave 1)	64.55 (6.62)	65.06 (6.60)	64.06 (6.60)
WAI (Wave 1)	63.63 (7.41)	65.84 (7.05)	61.49 (7.11)

One way ANOVAs revealed significant gender differences on:

- ARS – Language and Literacy, $p = 000$
- SDQ (total), $p = 000$
- Approaches to Learning, $p = .000$
- PPVT (Wave 1), $p = 001$, WAI (Wave 1), $p = 000$

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Correlations between early competencies (PPVT, WAI), later literacy and mathematical outcomes and behaviour

Variable	PPVT	WAI	Literacy	Maths	Approaches to Learning	SDQ
PPVT29**	.33**	.29**	.20**	-.15**
WAI	44**	.39**	.37**	-.28**
Literacy		81**	.62**	-.44**
Maths			52**	-.38**
Approaches to Learning					...	-.72**
SDQ						

Note – All correlations significant ($p < 0.01$, 2-tailed)

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Regression Analysis Plan

- Scores on the **Academic Rating Scales [ARS]** (Language and Literacy and Numeracy and Mathematical Thinking (continuous scores) are used as the outcome measures in these analyses.

Predictor variables included in multiple regression analyses:

- *Child characteristics* - sex and age
- *Family characteristics* – combined parental income, maternal education.
- *Child language and cognitive skills at age 4* – PPVT, Who Am I?
- *Classroom behaviour* - Strengths and Difficulties Questionnaire (SDQ) – total score, Approaches to Learning.

All predictor variables were categorised and dummy coded

Significant Variables in Predictive Model – ARS Literacy

<i>N</i> = 2,315; Adj R ² = 44.6%	Coefficient (95% CI)	p-value
<i>Child characteristics</i>		
Male	-.152 (-.221, -.082)	<0.001
<i>Family characteristics</i>		
Household Income		
<i>Lowest quintile</i>	0 (-,-)	
<i>1st</i>	-.024 (-.126, .079)	.654
<i>2nd</i>	-.024 (-.080, .129)	.646
<i>3rd</i>	.129 (.026, .233)	.015
<i>Highest quintile</i>	.146 (.038, .253)	.008

Significant Variables in Predictive Model – ARS Literacy

$N = 2,315$; Adj $R^2 = 44.6\%$ Coefficient (95% CI) p-value

Early competencies

PPVT (Wave 1)

<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	0.89 (-0.15, .193)	.093
<i>3rd</i>	.292 (.191, .393)	<0.001
<i>Highest</i>	.526 (.402, .651)	<0.001

WAI (Wave 1)

<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	.199 (.096, .302)	<0.001
<i>3rd</i>	.389 (.281, .496)	<0.001
<i>Highest</i>	.659 (.529, .790)	<0.001

Significant Variables in Predictive Model – ARS Literacy

<i>N</i> = 2,315; Adj R ² = 44.6%	Coefficient (95% CI)	p-value
<i>Behaviour in classroom</i>		
SDQ (total score)		
<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	-.075 (-.186, .036)	.185
<i>3rd</i>	-.149 (-.278, -.021)	.023
<i>Highest</i>	-.152 (-.312, .008)	.062
Approaches to learning		
<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	.662 (.548, .777)	<0.001
<i>3rd</i>	1.09 (.968, 1.20)	<0.001
<i>Highest</i>	1.36 (1.23, 1.50)	<0.001

Significant Variables in Predictive Model – ARS Maths

<i>N</i> = 2,315; Adj R ² = 34.2%	Coefficient (95% CI)	p-value
<i>Child characteristics</i>		
Male	-.333 (-.406, -.260)	<0.001
<i>Family characteristics</i>		
Household Income		
<i>Lowest quintile</i>	0 (-, -)	
<i>1st</i>	.002 (-.107, .111)	.970
<i>2nd</i>	-.006 (-.116, .105)	.918
<i>3rd</i>	.128 (.019, .238)	.022
<i>Highest quintile</i>	.137 (.024, .251)	.018

Significant Variables in Predictive Model – ARS Maths

$N = 2,315$; Adj $R^2 = 34.2\%$ Coefficient (95% CI) p-value

Early competencies

PPVT (Wave 1)

<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	.024 (-.086, .135)	.668
<i>3rd</i>	.212 (.105, .319)	<0.001
<i>Highest</i>	.413 (.281, .544)	<0.001

WAI (Wave 1)

<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	.252 (.142, .361)	<0.001
<i>3rd</i>	.440 (.326, .554)	<0.001
<i>Highest</i>	.723 (.585, .861)	<0.001

Significant Variables in Predictive Model – ARS Maths

<i>N</i> = 2,315; Adj R ² = 34.2%	Coefficient (95% CI)	p-value
<i>Behaviour in classroom</i>		
SDQ (total score)		
<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	-.082 (-.199, .036)	.173
<i>3rd</i>	-.174 (-.310, -.039)	.012
<i>Highest</i>	-.191 (-.361, -.022)	.027
Approaches to learning		
<i>Lowest</i>	0 (-, -)	
<i>2nd</i>	.501 (.379, .622)	<0.001
<i>3rd</i>	.833 (.709, .957)	<0.001
<i>Highest</i>	1.08 (.941, 1.22)	<0.001

Variables that made significant contribution to child's learning outcomes

- Being female
- High Household Income
- High early learning competencies (PPVT, WAI)
- Fewer problem behaviours on SDQ
- High scores on Approaches to Learning
 - Keeps belongings organised, shows eagerness to learn new things, works independently, easily adapts to changes in routine, persists in completing tasks, pays attention well



Conclusions

- Significant gender differences in language and literacy competence are present in the first year of school
- Early competencies at school entry are consistently associated with higher performance in language and literacy and mathematical understanding
- Gender predicted performance in language and literacy and mathematical understanding in the first year of school
- These gender differences in language and literacy competence and mathematical understanding are accounted for by differences in boys' and girls' behaviours in the classroom – particularly approaches to learning

Implications

- The teacher's role
- The role of classroom behaviours

