

Appendix

**This appendix was part of the submitted manuscript and has been peer reviewed.
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Appendix

This appendix is submitted in conjunction with the main full-text meta-analysis document entitled *A meta-analytic review of cognitive decline during pregnancy* for consideration by the editorial team at the Medical Journal of Australia.

Contents

1 Search strategy.....	4
1.1 Summary of search terms (CINAHL)	4
Table 1 Summary of article characteristics for included studies.....	5
Table 2- Quality analysis results.....	9

1 Search strategy

1.1 Summary of search terms (CINAHL)

1. Matern* Motherhood OR Pregnant* OR Gestation* OR Primipar* OR Multipar* OR *Parous OR *Parity OR (MH "Pregnancy") OR (MH "Periconceptual Period") OR (MH "Parity") OR (MH "Pregnancy Trimesters+")
2. "Processing speed" OR "Memory Loss" OR "Explicit Memory" OR "implicit memory" OR "Working memory" OR "Memory inhibition" OR "Cogniti* Function*" OR Impulsiv* OR Disinhibit* OR "Response inhibit*" OR "Inhibitory control" OR "Sensation seeking" OR "Novelty-seeking" OR "Novelty seeking" OR "Delay discounting" OR "Reward-seek*" OR "Reward seek*" OR "Reward sensitive*" OR "Reward-sensitiv*" OR "Reward dependen*" OR "Reward-dependen*" OR Interference OR "Exec* Control" OR "Attention* bias" OR "Memory inhibit*" OR (MH "Cognition") OR (MH "Memory") OR (MH "Memory, Short Term") OR (MH "Delay Discounting") OR (MH "Decision Making") OR (MH "Neurocognitive (Iowa NOC)") OR (MH "Decision Making (Iowa NOC)") OR (MH "Information Processing (Iowa NOC)") OR (MH "Memory (Iowa NOC)") OR (MH "Executive Function") OR (MH "Cognitive Ability (Iowa NOC)") OR (MH "Decision Making (Iowa NOC)") OR (MH "Information Processing (Iowa NOC)") OR (MH "Neurocognitive (Iowa NOC)") OR (MH "Control (Psychology)+") OR (MH "Self Regulation") OR (MH "Locus of Control") OR (MH "Neuropsychological Tests") OR (MH "Attention") OR (MH "Executive Function") OR (MH "Executive Function") OR (MH "Learning") OR (MH "Thinking") OR (MH "Decision Making") OR (MH "Volition") OR (MH "Cognitive Ability (Iowa NOC)") OR (MH "Cognitive Dissonance") OR (MH "Decision Making (Iowa NOC)") OR (MH "Memory (Iowa NOC)") OR (MH "Cognition (Omaha)") OR (MH "Wechsler Memory Scale-Revised") OR (MH "MMPI") OR (MH "Wechsler Adult Intelligence Scale-Revised")
3. S1 AND S2

Table 1 - Summary of article characteristics for included studies

		Sample size		Mean age in years (SD)				
Study	Study design	Pregnant	Controls	Pregnant	Controls	Cognitive tasks	Domain	Pregnancy trimester
Anderson & Rutherford (2010) ¹⁸	Cross-sectional	39	39	29.61 (4.8)	28.76 (6.7)	Male and female face sets	Memory	T1 T2 T3
Brindle et al. (1991) ²	Cross-sectional	32	9	–	–	Word recall Object recall Face recognition	Memory Memory Memory	T1 T2 T3
Casey (2000) ³⁰	Longitudinal	18	24	28.2 (5.0)	32.5 (7.2)	SILS Vocabulary SILS Abstract WAIS Digit Span (Forwards) WAIS Digit Span (Backwards) Sentence–Digit Working Memory Span	Intelligence Intelligence Memory Memory Memory	T1 T2 T3
Condon, Derham, & Kneebone (1991) ¹⁹	Longitudinal	38	15	27.3 (4.7)	–	Stroop Color-Word Task Selective Reminding Task	Attention Memory	T3
Crawley, Grant, & Hinshaw (2008) ¹⁴	Cross-sectional	50	25	27 (0.2)	29 (6.3)	Test of Everyday Attention (TEA) Rivermead Behavioural Memory Test BADS (Zoo Profile Score) BADS (Modified Six Elements) Speed of Comprehension (SCOLP)	Attention Memory Planning Planning Language	T2 T3
Crawley, Dennison, & Carter (2003) ²⁹	Longitudinal	15	14	29.3 (5.8)	34.1 (8.8)	DKEFS Trail-Making Stroop Color-Word Task Text Memory	Attention Attention Memory	T2 T3

		Sample size		Mean age in years (SD)				
Study	Study design	Pregnant	Controls	Pregnant	Controls	Cognitive tasks	Domain	Pregnancy trimester
Cuttler et al. (2011) ¹⁵	Cross-sectional	61	24	–	–	WAIS Digit Span (Backwards) Modified Rey AVLT Custom Picture Recognition Task Custom lab-based Fruit Prospective Task	Memory Memory Memory Memory	–
De Groot et al. (2003) ⁷	Cross-sectional	71	57	29.5 (3.7)	30.5 (4.2)	Fluency Task Visual Verbal Word Learning Task Stroop Color-Word Task Concept-Shifting Test Letter–Digit Substitution Test	Memory Memory Attention Attention Memory	
Farrar et al. (2014) ¹²	Longitudinal	23	23	30 (6.2)	32 (6.1)	CANTAB : - Intra-Extra Dimensional Set Shift - Stockings of Cambridge - Spatial Recognition Memory - Delayed Matching to Sample	Attention Planning Memory Memory	T1 T2 T3
Harris, Deary, & Harris (1996) ²⁰	Longitudinal	20	20	29 (4.6)	29.1 (4.7)	PASAT WMS-R Logical Memory WMS-R Digit Symbol Letter Cancellation Trail-Making Test (B)	Attention Memory Processing Speed Attention Attention	T3
Henry & Sherwin (2012) ²¹	Longitudinal	55	21	31.4 (4.1)	28.8 (5.6)	WAIS-III Verbal Paired Associates WAIS-III Logical Memory WAIS-III Digit Symbol WAIS-III Block Design WAIS-III Letter–Number Sequence	Memory Memory Processing Speed Visuospatial Org. Memory	T3

		Sample size		Mean age in years (SD)				
Study	Study design	Pregnant	Controls	Pregnant	Controls	Cognitive tasks	Domain	Pregnancy trimester
						WAIS-III Spatial Span WAIS-III Digit Span (Backwards) Tower of London Rey AVLT Cancellation Task Mental Rotations Test	Memory Memory Planning Memory Attention Memory	
Janes et al. (1999) ³¹	Cross-sectional	20	20	30.2 (4.8)	32.4 (4.7)	WAIS Digit Span (Backwards) Custom Reading Span Task	Memory Memory	—
Keenan et al. (1998) ²²	Longitudinal	10	10	32.5 (4.3)	34.9 (4.7)	WMS-R Logical Memory and California Discourse Memory Test	Memory Memory	T1 T2 T3
McDowall & Moriarty (2000) ²³	Cross-sectional	32	32	30 (—)	29 (—)	Customer word-based priming and recall task	Memory	—
Onyper et al. (2010) ²⁴	Cross-sectional	21	25	29.5 (4.9)	29 (5.9)	Shipley-2 O-Span Task COWAT WAIS-III Digit Symbol WAIS-III Digit Span (Forwards) WAIS-III Digit Span (Backwards) Wisconsin Card Sorting Task Prospective Memory Task Free Recall Task	Intelligence Memory Verbal Fluency Processing Speed Memory Memory Cognitive Flexibility Memory Memory	—
Raz (2014) ¹⁰	Cross-sectional	17	19	30.4 (6.3)	30.5 (6.1)	Online Continual Performance Test	Inhibition/Attention	T3

		Sample size		Mean age in years (SD)				
Study	Study design	Pregnant	Controls	Pregnant	Controls	Cognitive tasks	Domain	Pregnancy trimester
Shetty & Pathak (2002) ²⁵	Longitudinal	50	50	23.4 (1.39)	23.2 (1.72)	WMS	Memory	T1 T2 T3
Vanston (2006) ²⁶	Longitudinal	45	45	31.3 (4.4)	29.3 (5.9)	Digit Symbol Symbol Search C-Span L-Span California Verbal Learning Test	Processing Speed Perceptual Speed Memory Memory Memory	T1 T2 T3
Wilson et al. (2011) ²⁷	Cross-sectional	46	24	29.4 (1.4)*	29.3 (5.9)	WAIS-III Verbal Paired Associates WAIS-III Logical Memory WMS-III Family Pictures WMS-III Faces Rey AVLT Audio Recognition Test	Memory Memory Memory Memory Memory Memory	T1 T3
Wilson et al. (2013) ²⁸	Cross-sectional	46	24	29.4 (1.4)*	29.3 (5.9)	Verbal Paired Associates (Retention %) Logical Memory (Retention %) Faces (Retention %) Maze (Retention %) Rey AVLT (Retention %)	Memory Memory Memory Memory Memory Memory	T1 T3

– = Unreported

Table 2. Quality analysis results

Study	Selection and comparability		Outcome			Data quality			
	Both groups recruited from same community (•)	Controls were nulliparous (••) or not pregnant at time of study (•)	Controls were matched for age or education/IQ (•), or both (••)	Cognitive functioning measured with standardized objective task (••) or modified objective task (•)	Same assessment of cognitive function was utilized for both groups	Follow-up assessment occurred	Interval between initial assessment and follow-up assessments was adequate (i.e., >12 weeks)	All subjects were accounted for at follow-up (••) or lost participants were described (•)	Non-response rate or bad data rate same for both groups
Anderson & Rutherford (2010) ¹⁸			•	•	•	—	—	—	•
Brindle et al. (1991) ²	•		•	•	•	—	—	—	
Casey (2000) ³⁰	•		••	••	•	•	•	•	
Condon, Derham, & Kneebone (1991) ¹⁹				••	•	•		••	•
Crawley, Grant, & Hinshaw (2008) ¹⁴		••	••	••	•	—	—	—	•
Crawley, Dennison, & Carter (2003) ²⁹			••	••	•	•	•		•

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Cuttler et al. (2011) ¹⁵	•		•	••	•	—	—	—	
De Groot et al. (2003) ⁷			••	••	•	—	—	—	
Farrar et al. (2014) ¹²	•		••	••	•	•			•
Harris, Deary, & Harris (1996) ²⁰			••	••	•	•		••	•
Henry & Sherwin (2012) ²¹		••	••	••	•	•	•	••	•
Janes et al. (1999) ³¹	•	••	••	••	•	—	—	—	•
Keenan et al. (1998) ²²	•		••	••	•	•		•	
McDowall & Moriarty (2000) ²³				•	•	—	—	—	•

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Onyper et al. (2010) ²⁴	•		••	••	•	—	—	—	•
Raz (2014) ¹⁰	•		••	••	•	—	—	—	•
Shetty & Pathak (2002) ²⁵			•	••	•	—	—	—	•
Vanston (2006) ²⁶				••	•	•	•		
Wilson et al. (2011) ²⁷			••	••	•	—	—	—	
Wilson et al. (2013) ²⁸			••	••	•	—	—	—	

• = criteria were met

— = not applicable

References

- 2 Brindle PM, Brown MW, Brown J, et al. Objective and subjective memory impairment in pregnancy. *Psychol Med* 1991; 21: 647-653.
- 7 de Groot RHM, Hornstra G, Roozendaal N, Jolles J. Memory performance, but not information processing speed, may be reduced during early pregnancy. *J Clin Exper Neuropsychol* 2003; 25: 482-488.
- 10 Raz S. Behavioral and neural correlates of cognitive-affective function during late pregnancy: an event-related potentials study. *Behav Brain Res* 2014; 267: 17-25.
- 12 Farrar D, Tuffnell D, Neill J, et al. Assessment of cognitive function across pregnancy using CANTAB: a longitudinal study. *Brain Cognition* 2014; 84: 76-84.
- 14 Crawley R, Grant S, Hinshaw K. Cognitive changes in pregnancy: mild decline or societal stereotype? *Appl Cognit Psychol* 2008; 22: 1142-1162.
- 15 Cuttler C, Graf P, Pawluski JL, Galea LAM. Everyday life memory deficits in pregnant women. *Can J Exper Psychol* 2011; 65: 27-37.
- 18 Anderson MV, Rutherford MD. Recognition of novel faces after single exposure is enhanced during pregnancy. *Evol Psychol* 2011; 9: 47-60.
- 19 Condon JT, Derham, D, Kneebone AC. Cognitive functioning during pregnancy: a controlled investigation using psychometric testing. *Int J Prenatal Perinatal Psychol Med* 1991; 60: 199-212.
- 20 Harris ND, Deary IJ, Harris MB, et al. Peripartal cognitive impairment: Secondary to depression? *Br J Health Psychol* 1996; 1: 127-136.
- 21 Henry JF, Sherwin BB. Hormones and cognitive functioning during late pregnancy and postpartum: a longitudinal study. *Behav Neurosci* 2012; 126: 73-85.
- 22 Keenan PA, Yaldoo DT, Stress ME, et al. Explicit memory in pregnant women. *Am J Obstet Gynecol* 1998; 179: 731-737.

- 23 McDowall J, Moriarty R. Implicit and explicit memory in pregnant women: an analysis of data-driven and conceptually driven processes. *Q J Exp Psychol A* 2000; 53: 729-740.
- 24 Onyper SV, Searleman A, Thacher PV, et al. Executive functioning and general cognitive ability in pregnant women and matched controls. *J Clin Experl Neuropsychol* 2010; 32: 986-995.
- 25 Shetty DN, Pathak SS. Correlation between plasma neurotransmitters and memory loss in pregnancy. *J Reprod Med* 2002; 47: 494-496.
- 26 Vanston CM, Watson NV. Selective and persistent effect of foetal sex on cognition in pregnant women. *Neuroreport* 2005; 16: 779-782.
- 27 Wilson DL, Barnes M, Ellett L, et al. Compromised verbal episodic memory with intact visual and procedural memory during pregnancy. *J Clin Exper Neuropsychol* 2011; 33: 680-691.
- 28 Wilson DL, Barnes M, Ellett L, et al. Reduced verbal memory retention is unrelated to sleep disturbance during pregnancy. *Aust Psychologist* 2013; 48: 196-208.
- 29 Crawley RA, Dennison K, Carter C. Cognition in pregnancy and the first year post-partum. *Psychol Psychother* 2003; 76: 69-84.
- 30 Casey P. A longitudinal study of cognitive performance during pregnancy and new motherhood. *Arch Womens Ment Health* 2000; 3: 65-76.
- 31 Janes C, Casey P, Huntsdale C, Angus G. Memory in pregnancy. I. Subjective experiences and objective assessment of implicit, explicit and working memory in primigravid and primiparous women. *J Psychosom Obstet Gynaecol* 1999; 20: 80-87.