

A systematic Review of Neurodevelopmental Outcomes of Preschool Children who Underwent the Hybrid Procedure for Congenital Heart Disease

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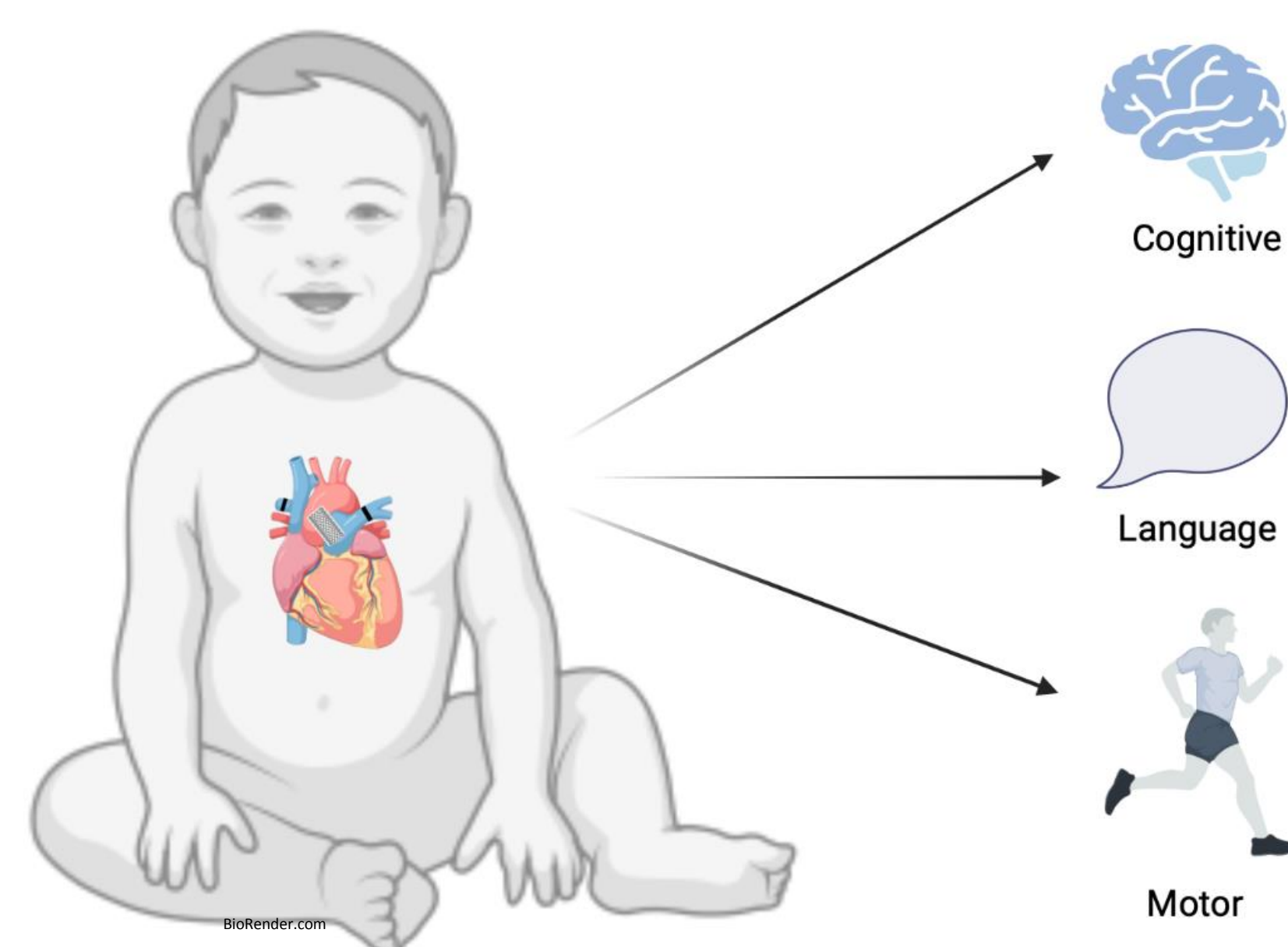
INTRODUCTION

Congenital heart disease (CHD) is the most common congenital defect in neonates, affecting approximately 1% of all births.

Neurodevelopmental delay is one of the most impactful morbidities in children with critical CHD as delays can have long lasting impact on their normal functioning.

Surgical palliation in children with critical CHD is essential for survival. While the Norwood procedure is the traditional first step in the palliation of children with single ventricle defects, the hybrid procedure (HP) is a less-invasive surgical option often offered to neonates with higher presurgical risks.

While estimates of up to 78% survival at 10 years of age have been made for children undergoing the HP, to date there is limited understanding of the long-term neurodevelopmental outcomes these children.

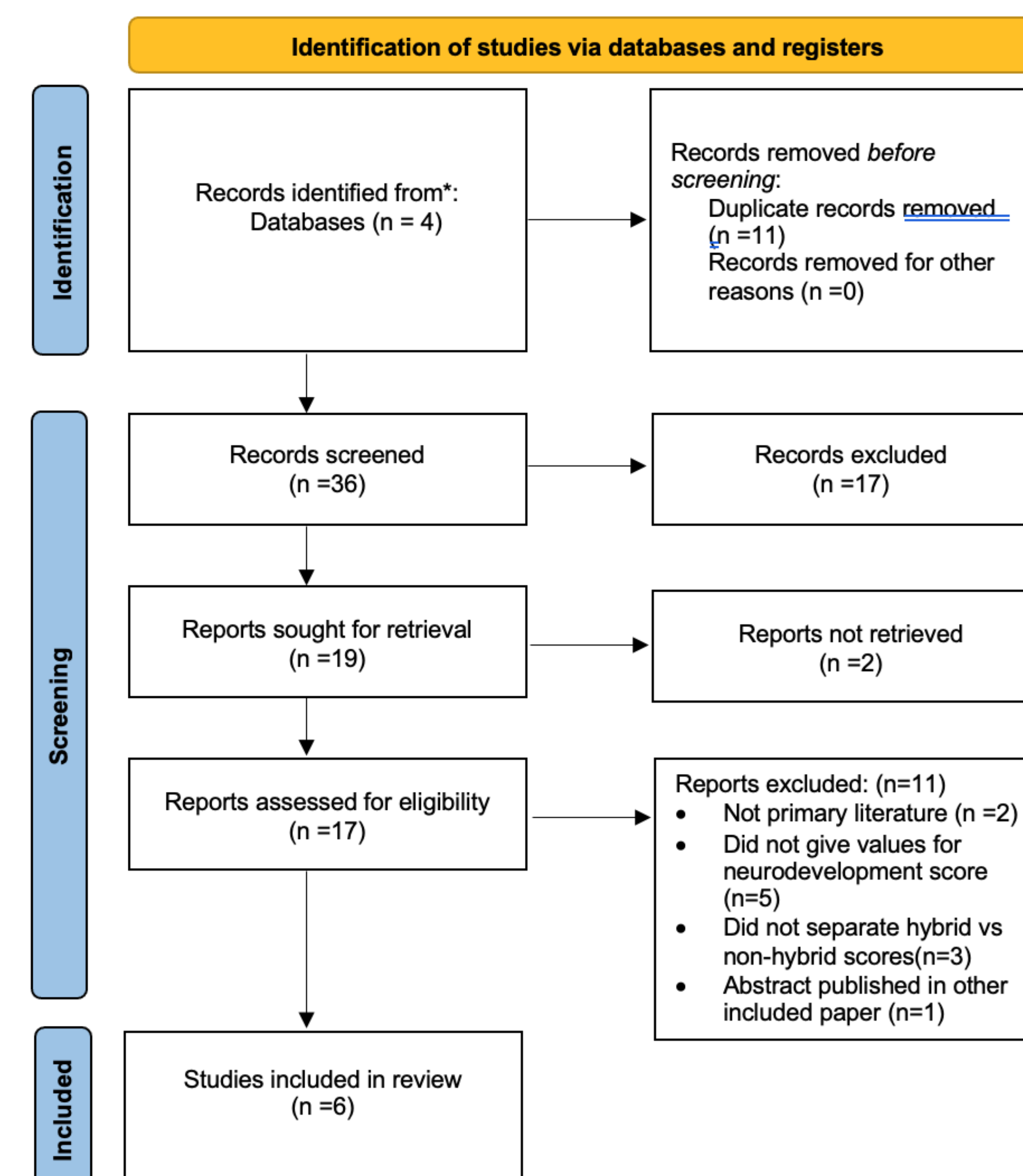


AIMS

This review aims to determine the neurodevelopmental outcomes of preschool children with CHD who underwent the Hybrid procedure.

METHODS

We used 4 databases to identify relevant articles: Embase, CINAHL MEDline and Child and Adolescent development. 36 articles underwent initial screening, 19 articles underwent full-text review, and 6 articles met our inclusion criteria.



RESULTS

The articles included in this study examined outcomes at four time points (6-months, 1-year, 2-years, and 4-years of age, total N:45). At 6-months of age Bayley-III composite scores (90.5 cognitive, 78.9 motor, 88.5 Language). Two studies reported 1-year outcomes (Bayley II 88 MDI, 65 PDI and Bayley-III 95.21 cognitive, 82.1 motor, 93.6 language). Weighted average of Bayley-III from 2 studies at 2-years of age was found to be 100.7 cognitive, 96.9 motor, 98.5 language). At 4-years, WPPSI-IV full scale IQ was 88.

RESULTS

Reference	Year of Publication	Age at Neurodevelopmental Assessment	Type of Neurodevelopmental Assessment	Neurodevelopmental Score
1. Knirsch et al.	2012	1 year	BSID II †	PDI: 65(50-99) MDI: 88(71-102)
		4 years	WPPSI-III in toddlers, Movement-ABC 2	88 (76-116)
2. Khalid et al.	2019	1 year	BSID III	Cognitive: 95.21 ± 8.14 Motor: 82.12 ± 11.88 Language: 93.58 ± 9.59
3. Cheatham et al.	2015	2 months	TIMP	63.9 ± 18.1
		4 months	TIMP	108.3 ± 14.9
		6 months	BSID III	Cognitive: 90.5 ± 16. Motor: 78.9 ± 16.4 Language: 88.5 ± 12.4
4. Reich et al.	2019	2 years	BSID III	Cognitive: 100 (65-120) Motor: 96 (55-121) Language: 97 (68-124)
5. Knirsch et al.	2012	1 year	BSID II †	PDI: 65 (50-99) MDI: 88 (71-102)
6. Reich et al.	2019	2 years	BSID III	Cognitive: 101.5 ± 9.3 Motor: 98 ± 11.7 Language: 100.3 ± 13.0

PDI= psychomotor developmental index; MDI =mental developmental index; BSID= Bayley Scales of Infant Development; WPPSI= Wechsler Primary Preschool Scale of Intelligence; TIMP= Test of infant motor performance

† These studies used the same population of children for 1 year outcomes

CONCLUSION

While children undergoing the HP have higher pre surgical risks and hence would be considered at higher risk for developmental impairment, neurodevelopmental outcomes of preschool children who survive the HP are similar to those of children who undergo the Norwood procedure. Few studies reported developmental data after the HP, which limits the generalizability of these results. Centers should collectively report outcomes of children undergoing HP to allow for larger sample size and better understanding of long-term outcomes.