



## iCAHE Journal Club Abstract Summary

### Journal Club Details

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Journal Club location	FMC Physiotherapy Department
JC Facilitator	Jo Nolan
JC Discipline	Physiotherapy

### Background

In the FMC Physiotherapy Department, we are interested in understanding the literature about the motor outcomes of premature infants; (babies born under 30 weeks gestation and /or under 1250 g) with Gross motor outcomes assessed (co-ordination, movement skills) at 3 years of age or older (up to and including young adult).

### Clinical Scenario

N/A

### Review Question

What are the gross motor outcomes of premature infants (babies born under 30 weeks gestation and/or 1250g birth weight) from 3 years of age up until young adult?

### PICO

**P:** babies born under 30 weeks gestation and/or under 1250g birth weight

**I:** N/A

**C:** N/A

**O:** gross motor outcomes assessed at  $\geq 3$  years but  $\leq$  young adult



## iCAHE Journal Club Abstract Summary

Edwards, J., Berube, M., Erlandson, K., Haug, S., Johnstone, H., Meagher, M., Sarkodee-Adoo, S. and Zwicker, J.G., 2011. Developmental coordination disorder in school-aged children born very preterm and/or at very low birth weight: a systematic review. *Journal of Developmental & Behavioral Pediatrics*, 32(9), pp.678-687.

### Objective:

To systematically review and synthesize the literature to document the association between infants born very preterm and/or very low birth weight (VLBW) and the presence of developmental coordination disorder (DCD) at school age.

### Methods:

Seven databases were systematically searched. Studies were included if they examined very preterm (<32 weeks) and/or VLBW (<1500 g) infants to school age (age, 5–18 years), had a full-term and/or normal birth weight comparison group, and used a formal measure of motor impairment. Studies that included only infants who were small for gestational age or diagnosed with cerebral palsy were excluded. Two independent reviewers completed abstract and full-text screening, data extraction, and quality assessment of included studies.

### Results:

Sixteen articles were included, with 7 studies incorporated into 2 meta-analyses using cutoff scores of either <5th or 5–15th percentile on the Movement Assessment Battery for Children. Both analyses showed a significant increase in the likelihood of DCD for children born very preterm and/or 1500 g or less, with odds ratios of 6.29 (95% confidence interval, 4.37–9.05,  $p < .00001$ ) and 8.66 (95% confidence interval, 3.40–22.07,  $p < .00001$ ) for <5th or 5–15th percentile scores, respectively.

### Conclusions:

Consistent across studies, DCD is more prevalent in the VLBW/very preterm population than full-term/normal birth weight control children and the general school-age population, with significantly greater odds of developing the disorder. Clinical practice should focus on early identification of and intervention for children with DCD, while research should focus on determining the mechanisms underlying DCD in the preterm population.



## iCAHE Journal Club Abstract Summary

Janssen, A.J., Oostendorp, R.A., Akkermans, R.P., Steiner, K., Kollée, L.A. and Nijhuis-van der Sanden, M.W., 2016. High variability of individual longitudinal motor performance over five years in very preterm infants. *Research in developmental disabilities*, 59, pp.306-317.

### Aim

To determine longitudinal motor performance in very preterm (VPT) infants from 6 months to 5 years of age for the entire cohort of infants, according to gender and gestational age and at the individual level.

### Method

Single-center, prospective longitudinal study of 201 VPT infants (106 boys) without severe impairments.

### Outcomes

Motor performance was assessed with the Bayley Scales of Infant Development (BSID-II-MS: 6, 12, 24 months) and the Movement Assessment Battery for Children (MABC-2-NL: 5 years).

### Results

At 6, 12, and 24 months and then at 5 years, 77%, 80%, 48%, and 22% of the infants, respectively, showed delayed motor performance ( $<-1SD$ ). At 5 years, girls performed significantly better than boys in manual dexterity and balance. Mixed model analyses that examined interactions between time and gender and time and gestational age, revealed no significant interactions. The variance at child level was 29%. Linear mixed model analysis revealed that mean z-scores of  $-1.46$  at 6 months of age declined significantly to  $-0.52$  at 5 years. Individual longitudinal motor performance showed high variability.

### Implications

Longitudinal motor performance improved almost 1 SD over five years. However, the variability of individual longitudinal motor performance hampers evaluation in clinical care and research.



## iCAHE Journal Club Abstract Summary

Husby, I.M., Stray, K.M.T., Olsen, A., Lydersen, S., Indredavik, M.S., Brubakk, A.M., Skranes, J. and Evensen, K.A.I., 2016. Long-term follow-up of mental health, health-related quality of life and associations with motor skills in young adults born preterm with very low birth weight. *Health and quality of life outcomes*, 14(1), p.56.

### Background

Being born with very low birth weight (VLBW:  $\leq 1500$  g) is related to long-term disability and neurodevelopmental problems, possibly affecting mental health and health-related quality of life (HRQoL). However, studies in young adulthood yield mixed findings. The aim of this study was to examine mental health and HRQoL at 23 years, including changes from 20 to 23 years and associations with motor skills in VLBW young adults compared with controls.

### Methods

In a geographically based follow-up study, 35 VLBW and 37 term-born young adults were assessed at 23 years by using Achenbach Adult Self-Report (ASR), Short Form 36 Health Survey (SF-36), Beck Depression Inventory (BDI) and various motor tests. The ASR and SF-36 were also used at 20 years. Longitudinal changes in ASR and SF-36 from 20 to 23 years were analysed by linear mixed models and associations with motor skills at 23 years by linear regression.

### Results

At 23 years, total ASR score was 38.6 (SD: 21.7) in the VLBW group compared with 29.0 (SD: 18.6) in the control group ( $p = 0.048$ ). VLBW participants had higher scores for attention problems, internalizing problems and critical items, and they reported to drink less alcohol than controls. BDI total score did not differ between groups. On SF-36, VLBW participants reported significantly poorer physical and social functioning, more role-limitations due to physical and emotional problems, more bodily pain and lower physical and mental component summaries than controls. In the VLBW group, total ASR score increased by 9.0 (95 % CI: 3.3 to 14.7) points from 20 to 23 years ( $p = 0.009$  vs controls), physical and mental component summaries of SF-36 decreased by 2.9 (95 % CI: -4.8 to -1.1) and 4.4 (95 % CI: -7.1 to -1.7) points, respectively ( $p = 0.012$  and  $p = 0.022$  vs controls). Among VLBW participants, more mental health problems and lower physical and mental HRQoL were associated with poorer motor skills at 23 years.

### Conclusions

VLBW young adults reported poorer and declining mental health and HRQoL in the transitional phase into adulthood. They seemed to have a cautious lifestyle with more internalizing problems and less alcohol use. The associations of mental health problems and HRQoL with motor skills are likely to reflect a shared aetiology.



## iCAHE Journal Club Abstract Summary

Oudgenoeg-Paz, O., Mulder, H., Jongmans, M.J., van der Ham, I.J. and Van der Stigchel, S., 2017. The link between motor and cognitive development in children born preterm and/or with low birth weight: A review of current evidence. *Neuroscience & Biobehavioral Reviews*, 80, pp.382-393.

### Background

The current review focuses on evidence for a link between early motor development and later cognitive skills in children born preterm or with Low Birth Weight (LBW). Studies with term born children consistently show such a link. Motor and cognitive impairments or delays are often seen in children born preterm or with LBW throughout childhood and studies have established a cross-sectional association between the two. However, it is not yet clear if, and if so, how, motor and cognitive skills are longitudinally interrelated in these children.

### Methods

Longitudinal studies with this population including measures of motor development during the first year of life and cognitive measures at later measurement points were included.

### Results

The 17 studies included usually show a link between level and/or quality of motor development during the first year of life and later cognitive skills in children born preterm and/or with LBW.

### Conclusion

However, given the small number of studies, and a possible effect of early interaction between motor and cognitive skills affecting this relation, more work is clearly needed.



## iCAHE Journal Club Abstract Summary

Villar, J., Giuliani, F., Bhutta, Z.A., Bertino, E., Ohuma, E.O., Ismail, L.C., Barros, F.C., Altman, D.G., Victora, C., Noble, J.A. and Gravett, M.G., 2015. Postnatal growth standards for preterm infants: the Preterm Postnatal Follow-up Study of the INTERGROWTH-21st Project. *The Lancet Global Health*, 3(11), pp.681-691.

### Background

Charts of size at birth are used to assess the postnatal growth of preterm babies on the assumption that extrauterine growth should mimic that in the uterus.

### Methods

The INTERGROWTH-21st Project assessed fetal, newborn, and postnatal growth in eight geographically defined populations, in which maternal health care and nutritional needs were met. From these populations, the Fetal Growth Longitudinal Study selected low-risk women starting antenatal care before 14 weeks' gestation and monitored fetal growth by ultrasonography. All preterm births from this cohort were eligible for the Preterm Postnatal Follow-up Study, which included standardised anthropometric measurements, feeding practices based on breastfeeding, and data on morbidity, treatments, and development. To construct the preterm postnatal growth standards, we selected all live singletons born between 26 and before 37 weeks' gestation without congenital malformations, fetal growth restriction, or severe postnatal morbidity. We did analyses with second-degree fractional polynomial regression models in a multilevel framework accounting for repeated measures. Fetal and neonatal data were pooled from study sites and stratified by postmenstrual age. For neonates, boys and girls were assessed separately.

### Findings

From 4607 women enrolled in the study, there were 224 preterm singleton births, of which 201 (90%) were enrolled in the Preterm Postnatal Follow-up Study. Variance component analysis showed that only 0.2% and 4.0% of the total variability in postnatal length and head circumference, respectively, could be attributed to between-site differences, justifying pooling the data from all study sites. Preterm growth patterns differed from those for babies in the INTERGROWTH-21st Newborn Size Standards. They overlapped with the WHO Child Growth Standards for term babies by 64 weeks' postmenstrual age.

### Interpretation

Our data have yielded standards for postnatal growth in preterm infants. These standards should be used for the assessment of preterm infants until 64 weeks' postmenstrual age, after which the WHO Child Growth Standards are appropriate. Size-at-birth charts should not be used to measure postnatal growth of preterm infants.



## iCAHE Journal Club Abstract Summary

de Kieviet, J.F., Piek, J.P., Aarnoudse-Moens, C.S. and Oosterlaan, J., 2009. Motor development in very preterm and very low-birth-weight children from birth to adolescence: a meta-analysis. *Jama*, 302(20), pp.2235-2242.

### Context

Infants who are very preterm (born  $\leq 32$  weeks of gestation) and very low birth weight (VLBW) (weighing  $\leq 1500$  g) are at risk for poor developmental outcomes. There is increasing evidence that very preterm birth and VLBW have a considerable effect on motor development, although findings are inconsistent.

### Objective

To investigate the relationship between very preterm birth and VLBW and motor development.

### Data Sources

The computerized databases EMBASE, PubMed, and Web of Knowledge were used to search for English-language peer-reviewed articles published between January 1992 and August 2009.

### Study Selection

Studies were included if they reported motor scores of very preterm and VLBW children without congenital anomalies using 1 of 3 established and widely used motor tests: the Bayley Scales of Infant Development II (BSID-II), the Movement Assessment Battery for Children (MABC), and the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP). Forty-one articles were identified, encompassing 9653 children.

### Results

In comparison with term-born peers, very preterm and VLBW children obtained significantly lower scores on all 3 motor tests: BSID-II:  $d = -0.88$  (95% confidence interval [CI],  $-0.96$  to  $-0.80$ ;  $P < .001$ ), MABC:  $d = -0.65$  (95% CI,  $-0.70$  to  $-0.60$ ;  $P < .001$ ), and BOTMP:  $d = -0.57$  (95% CI,  $-0.68$  to  $-0.46$ ;  $P < .001$ ). Whereas motor outcomes on the BSID-II show a catch-up effect in the first years of development ( $r = 0.50$ ,  $P = .01$ ), the results on the MABC demonstrate a nonsignificantly greater deficit with increasing age during elementary school and early adolescence ( $r = -0.59$ ,  $P = .07$ ).

### Conclusion

Being born preterm or VLBW is associated with significant motor impairment persisting throughout childhood.



## iCAHE Journal Club Abstract Summary

Ghassabian, A., Sundaram, R., Bell, E., Bello, S.C., Kus, C. and Yeung, E., 2016. Gross motor milestones and subsequent development. *Pediatrics*, p.e20154372.

### OBJECTIVE:

We examined the longitudinal associations of age at achieving gross motor milestones and children's development in a US cohort of singletons and twins.

### METHODS:

In the Upstate KIDS study, a population-based study of children born between 2008 and 2010, information on age at achievement of motor milestones and developmental skills was available in 599 children (314 singletons, 259 twins, and 26 triplets). Mothers reported their children's major motor milestones at ~4, 8, 12, 18, and 24 months. At age 4 years, children's development was clinically assessed by using the Battelle Developmental Inventory, Second Edition (BDI-2). Primary analyses by using multivariate linear regressions were conducted in singletons. We also examined the associations in twins.

### RESULTS:

Later achievement of standing with assistance predicted lower BDI-2 scores in singletons in adjusted models (B per SD of age at achievement,  $-21.9$  [95% confidence interval (CI),  $-41.5$  to  $-2.2$ ]). Post hoc analysis on age of standing with assistance showed that associations were driven by differences in adaptive skills (B =  $-5.3$  [95% CI,  $-9.0$  to  $-1.6$ ]) and cognitive skills (B =  $-5.9$  [95% CI,  $-11.5$  to  $-0.4$ ]). Analyses restricted to twins suggested no association between the age at achievement of milestones and total BDI-2 score after adjustment for gestational age and birth weight.

### CONCLUSIONS:

This study provides evidence that the age of achieving motor milestones may be an important basis for various aspects of later child development. In twins, key predictors of later development (eg, perinatal factors) overshadow the predictive role of milestones in infancy.



## iCAHE Journal Club Abstract Summary

Marlow, N., Hennessy, E.M., Bracewell, M.A. and Wolke, D., 2007. Motor and executive function at 6 years of age after extremely preterm birth. *Pediatrics*, 120(4), pp.793-804.

### BACKGROUND

Studies of very preterm infants have demonstrated impairments in multiple neurocognitive domains. We hypothesized that neuromotor and executive-function deficits may independently contribute to school failure.

### METHODS

We studied children who were born at  $\leq 25$  completed weeks' gestation in the United Kingdom and Ireland in 1995 at early school age. Children underwent standardized cognitive and neuromotor assessments, including the Kaufman Assessment Battery for Children and NEPSY, and a teacher-based assessment of academic achievement.

### RESULTS

Of 308 surviving children, 241 (78%) were assessed at a median age of 6 years 4 months. Compared with 160 term classmates, 180 extremely preterm children without cerebral palsy and attending mainstream school performed less well on 3 simple motor tasks: posting coins, heel walking, and 1-leg standing. They more frequently had non-right-hand preferences (28% vs 10%) and more associated/overflow movements during motor tasks. Standardized scores for visuospatial and sensorimotor function performance differed from classmates by 1.6 and 1.1 SDs of the classmates' scores, respectively. These differences attenuated but remained significant after controlling for overall cognitive scores. Cognitive, visuospatial scores, and motor scores explained 54% of the variance in teachers' ratings of performance in the whole set; in the extremely preterm group, additional variance was explained by attention-executive tasks and gender.

### CONCLUSIONS

Impairment of motor, visuospatial, and sensorimotor function, including planning, self-regulation, inhibition, and motor persistence, contributes excess morbidity over cognitive impairment in extremely preterm children and contributes independently to poor classroom performance at 6 years of age.