



UNIVERSITY OF
LEICESTER



The **I**nfant **M**ortality & **M**orbidity **S**tudies

Improving educational outcomes for children born preterm: From evidence to intervention

Samantha Johnson
Professor of Child Development



Overview

- What is preterm birth?
- Long term effects on development
 - Neurodevelopmental disorders
 - Behaviour, social & emotional outcomes
- Impact on learning & education
- How can we improve long term outcomes?
- Towards a new approach to intervention . . .



Why should we be concerned with preterm birth?

- 1 in every 10 babies is born preterm.
- Globally, 15 million babies are born preterm each year.
- All newborns are vulnerable, but preterm babies are acutely so. Many require special care simply to remain alive.
- Many of the preterm babies who survive face a lifetime of disability.
- An increased awareness of the long-term consequences of preterm birth is required to fashion policies to support these survivors and their families as part of a generalised improvement in quality of care.



What is preterm birth?

Completed weeks of gestation																			
22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41
															Term				
All Preterm																			
Very Preterm										Moderate		Late							
Extremely																			
<28⁺⁰ weeks' gestation Extremely preterm 4,200 births per year 0.5% of all births						28⁺⁰ - 31⁺⁶ weeks' gest. Very preterm 6,600 births per year 0.9% of all births				32⁺⁰ to 36⁺⁶ weeks' gestation Late and moderately preterm 50,000 births per year 6.5% of all births					37⁺⁰ to 41⁺⁶ weeks' gestation Term 705,000 births per year 92.1% of all births				

Born just a few weeks early

- Late & moderately preterm babies are more likely than term-born babies to:
 - Be transferred to a neonatal intensive care unit (NICU)
 - Have breathing difficulties
 - Have feeding difficulties
 - Develop jaundice or infection
 - Have poor growth
 - Spend longer in hospital
- Severe illnesses are rare

Extremely preterm babies

- May spend many months in a neonatal intensive care unit (NICU)
 - Respiratory disease
 - Severe infections
 - Feeding difficulties
 - Poor growth
 - Severe brain injuries
- Abnormal environment for early development
- A major impact on the family



Miracle baby born at 11 ounces headed home after 9 months

By Amanda Woods

April 10, 2019 | 8:00pm | Updated



Connor Florio, who wasn't much bigger than his dad's hand when he was born last July, is heading home after nine months in the hospital.
Blytheville Children's Hospital

MORE ON:
BABIES

Parents don't regret

A preemie from Connecticut who weighed just 11 ounces when he was born is finally home after growing to nearly 11 pounds during nine miracle months at two Westchester hospitals.

ido at a Los Angeles
e and weighed just
es. Despite her slim
1.8kg (4lb) - left - and
Year PICTURE:AP

AFTER 140 DAYS, PREMATURE BABY TO LEAVE MOUNT SINAI NICU

FAMILY & PARENTING



BBC

Sign in

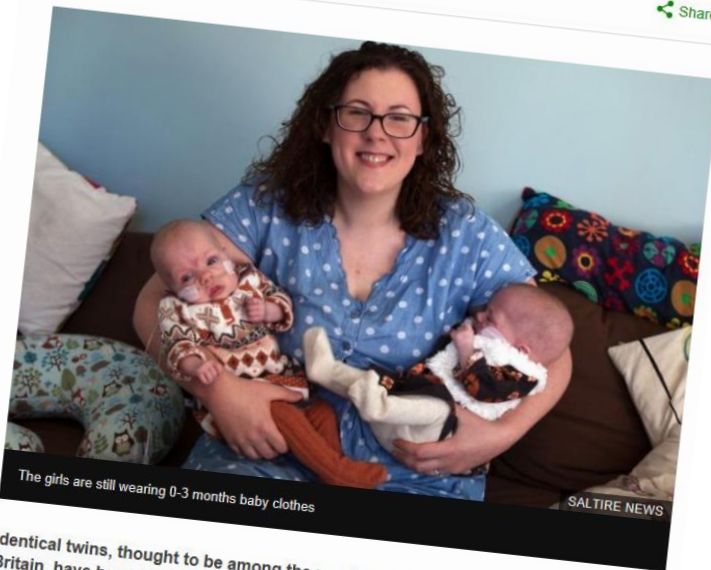
NEWS

Home UK World Business Politics Tech Science Health Education Entertainment
Scotland Scotland Politics Scotland Business Edinburgh, Fife & East Glasgow & West

Twins born at 23 weeks are 'little miracles'

30 January 2017 Glasgow & West Scotland

Share



The girls are still wearing 0-3 months baby clothes

SALTIRE NEWS

Identical twins, thought to be among the most premature ever recorded in Britain, have been described by their parents as "little miracles".

Imogen and Annabelle Weir were born at just 23 weeks and four days, weighing about a pound each.

The long term consequences of preterm birth

- Preterm birth affects multiple areas of development
- Most research is focused on very preterm children, but effects can be seen after birth at all preterm gestations
- The prevalence of problems is related to the baby's gestational age at birth
- The earlier the baby is born, the greater the risk of long term problems
- Problems are evident in infancy and may persist throughout the lifespan



The **EPI**Cure Studies

- National cohort studies of survival and outcome after extremely preterm birth
- All babies born at 22-25 weeks' gestation in all 276 maternity units in the whole of the UK & Ireland, March-December 1995
- Surviving children assessed at:
 - 2 years of age
 - 6 years of age
 - 11 years of age
- A specific pattern of problems following preterm birth

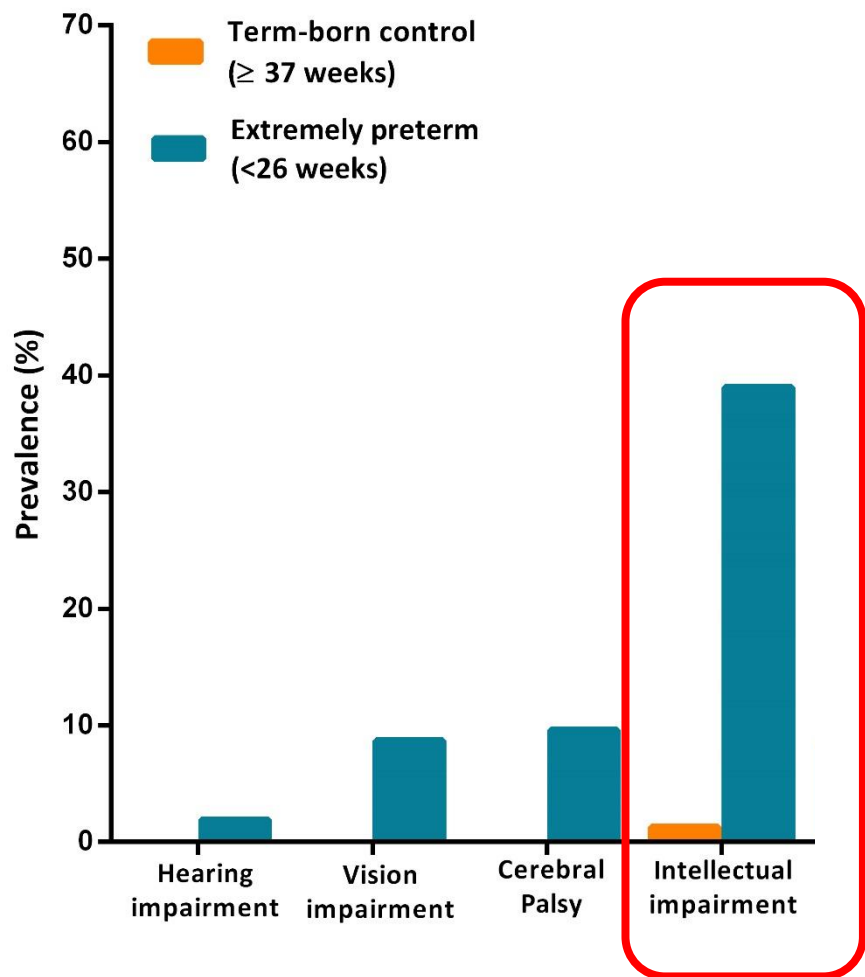
EPIcure 1995
22-25 weeks' gestation
British Isles
1185 live births
309 long term survivors

2.5 year follow-up
283 assessed

6 year follow-up
241 assessed
and 160 controls

11 year follow-up
219 assessed (72%)
and 153 controls

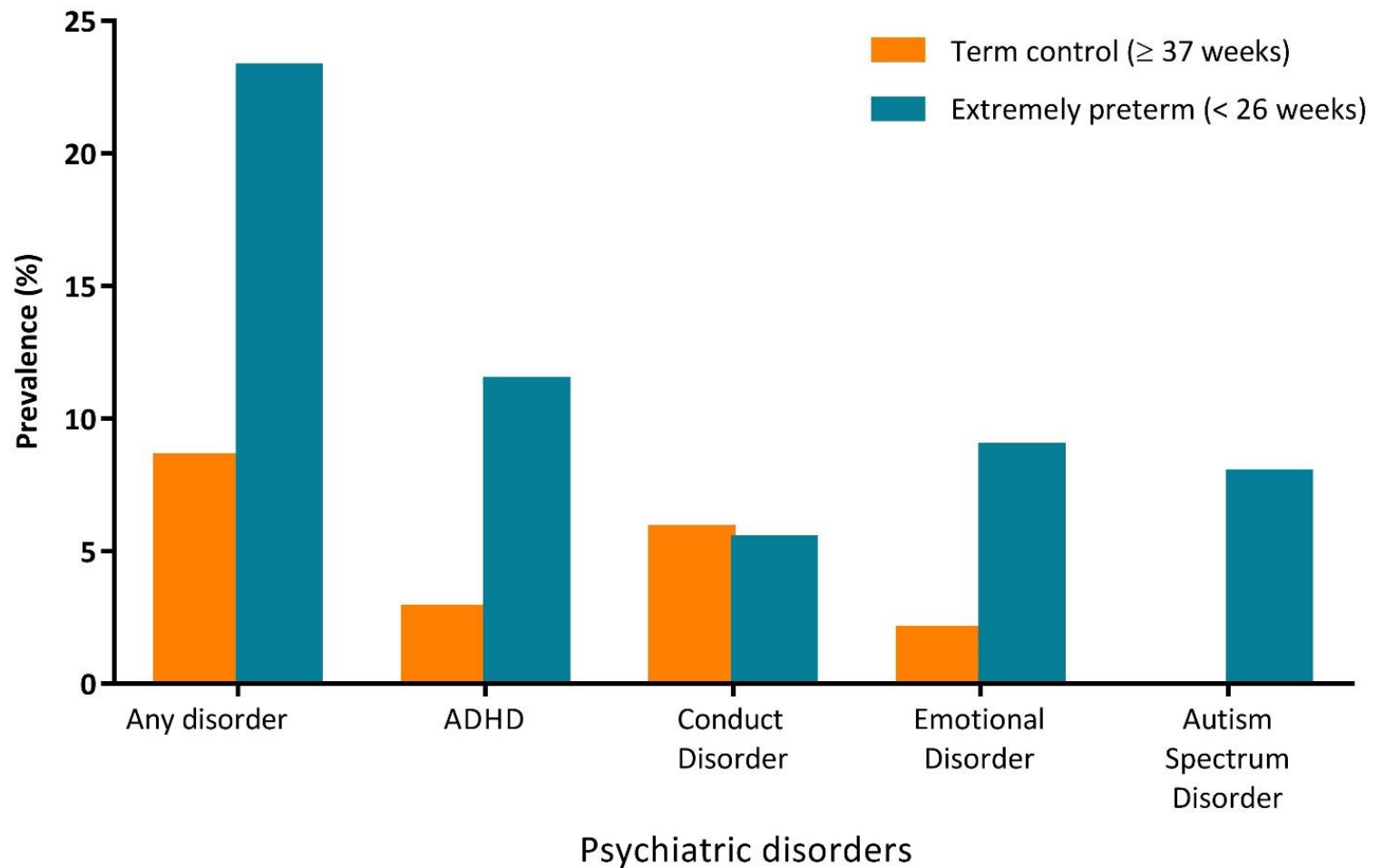
Outcomes at 11 years of age



Cognitive difficulties:

- Difficulties problem solving
- Poor working memory
- Poor visuospatial skills
- Poor hand-eye coordination
- Slow processing speed
- Difficulties planning & organising (executive function)
- Difficulties processing multiple tasks at once
- **Important skills for learning**

Neurodevelopmental & emotional disorders **EPI**Cure



Special educational needs

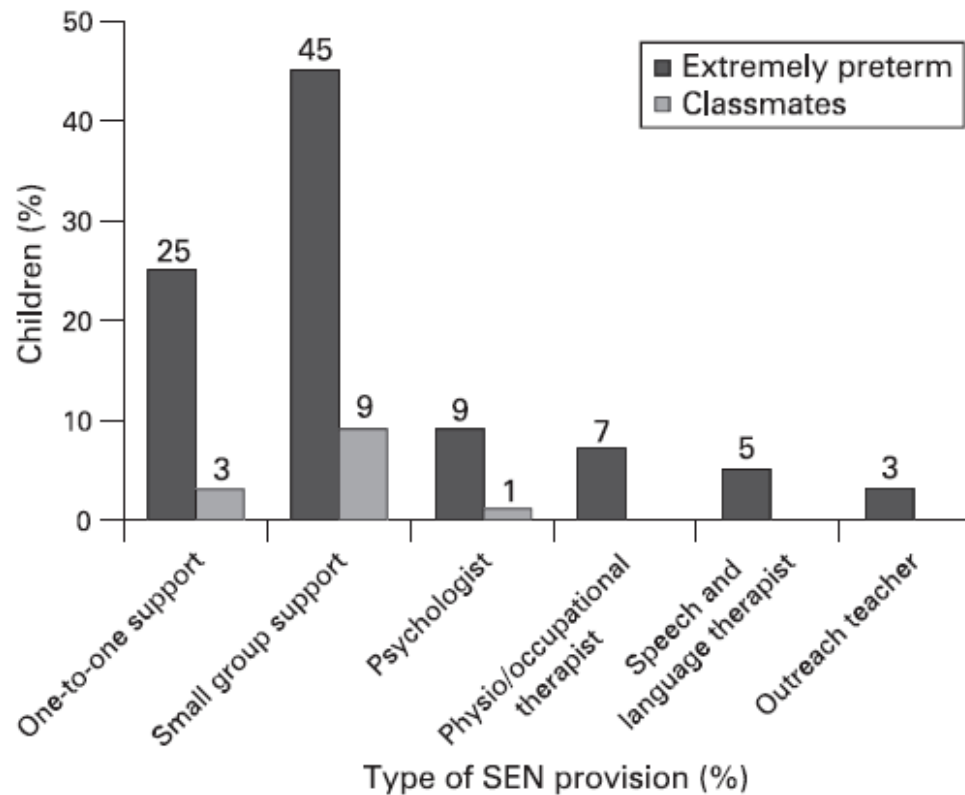
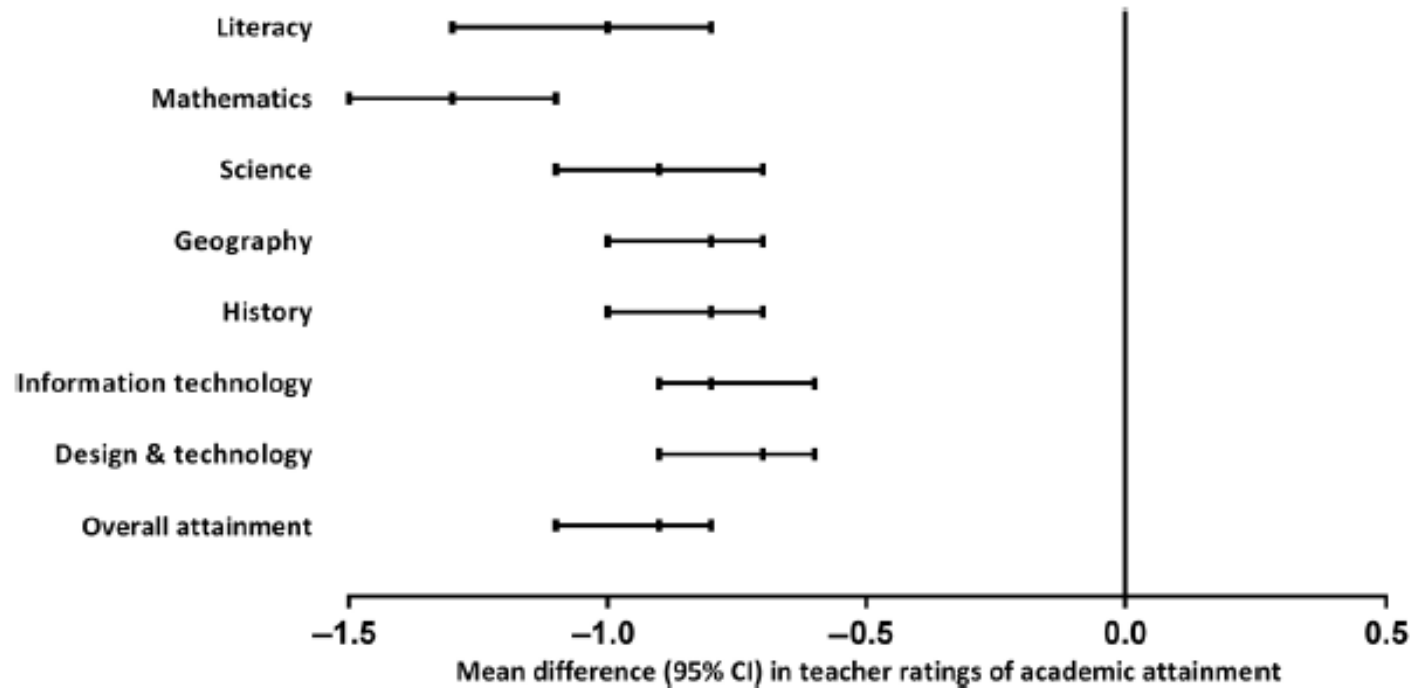


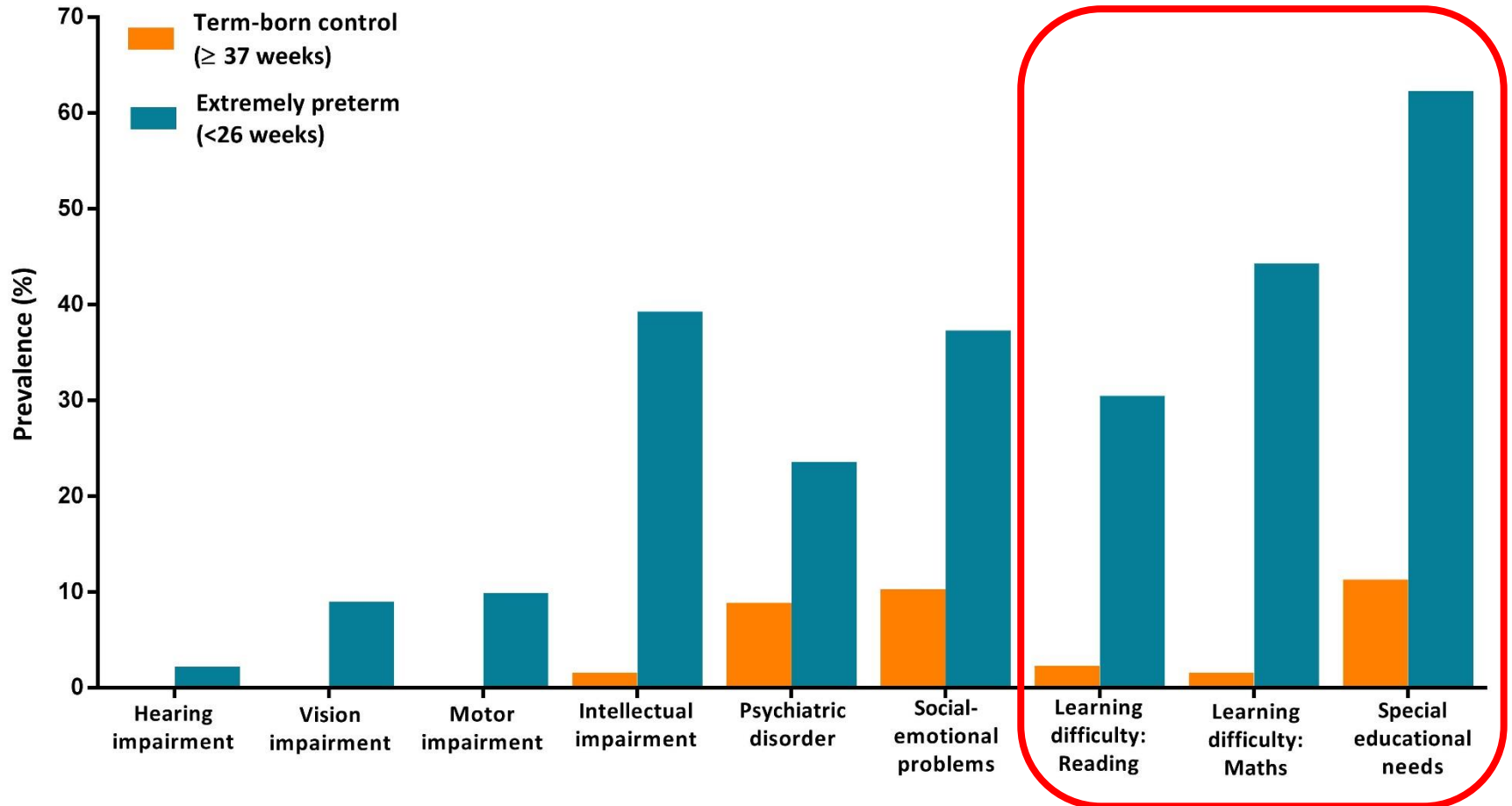
Figure 1 Type of special educational needs (SEN) resource utilised by extremely preterm children and classmates in mainstream schools at 11 years of age.

Academic attainment



Mean difference (95% CI) in teacher ratings of academic attainment for extremely preterm children compared with term-born controls

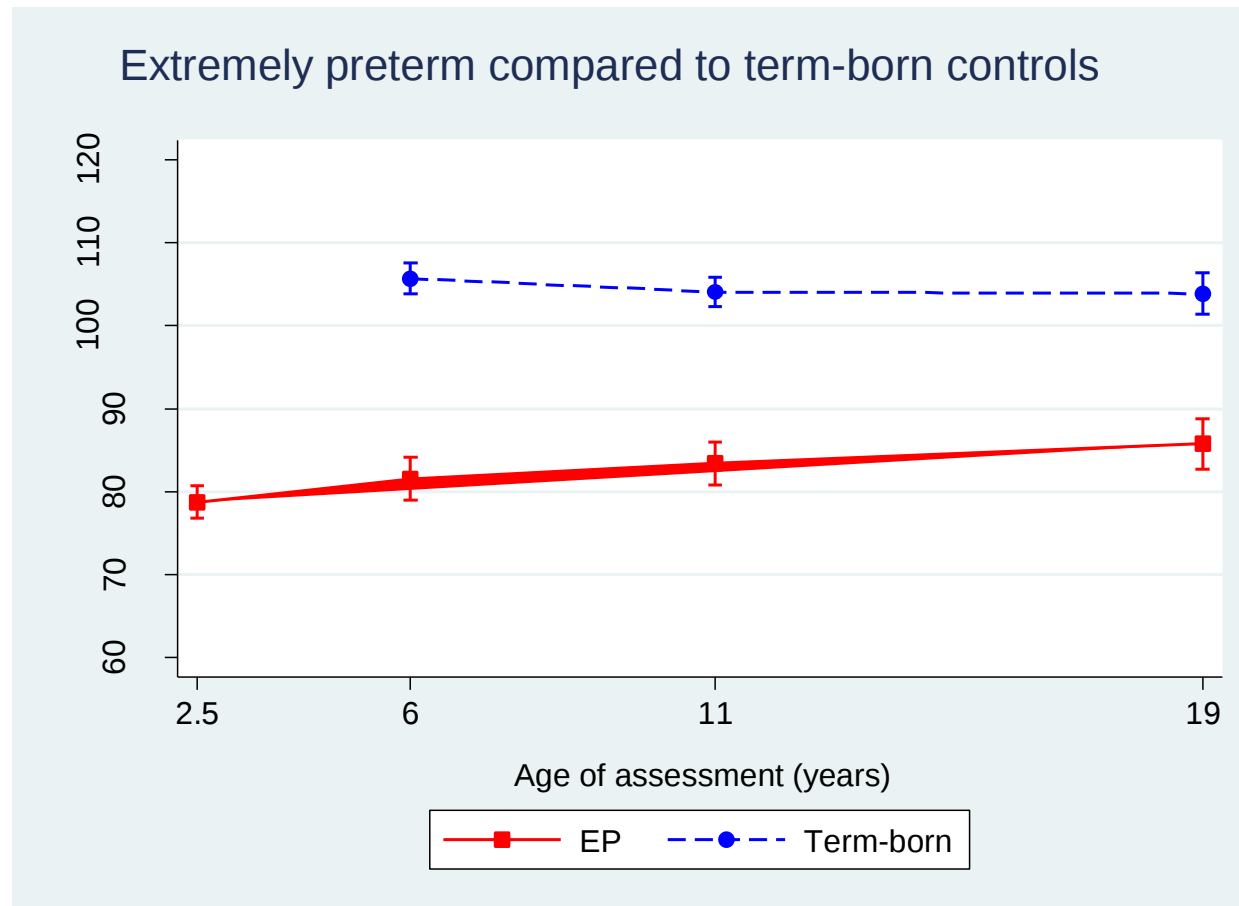
Putting it all together



How can we improve long term
outcomes for children born preterm?



Do nothing?





Improve neonatal care?

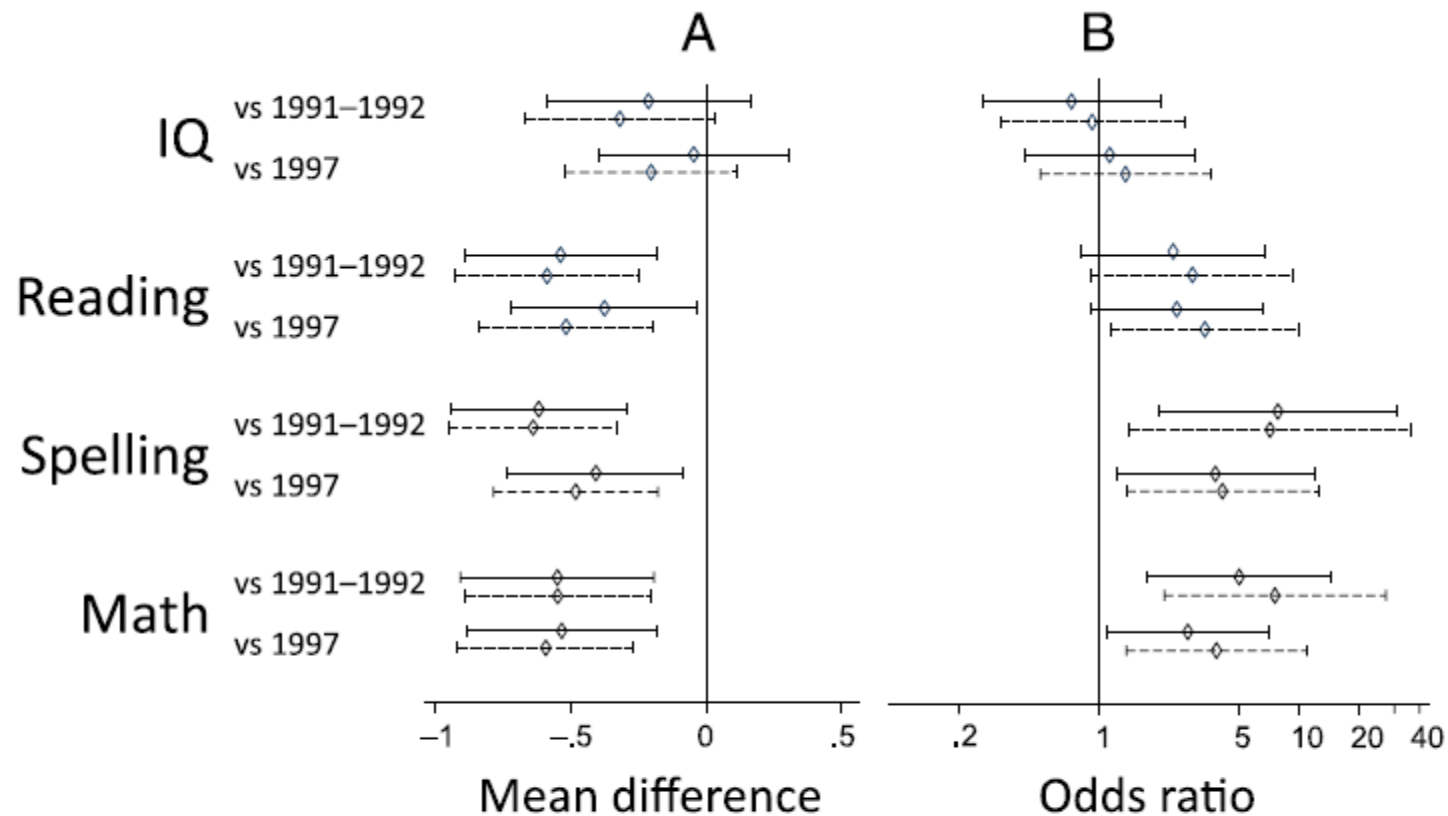


FIGURE 1

Differences on standardized cognitive and academic scores comparing 2005 cohort with both earlier eras. A, Continuous scores. B, Dichotomous scores < -2 SD vs ≥ -2 SD. Solid line is adjusted for age at assessment, age of mother, and sociodemographic variables; dashed line is adjusted for age at assessment, age of mother, sociodemographic variables, and perinatal variables.



Early intervention?

- **Parent Baby Interaction Programme**

- Started shortly after birth
- Nurses provide weekly 1-hour sessions during NICU with up to 6 weekly sessions after discharge
- Enhance parents' sensitivity to infant cues and improve parent-infant interaction

- 233 very preterm babies born before 32 weeks' gestation

- 112 had PBIP intervention
- 121 had standard care

- Assessed children's development at age 2

- **No benefit of intervention on children's cognitive or motor development ☹️**

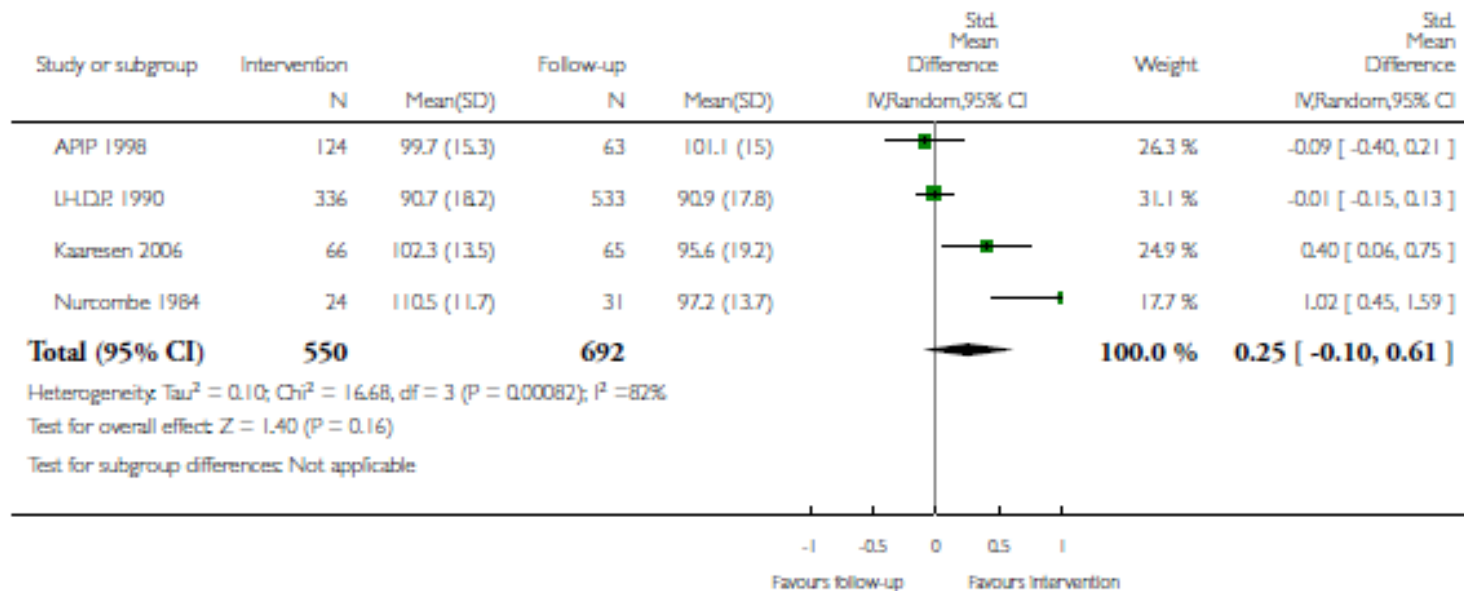
Early intervention?

Analysis 1.3. Comparison 1 Early developmental intervention versus standard follow-up (all studies), Outcome 3 Cognitive outcome at school age - IQ (WISC, Kaufmann).

Review: Early developmental intervention programmes post-hospital discharge to prevent motor and cognitive impairments in preterm infants

Comparison: 1 Early developmental intervention versus standard follow-up (all studies)

Outcome: 3 Cognitive outcome at school age - IQ (WISC, Kaufmann)



Early intervention?

DEVELOPMENTAL MEDICINE & CHILD NEUROLOGY

COMMENTARY

Timing and content of interventions to enhance cognitive performance of very-low-birthweight children

Previous research has indicated that interventions in infancy may have short-term but not positive long-term effects on cognitive or academic performance.² It is not surprising that interventions in the first few months of life may not be enough to solve the complex issue of cognitive deficits in preterm children at school age. This highlights the need for intervention at around school age



Working memory training?

ORIGINAL ARTICLES

www.jpeds.com • THE JOURNAL OF PEDIATRICS



Long-Term Academic Functioning Following Cogmed Working Memory Training for Children Born Extremely Preterm: A Randomized Controlled Trial

Peter J. Anderson, PhD^{1,2}, Katherine J. Lee, PhD^{2,3}, Gehan Roberts, MPH, PhD^{2,3}, Megan M. Spencer-Smith, PhD^{1,2}, Deanne K. Thompson, PhD^{2,3,4}, Marc L. Seal, PhD^{2,3}, Chiara Nosarti, PhD⁵, Andrea Grehan, MSc², Elisha K. Josev, PhD^{2,3}, Susan Gathercole, PhD⁶, Lex W. Doyle, MD, MSc, FRACP^{2,3,7,8}, and Leona Pascoe, BBNSc (Hons), GDipPsych^{1,2}

Objective To assess the effectiveness of Cogmed Working Memory Training compared with a placebo program in improving academic functioning 24 months post-training in extremely preterm/extremely low birth weight 7-year-olds.

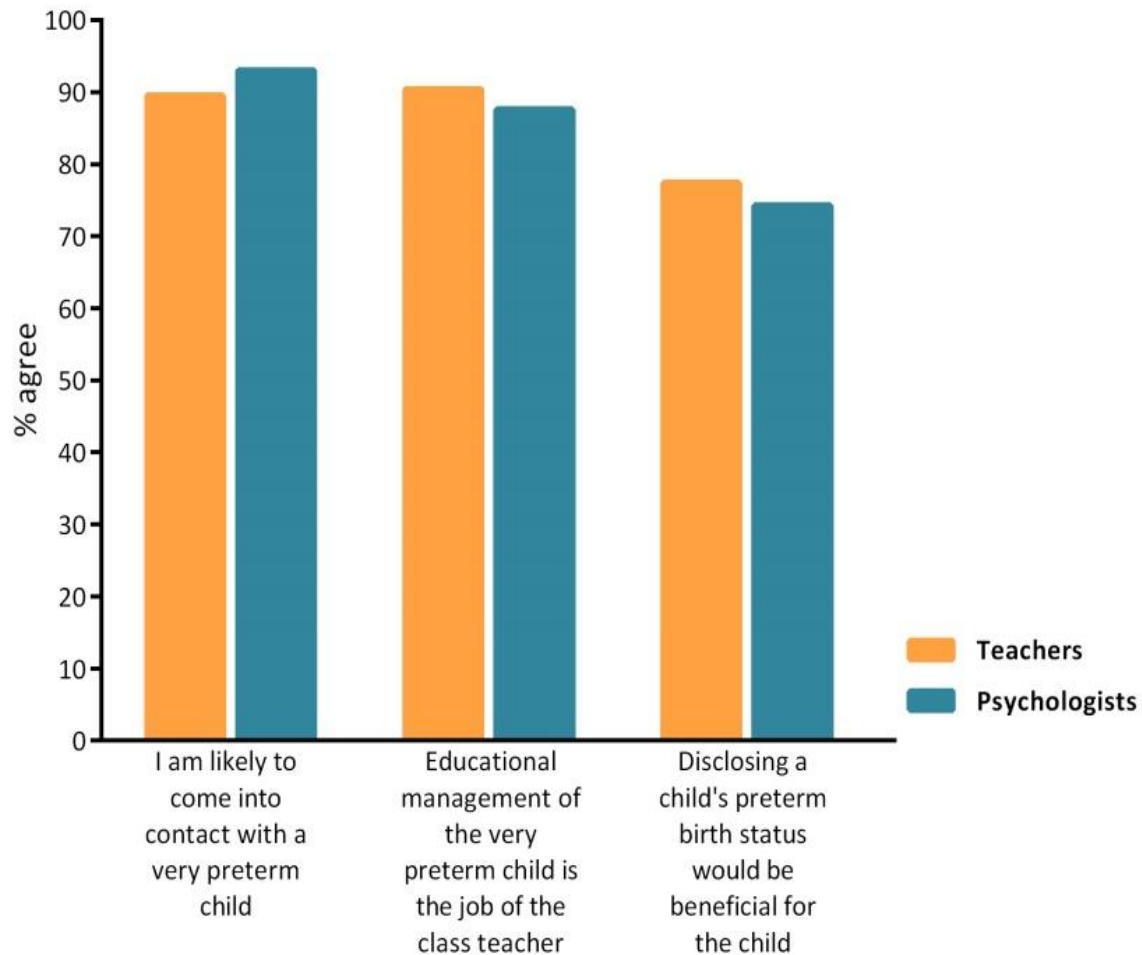
Study design A multicenter double-blind, placebo-controlled randomized controlled trial was conducted across all tertiary neonatal hospitals in the state of Victoria, Australia. Participants were 91 extremely preterm/extremely low birth weight 7-year-old children born in Victoria in 2005. Children were randomly assigned to either the Cogmed or placebo arm and completed the Cogmed or placebo program (20-25 sessions of 35-40 minutes duration) at home over 5-7 weeks. Academic achievement (word reading, spelling, sentence comprehension, and mathematics) was assessed 24 months post-training, as well as at 2 weeks and 12 months post-training, via standardized testing inclusive of working memory, attention, and executive behavior assessments. Data were analyzed using an intention-to-treat approach with mixed-effects modeling.

Results There was little evidence of any benefits of Cogmed on academic functioning 24 months post-training, as well as on working memory, attention, or executive behavior at any age up to 24 months post-training compared with the placebo program.

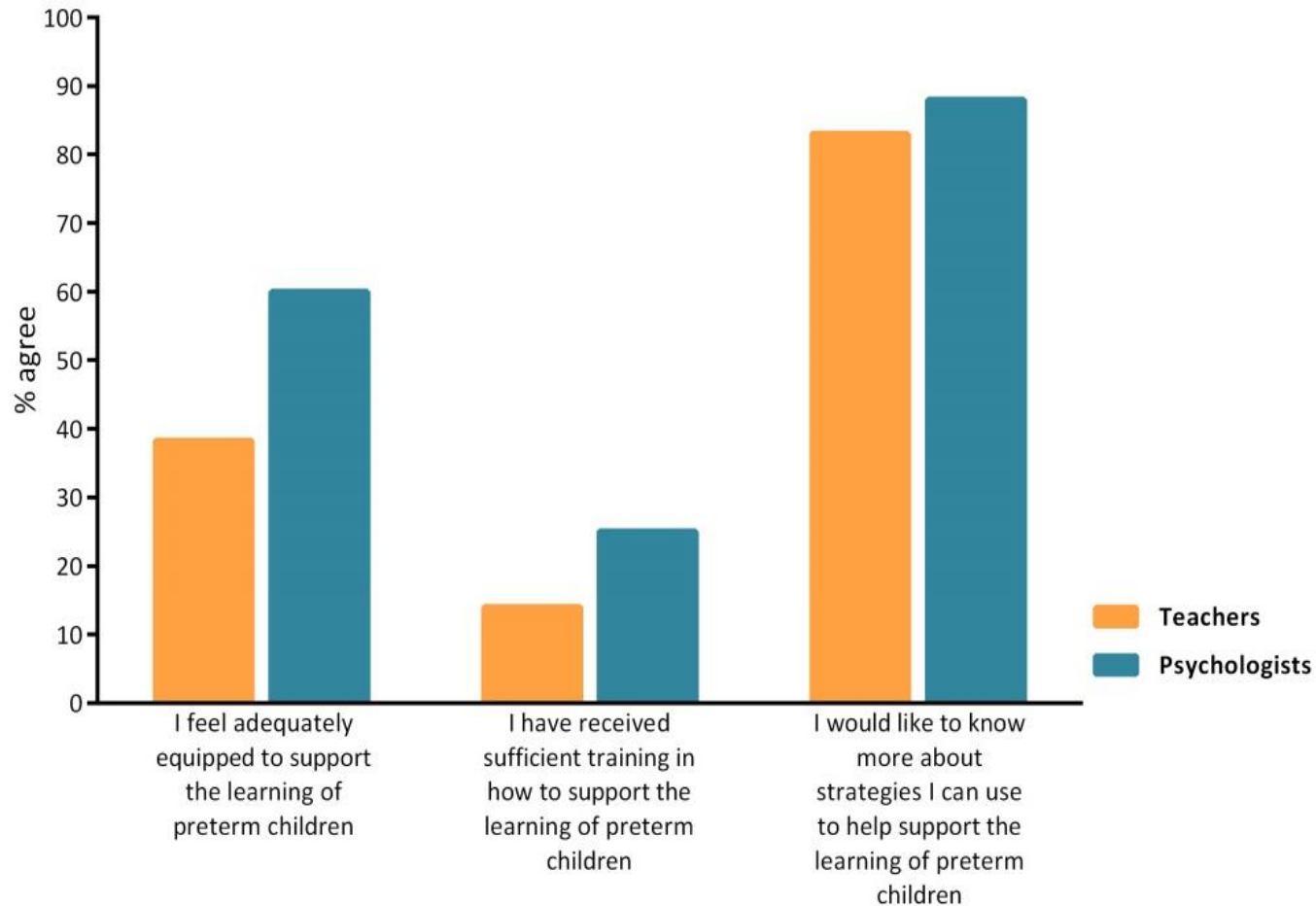
Conclusions We currently do not recommend administration of Cogmed for early school-aged children born extremely preterm/extremely low birth weight to improve academic functioning. (*J Pediatr* 2018;202:92-7).



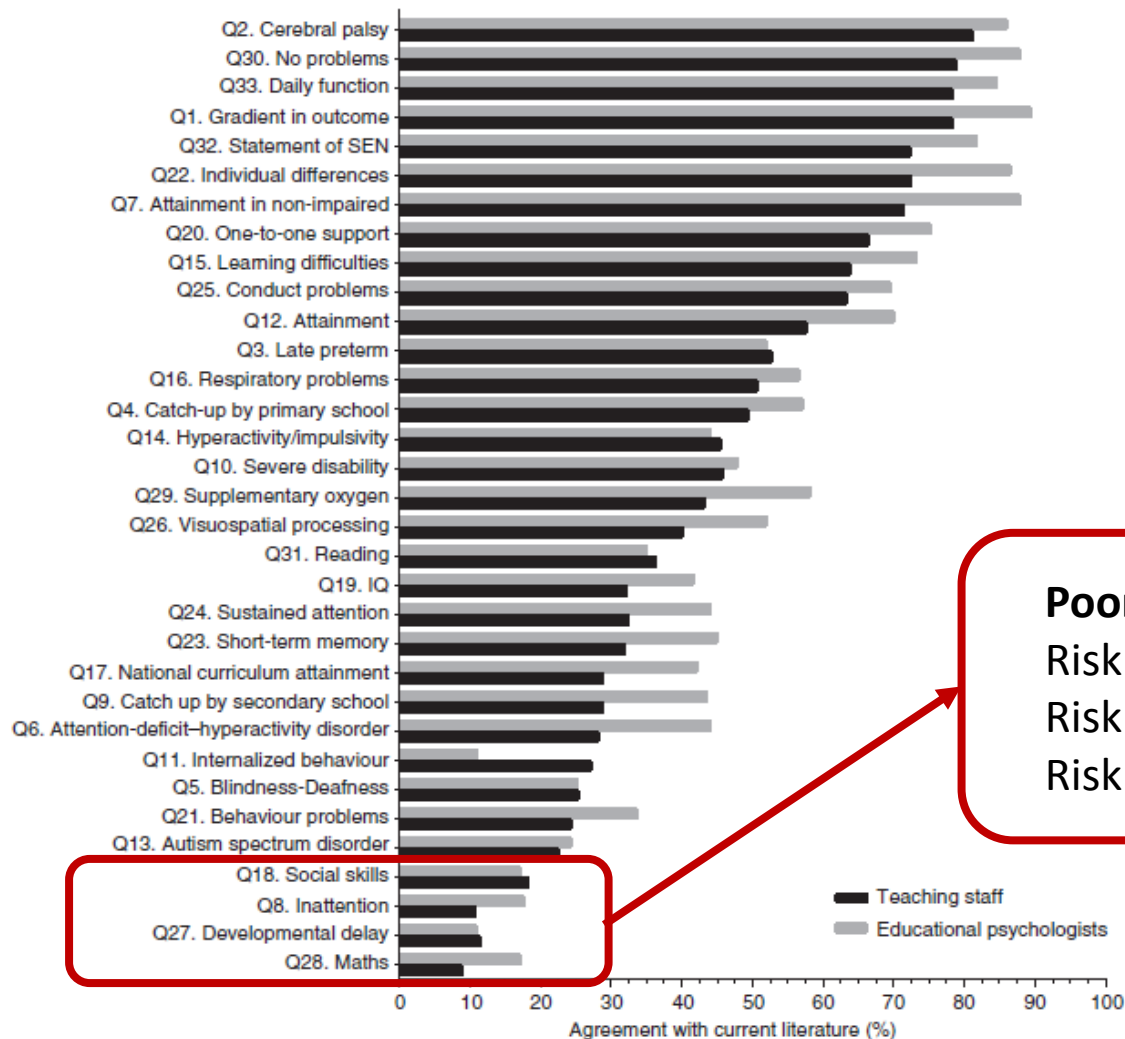
Teachers' knowledge of preterm birth



Teachers' knowledge of preterm birth



Teachers' knowledge of preterm birth



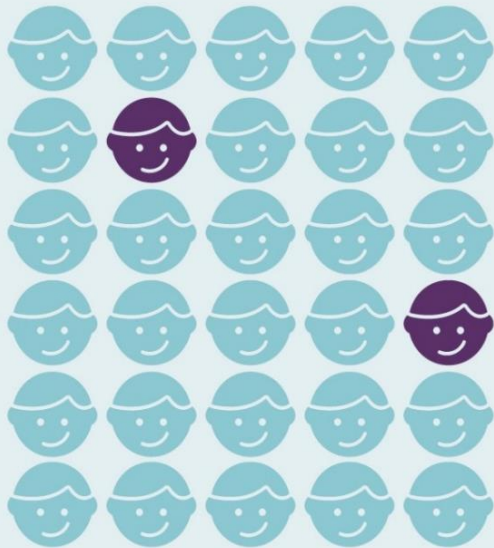
Poorest knowledge:

Risk for poor social skills

Risk for inattention

Risk for maths difficulties

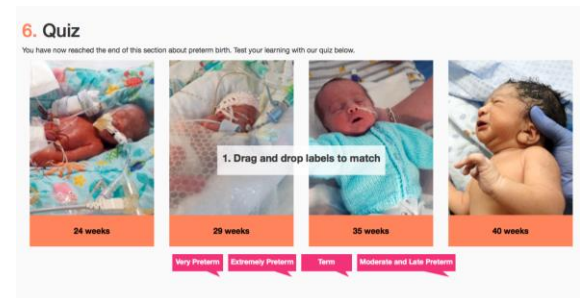
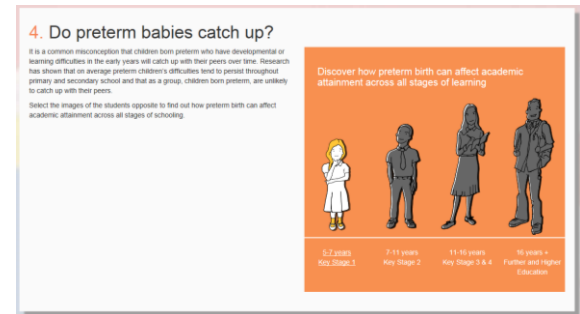
2 children in an average UK
primary school class are
born preterm



- Preterm birth rates and survival rates continue to increase.
- The number of preterm children entering schools is increasing.
- Almost all education professionals will be responsible for supporting children born preterm.
- Knowledge and preparation about health conditions is crucial for appropriate educational management.

Developed an e-learning resource . . .

- Designed for education professionals
- Co-designed with stakeholders
- 5 short 10-minute sections
- Approximately 1 hour of learning
- Control own pace of learning
- Engaging interactive multi-media content
- **Provides strategies staff can use to support children in the classroom**



Evaluated it . . .

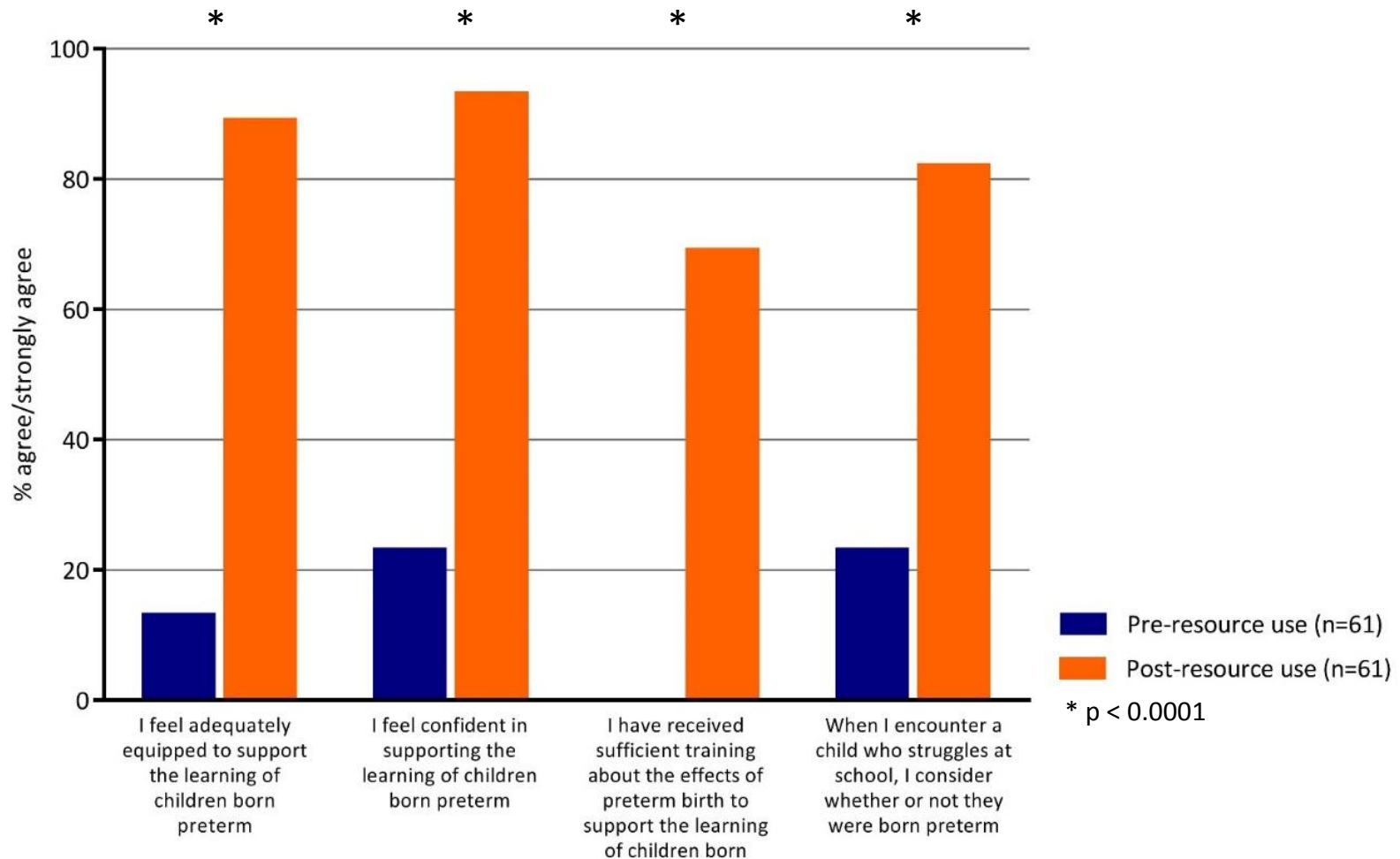
- 61 teachers from primary schools in Nottingham & Derbyshire
 - Class teachers (48%)
 - Teaching assistant (39%)
 - SENCOs (7%)
 - Assistant/Deputy/Head (15%)
- 1 month access to the resource
- Before and after using the resource we:
 - Assessed knowledge of outcomes following preterm birth
 - Assessed confidence in supporting preterm children
 - Is it user friendly?

Evaluated it . . .

- Mean knowledge score
 - Pre-resource use: 13 (SD 6.2); range 0-25
 - Post-resource use: 28 (SD 3.5); range 18-33; $p < 0.001$
- Greatest increase in knowledge

Item	% accuracy pre resource	% accuracy post resource	% difference in accuracy
Risk for mathematics difficulties	7%	100%	93%
Risk for poor social skills	15%	95%	79%
Risk for inattention	15%	89%	74%
Risk for poor visuospatial skills	26%	100%	74%

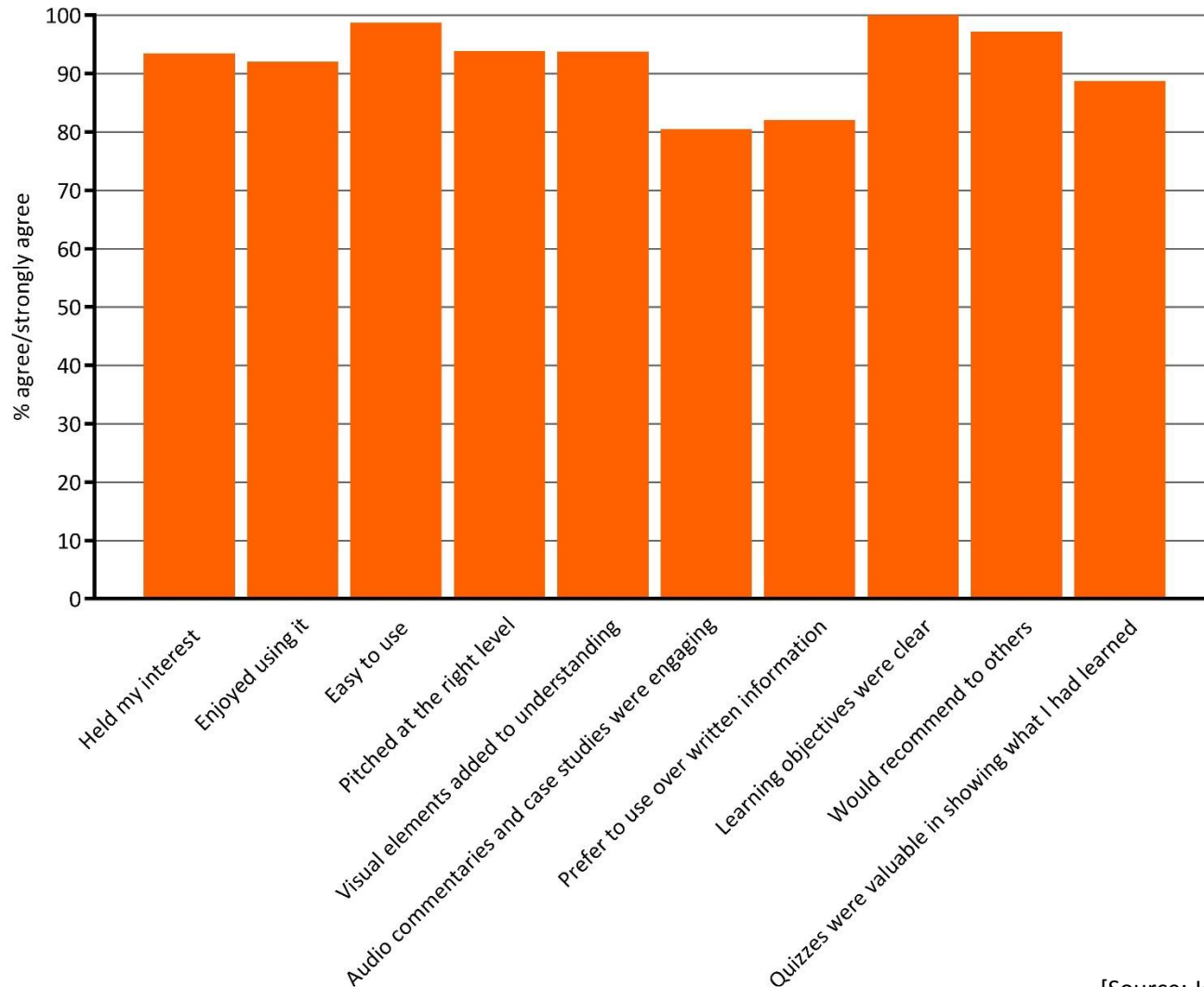
Evaluated it . . .



Evaluated it . . .



PRISM
*Premature Infants' Skills
in Mathematics*

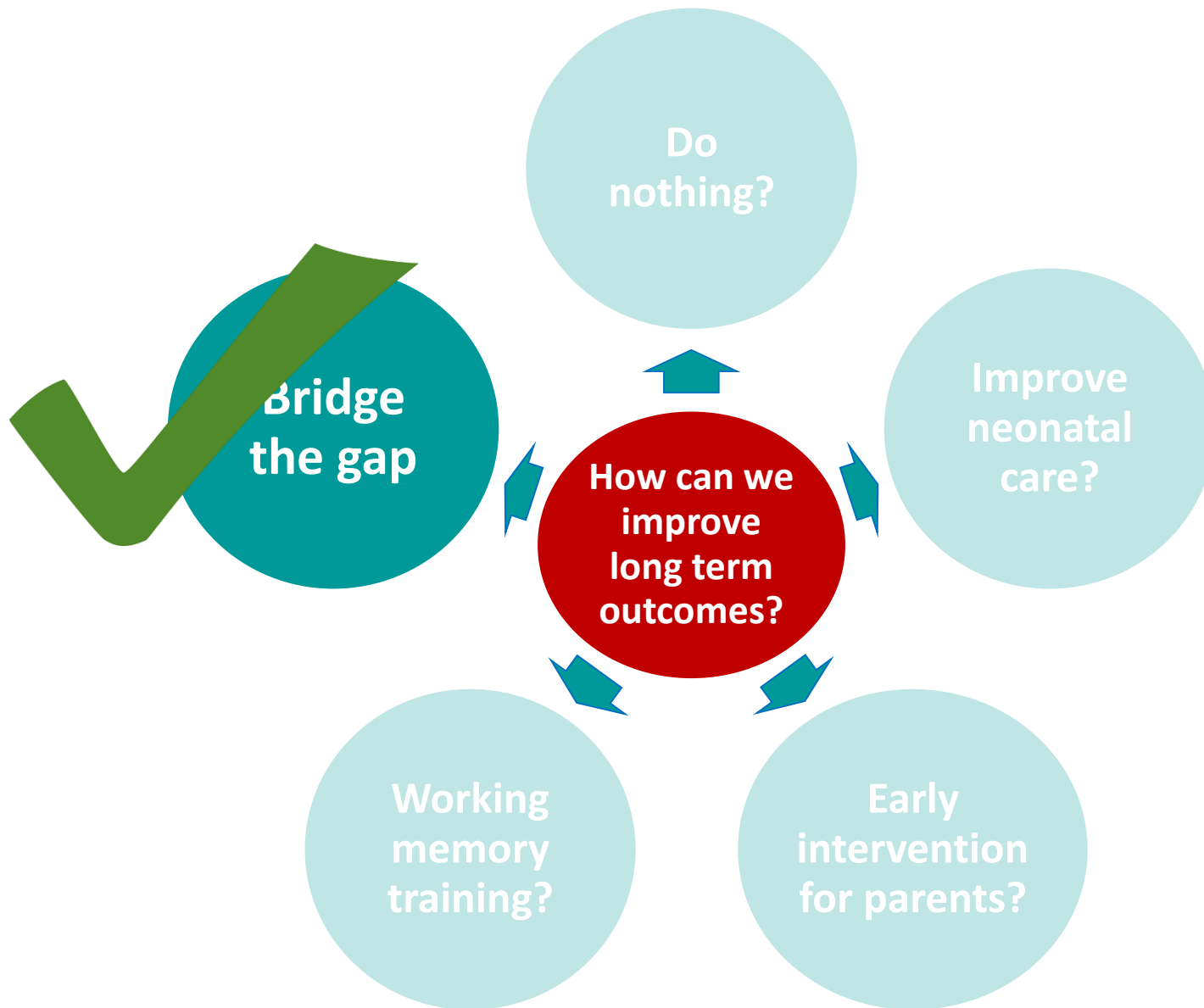


[Source: Johnson et al. *BMJ Open*, 2019]

Launched it . . .

- www.pretermbirth.info
- Released on 22nd May 2019
- In collaboration with the TES
- 2,400 users so far
 - Health professionals
 - Teachers
 - Educational psychologists
 - Parents







UNIVERSITY OF
LEICESTER



The **I**nfant **M**ortality & **M**orbidity **S**tudies

Thank you for listening.
Any questions?

Email: sjj19@le.ac.uk

Twitter: [@SamJPsych](https://twitter.com/SamJPsych)

