BAYLEY-III motor scale and neurological examination at two years do not predict motor skills at 4.5 years

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Abstract

AIMS To determine if Bayley Scales of Infant and Toddler Development, 3rd edition (Bayley-III) motor scores and neurological examination at 2 years' corrected age predict motor difficulties at 4.5 years' corrected age.

METHODS Prospective cohort study of children born at risk of neonatal hypoglycaemia in Waikato Hospital, Hamilton, New Zealand. Assessment at 2 years was performed using the Bayley-III motor scale and neurological examination, and at 4.5 years using the Movement Assessment Battery for Children, 2nd edition (MABC-2).

RESULTS Of 333 children, 8 (2%) had Bayley-III motor scores <85 and 50 (15%) had minor deficits on neurological assessment at 2 years; 89 (27%) scored ≤15th and 54 (16%) ≤5th centile on MABC-2 at 4.5 years. Motor score, fine and gross motor subtest scores and neurological assessments at 2 years were poorly predictive of motor difficulties at 4.5 years, explaining 0 to 7% of variance in MABC-2 scores. A Bayley-III motor score <85 predicted MABC-2 scores ≤15th centile with positive predictive value of 30% and negative predictive value of 74% (7% sensitivity and 94% specificity).

INTERPRETATION Bayley-III motor scale and neurological exam at 2 years were poorly predictive of motor difficulties at 4.5 years.

Short title: Predicting motor difficulties in preschool children

Key words: motor skills disorders, child development, Movement Assessment Battery for Children, fine and gross motor skills, neurologic findings

Abbreviations:

Bayley-III, Bayley Scales of Infant and Toddler Development – Third Edition

FSIQ, Full Scale Intelligence Quotient

IDM, Infants of diabetic mothers

MABC-2, Movement Assessment Battery for Children – Second Edition

What this paper adds:

- 2 year Bayley-III motor scores were poorly predictive of motor difficulties at 4.5 years in a cohort of children born at risk of neonatal hypoglycaemia
- Minor deficits on neurological examination at 2 years also did not predict motor difficulties at 4.5 years

Movement and motor competence are essential in every-day tasks and participation in social life.[1] Motor competence in early childhood is positively associated with the duration and intensity of physical activity in adolescence.[2] Motor difficulties that cause low participation in physical activities in turn may lead to poor muscle strength, poor bone health and obesity.[3]

Early screening for motor difficulties using assessment tools and routine neurological examination is performed regularly, especially in children born at risk of adverse outcomes[4,5] to guide the requirement for early supportive interventions. Bayley Scales of Infant and Toddler Development (Bayley) have been widely used to assess neurodevelopment of children from 1 to 42 months of age.[6] The third edition of the Bayley Scales (Bayley-III) includes a motor scale, which is commonly used as a test of motor function in research and clinical settings,[7] although it has been reported to underestimate rates of later motor difficulties in a cohort of 96 children born very preterm.[8] Demands of tasks increase as children grow. Therefore, neurodevelopmental problems might become more evident as children get older,[9] as has been demonstrated for cognitive function.[10] Moreover, it is unclear if general neurological examination that is often part of assessment protocols in research and clinical settings at 2 years is itself predictive of later motor difficulties.

Therefore, we aimed to determine whether (1) Bayley-III motor score, and fine and gross motor subtest scores and (2) routine neurological examination at 2 years predict motor difficulties at 4.5 years' corrected age in a large cohort of children born late preterm or at term and at risk of neonatal hypoglycaemia.

METHODS

Participants

Participants were part of the CHYLD Study, a prospective cohort of children born at risk of neonatal hypoglycaemia at Waikato Women's Hospital, Hamilton, New Zealand between 2006 and 2010.[11] Infants were recruited to one of two neonatal studies, BABIES[12] or Sugar Babies,[13] due to the presence of one or more of the following risk factors for neonatal hypoglycaemia: preterm (32-36 completed weeks' gestation), small (<2500 g or <10th centile), large (>4500 g or >90th centile), born to diabetic mothers, or other (poor feeding or sepsis). This study was limited to children born at ≥35 weeks' gestation and seen for follow-up at 2 and 4.5 years.

Neurodevelopmental assessments

Children and their families were invited to take part in a follow-up assessment at 2 years ± 4 weeks'[11] and 4.5 years ± 2 months' corrected age. The assessment consisted of developmental tests administered by a trained examiner, vision assessment by an optometrist, and neurological, motor skills and general health examinations by a trained doctor. All assessors were blinded to neonatal history and glycaemic status of children.

At 2 years ± 4 weeks' corrected age, children underwent Bayley-III and structured neurological examination, as previously described.[11] Assessment at 4.5 years ± 2 months' corrected age included neurological examination and standardised tests of cognitive function (Wechsler Preschool and Primary Scale of Intelligence, 3rd edition), visual-motor

integration (Beery-Buktenica Developmental Test of Visual-Motor Integration, 6th edition) and motor function (Movement Assessment Battery for Children, 2nd edition [MABC-2]).

Bayley-III includes a motor score, and fine and gross motor subtest scores. The standardised mean motor score is 100 (Standard deviation [SD] 15), with scores <85 indicating mild impairment and <70 indicating moderate or severe impairment. MABC-2 results include a total score and three subtest scores: Manual Dexterity, Aiming and Catching, and Balance. Standardised mean MABC-2 standard score is 10 (SD 3), and recommended MABC-2 cut-offs are ≤15th centile, indicating a child is at risk of motor difficulty, and ≤5th centile, indicating the presence of significant motor difficulty.[14]

Neurological examination included assessment of tone, deep tendon reflexes, gait and level of disability in children with cerebral palsy using the Gross Motor Function Classification System.[15] Abnormal findings were defined as one or more of the following: decreased or increased tone or deep tendon reflexes, ankle clonus more than 5 beats, limited movements of hip abductors and extensors, toe walking (heels off the ground), asymmetrical gait. All abnormal findings were reviewed by a panel of study paediatricians (JMA, JEH, CJDMcK). Children with abnormal findings but judged by the examiner and the study paediatricians to not have cerebral palsy were classified as having minor neurological abnormalities.

Children were excluded from analysis if they had experienced significant head trauma that could have had an effect on neurodevelopment, or cerebral palsy diagnosed prior to or at the 2 year assessment.

Statistical analysis

Analyses were performed using JMP Software, Version 11.2.0 (SAS Institute Inc., Cary, NC, 2013). Data are presented as mean (standard deviation), median (interquartile range) or number (percent).

Characteristics of children with MABC-2 scores above and below 15th centile were compared using chi-squared tests and one-way ANOVA.

Linear regression was used to explore the relationship between Bayley-III motor score and MABC-2 total score, Bayley-III fine motor subtest score and MABC-2 Manual Dexterity score, and Bayley-III gross motor subtest score and MABC-2 Aiming and Catching and Balance scores. Receiver operating characteristic (ROC) curves were used to assess the predictive value of Bayley-III motor scores for MABC-2 scores ≤15th and ≤5th centiles.

Logistic regression was used to assess the relationship between neurological examination at 2 years and MABC-2 scores ≤15th centile at 4.5 years. ROC curves were used to assess the predictive value of 2 year examination for 4.5 year neurological examination, and agreement between outcomes of 2 and 4.5 year examinations was assessed using kappa agreement statistics.

Because it is possible that the assessment tasks for the Bayley-III motor scale involve cognitive and visual-motor integration skills as well as motor skills at 2 years, we also

explored the association between Bayley-III motor scores and measures of cognitive function and visual-motor skills at 4.5 years using linear regression analysis.

Ethics

The study was approved by the Northern Y Health and Disability Ethics Committee (reference number NTY/10/03/021). Caregivers of children gave written informed consent prior to assessment at both 2 and 4.5 years.

RESULTS

Of 614 children recruited to the neonatal studies, 86 were not eligible for 2 year follow-up, most because they were already older than 2 years when the study started, or because they were born <35 weeks' gestation (Figure 1). Compared with children who were eligible for 2 year follow-up, children not eligible had lower birth weight (2485 g (852) vs 3109 (854) g, P< 0.0001 and gestational age (35.1 (2.6) vs 37.8 (1.7) weeks, P< 0.0001) but had similar sex distribution and socio-economic status (data not shown). Socio-demographic and neonatal characteristics of children eligible and not eligible for 4.5 year follow-up were similar. Characteristics of children recruited and not recruited to 2 year follow-up did not differ, while at 4.5 year follow-up children not recruited were from more deprived areas than those recruited (New Zealand Deprivation index[16] decile 7.2 (2.3) vs 6.4 (2.8), P= 0.002).

The median (IQR) WPPSI Full Scale IQ was lower in children who did not complete Bayley-III motor test (IQ 88 [74; 97], n=3) or MABC-2 (IQ 86 [67; 96], n=21) compared to those who did complete motor tests (IQ 98 [89; 109]) at 4.5 years (Figure 1).

Of 355 children who were assessed at 2 and 4.5 years, 352 completed 2 year Bayley-III motor assessments, 339 completed 4.5 year MABC-2, and 336 children completed both assessments (Figure 1). Two children with cerebral palsy and one child who had experienced significant head trauma were excluded, leaving 333 children for analysis. The mean corrected age at assessments was 24 (1.8) and 53 (1.8) months, respectively. Children with MABC-2 scores above and below the 15th centile at 4.5 years were similar in sex ratio, gestational age, birth weight, and neonatal risk factors for hypoglycaemia (Table 1).

The mean Bayley-III motor score was 99 (9.1). No child had a Bayley-III motor score < 70 and 8/333 (2%) had a score < 85 at 2 years. The mean MABC-2 total score at 4.5 years was 72 (14.4) and standard score 9 (3). A total of 89/333 (27%) children had MABC-2 total scores ≤15th centile and 54/333 (16%) had total scores ≤5th centile. A mean difference (95% Confidence Interval) of 3.5 (1.3; 5.7; p= 0.002) in Bayley-III motor score was found for children with MABC-2 total scores >15th and ≤15th centile (Table 1).

Of the 89 children who had MABC-2 total scores ≤15th centile, 62 (70%) had scores ≤15th centile on manual dexterity, 23 (26%) on aiming and catching and 69 (78%) on balance. Almost half of these children (43/89, 48%) had low scores on two subtests and 11/89 (12%) on all three subtests of MABC-2. Minor neurological abnormalities were identified at neurological examination in 50/331 (15%) children at 2 years and in 99/315 (31%) children at 4.5 years.

Of the 89 children with MABC-2 total scores ≤15th centile at 4.5 years only three (2%) had a Bayley III motor score < 85 at 2 years. Similarly, of 54 children with total scores ≤5th centile at 4.5 years only two (1%) had a Bayley III motor score < 85 at 2 years. Bayley-III motor scores at 2 years were significantly but weakly related to total MABC-2 scores at 4.5 years (β=0.4 [95% CI 0.3, 0.6]; R^2=0.07; p<0.0001; Figure 2). There was also a weak association between Bayley-III motor scores and MABC-2 Manual Dexterity scores (β=0.8 [0.5, 1.1]; R^2=0.06; p<0.0001) and Balance scores (β=0.7 [0.4, 1.0]; R^2=0.05; p<0.0001), but no association with Aiming and Catching scores (β=0.2 [-0.1, 0.6]; R^2=0.00; p=0.20). Bayley-III fine motor subtest scores were only weakly associated with MABC-2 Manual Dexterity scores at 4.5 years (β=2.7 [1.5, 4.0]; R^2=0.05; p<0.0001). Similarly, Bayley III gross motor subtest scores were only weakly associated with MABC-2 Aiming and Catching scores (β=1.8 [0.6, 3.1]; R^2=0.02; p=0.003) and Balance scores (β=2.4 [1.2, 3.5]; R^2=0.04; p<0.0001) at 4.5 years.

The area under the Bayley III motor score receiver operating characteristic curve for MABC-2 score ≤15th centile was 0.62 (95% CI 0.56, 0.67) and 0.62 (95% CI 0.57, 0.67) for MABC-2 score ≤5th centile. A Bayley-III motor score <85 identified children with MABC-2 total score ≤15th centile with a positive predictive value of 30% and negative predictive value of 74% (sensitivity of 7% and specificity 94%). The best combination of sensitivity (79%) and specificity (39%) was for a Bayley-III motor score cut-off <100, which is the standardised test mean (Table 2). The specificity and sensitivity of <85 Bayley-III motor cut-off was similar in children with different risk factors for hypoglycaemia (data not shown).

Bayley-III motor scores were only weakly associated with full scale IQ (FSIQ) at 4.5 years (β=0.5 [95% CI 0.3, 0.6]; R^2=0.09; p<0.0001). Similarly, Bayley-III fine motor subset scores were only weakly associated with FSIQ at 4.5 years (β=1.8 [1.2, 2.4]; R^2=0.09; p<0.0001), and there was no association between Bayley-III gross motor subset score and FSIQ (β=0.6 [-0.1, 1.2]; R^2=0.01; p=0.08). There was also no association between Bayley-III motor scores, or fine and gross motor subset scores, and Beery-Buktenica Visual Motor Integration scores at 4.5 years (motor score; β=0.2 [-0.4, 0.8]; R^2=-0.01; p=0.54).

Children with minor neurological abnormality at 2 years had similar MABC-2 scores to those who had a normal neurological examination, and were not at increased risk of MABC-2 scores ≤15th centile at 4.5 years (OR=1.7; 95% CI 0.9, 3.12; p=0.12). Further, there was only slight agreement between the outcomes of 2 and 4.5 year neurological examinations (kappa=0.10 [95% CI 0.00, 0.21]). Of 313 children who had neurological examination at 2 and 4.5 years, 21 (7%) had minor abnormalities at both assessments, 26 of 47 (55%) children with minor abnormalities at 2 years had no abnormalities at 4.5 years, and 78 of 99 (79%) with minor abnormalities at 4.5 years had none at the 2 year assessment. A minor abnormality outcome at 2 years could predict the minor abnormality at 4.5 year neurological examination with a positive predictive value (95% Confidence Interval) of 45% (30; 60) and negative predictive value of 71% (65; 76).

DISCUSSION

We found that Bayley-III motor scores, including fine and gross motor subtest scores, at 2 years are poorly predictive of motor difficulties at 4.5 years, as detected by MABC-2, in children born at risk of neonatal hypoglycaemia. Routine neurological examination at 2

years also did not predict motor difficulties at 4.5 years. More children were identified at risk of motor difficulty at 4.5 years than at 2 years.

Possible explanations of our results are inability of Bayley-III to assess skilled motor function, appearance of motor problems only later in childhood, or variability of motor skills as children grow. Serial assessments of motor performance up to 2 years of age using Bayley-III or II have shown relatively stable or decreasing rates of motor difficulties.[17,18] However, few studies have followed children beyond 2 years, and in studies where motor function is assessed in later life a different motor test is required after the age of 42 months.

It is possible that the Bayley-III motor score measures functions that are part of overall development rather than specific motor function defined as a motor competence or skilled movement.[14] The fine motor subtest evaluates ocular-motor control, hand and finger movements, reaching and grasping, pre-writing skills, and use of tools (blocks, scissors etc.). The gross motor subtest evaluates skills that are important for movement and play: head control, rolling, sitting, walking and balance. All of these skills are essential for future skilled motor performance, but many are not purposeful at 2 years, whereas MABC-2 includes timed and graded tasks that require accurate and skilled movement and the ability to plan actions and correct errors to achieve a goal. Therefore, as test demands increase, motor difficulties may become more evident.

It is also possible that motor difficulties are not apparent until a later stage of development. In one prospective study of 50 children born <29 weeks' gestation or <1000g who did not have cognitive or neurological deficits, or vision and hearing problems at 12 months' corrected age, the prevalence of gross motor impairment assessed using the Peabody Developmental Motor Scale increased from 14% at 18 months to 33% at 3 years and 81% at 5 years, while impairment in fine motor function was found in 54%, 47% and 64% of children, respectively.[19] Our results show that Bayley-III motor scores and fine motor subtest scores explained a similar proportion of the variance in cognitive score at 4.5 years (9%) and in MABC-2 motor scores (7%), suggesting that the Bayley-III motor scale is not assessing skills that relate specifically to either later cognitive or motor function. In studies assessing predictive validity of Bayley-III cognitive and language scales, both were related to 4 year IQ (correlation coefficient 0.81 and 0.78 respectively)[20] but Bayley-III cut-offs <85 did not have strong sensitivity and specificity to detect developmental delay at 4 years.[21]

The variability of a child's motor development has been described in many studies of high risk children born preterm or with low birth weight, but the direction of these changes is not clear. For example, the prevalence of motor difficulties increased from 3 to 5 years of age,[19] while in another study motor impairment improved from 6 to 8 years and then was relatively stable at 12 to 13 years.[22] Furthermore, in full-term low risk children, gross motor scores were more stable between 21 months and 4 years using Peabody Developmental Motor Scale (70% of children remained in the same category) compared to fine motor scores (36% of children had stable scores).[23] Similarly, meta-analysis of reports of motor development of very preterm and very low birth weight children found that up to 2 years children catch up in motor development measured by Bayley Scales compared to controls, but then motor proficiency declines during elementary school and adolescence when measured by MABC.[24] Therefore, it is not clear if the reported changes are because of variability of children's motor development, or are due to different requirements of the tests used at different ages.

In previous studies, the predictive value of early motor testing for later motor outcomes has been mixed. An Australian study showed that motor difficulties on MABC-2 at 4 years were accurately predicted by two tests administered at 4, 8, and 12 months to children born preterm.[25] The Alberta Infant Motor Scale scores at 4 months most accurately predicted MABC-2 scores ≤15th and ≤5th centile at 4 years (accuracy 79%), while Neuro-Sensory Motor Developmental Assessment at 12 months most accurately predicted cerebral palsy at 4 years (accuracy 77%).[25] However, in a prospective study of healthy term-born children, scores of motor function tests administered at a mean age of 10 days, 12 weeks and 18 months were not associated with motor outcomes at school age (mean 6 years 1 month).[26] Therefore, accuracy of prediction of preschool and school motor performance may depend on the tests used in assessments and the study population.

Both positive and negative predictive values were poor for the cut-off of a Bayley-III score <85, although there were only 8 children with scores below this at two years. Therefore, we investigated if a different cut-off for Bayley-III motor scores would better predict later motor difficulties. We found that the sum of sensitivity and specificity for predicting motor difficulties at 4.5 years was maximal at a cut-off of <100 which is the test mean, but predictive value was still poor. Recent studies have found that Bayley-III underestimated developmental delay compared to the previous edition, Bayley-II.[27] Further, Bayley-II has also been reported to have poor predictive validity for later developmental delays.[28] An alternative cut-off of <73 was suggested for Bayley-III motor score instead of <85 to improve sensitivity and specificity for identifying motor difficulties at 18-22 months' corrected age in babies born <27 weeks' gestation.[7] In another study that used the same motor tests as our study, 2 year Bayley-III motor score cut-offs of <97 and <94 were considered optimal to identify at risk and significant movement difficulty respectively in 4 year old children born very preterm.[8] Those proposed motor cut-offs had slightly lower sensitivity (74% for ≤15th and 78% for ≤5th MABC-2 centiles) but higher specificity (77% for both) compared to that found for the <100 cut-off in our study (sensitivity 79% for ≤15th and 83% for ≤5th MABC-2 centiles, specificity 39% and 38%).

Routine neurologic examination has been shown to predict major neurological deficits such as cerebral palsy.[29] However, data on the ability of neurological examination to predict mild and moderate motor impairment is limited. We found that neurological examination at 2 years was not predictive of motor outcomes at 4.5 years. In a study of 5 year olds, similar results were found for paediatric overall judgement (at risk, abnormal or optimal categories) with a sensitivity of paediatric examination to detect motor difficulties of 19% and specificity of 98%.[30] Moreover, in our study there was only slight agreement between 2 and 4.5 year neurological examinations. Our data suggest that, although routine neurological examination at 2 years may be useful in detecting major neurological deficits, it is not a useful tool to predict skilled motor performance or minor neurological abnormalities in children at 4.5 years.

Study limitations

We do not have MABC-2 reference values for New Zealand children. Moreover, the CHYLD cohort is comprised of children born at risk of hypoglycaemia and our findings might not be applicable to the general population. We also do not know the incidence of

MABC-2 scores ≤15th and ≤5th centiles in children born without risk factors for hypoglycaemia. Further research is needed to understand motor function and assessment of motor difficulties in typically developing children.

The reference population on which MABC-2 norms are based comprises 1172 children from United Kingdom,[14] and may differ from the population in our study. For example, Dutch children performed better on the MABC-2 than the reference population,[31] although total scores of 3-6 year old children were similar to the reference population. Further, the prevalence of children with MABC-2 scores ≤15th centile were greater than the reference norms for 3-6 year-olds and lower for 7-10 and 11-16 year-olds. Nevertheless, MABC-2 is the most widely used test of motor performance in children,[32] and other studies have reported good intraclass correlation coefficient, test-retest reliability and internal consistency, and to be able to discriminate typically developing children from those with motor difficulties.[32-34]

The poor agreement in neurological status between 2 and 4.5 years could be partly due to examination by different assessors. However, all examiners were experienced in assessment of young children and followed a common examination protocol.

CONCLUSIONS

Bayley-III motor scores at 2 years were poorly predictive of MABC-2 motor scores at 4.5 years in this cohort of children at risk, even if alternative cut-off values were used. Neurological examination at 2 years also did not predict later motor difficulties. Bayley-III motor scale and neurological examination at 2 years may be of limited utility in routine follow-up assessments of children at risk of adverse long-term neurological and skilled motor performance outcomes.

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Conflict of interests None.

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Table 1. Characteristics of the study cohort

Characteristic	Cohort N=333	MABC-2 ≤ 15th centile at 4.5 years		
		Yes N=89	No N=244	P¶
Boys	171(51)	49(55)	122(50)	0.4
Ethnicity§:				
New Zealand European	165(52)	35(41)	130(56)	
Maori	115(36)	42(49)	73(31)	
Pacific Islander	11(3)	3(4)	8(3)	
Other	28(9)	5(6)	23(10)	**0.03**
Neonatal risk factor:ł				
Pre-term	116(35)	33(37)	83(34)	0.60
IDM	134(40)	40(45)	94(39)	0.29
Small	92(28)	22(25)	70(29)	0.47
Large	91(27)	28(31)	63(26)	0.31
Other	11(3)	2(2)	9(4)	0.51
Gestational age, weeks	38(36; 39)	38(36; 39)	38(36; 39)	0.09
Birth weight, grams	3006 (2485; 3673)	3010 (2500;3640)	2998 (2471; 3712)	0.8
Hypoglycaemia	141(42)	44(49)	97(40)	0.14
Bayley-III motor score	99 (9)	97 (8)	100 (9)	**0.002**
WPPSI-III Full Scale IQ	98(89; 109)	92(81; 102)	101(91; 111)	**<0.001**
New Zealand Deprivation index	7(5;9)	7(5;9)	6(4;9)	**0.02**
Maternal education§:				
Secondary School	95(30)	29(36)	66(28)	
Tertiary	218(70)	51(64)	167(72)	0.18

Data are number (percent), mean (standard deviation) or median (Interquartile Range); IDM, infant of a diabetic mother. MABC-2, Movement Assessment Battery for Children, second edition; Bayley-III, Bayley Scales of Infant and Toddler Development, third edition; WPPSI, Wechsler Preschool and Primary Scale of Intelligence, 3rd edition; §Data missing for 20 children łRisk factors not mutually exclusive. ¶Comparing characteristics of children ≤15th and >15th centile on MABC-2.

Table 2. Characteristics of Bayley-III motor score cut-off values to predict motor impairment at 4.5 years

4.5 year motor outcome	Bayley-III motor composite cut-off	Sensitivity	Specificity	Positive predictive value	Negative predictive value
≤15th centile on MABC-2	79 85 100§	2(0;8) 7(3;14) 79(69;87)	99(97;100) 94(91;97) 39(33;45)	50(7;93) 30(12;54) 32(26;39)	74(68;78) 74(68;78) 83(75;90)
≤5th centile on MABC-2	79 85 100§	2(0;10) 6(1;15) 83(71;92)	99(97;100) 94(90;96) 38(32;44)	25(1;81) 15(3;38) 21(15;27)	84(80;88) 84(79;88) 92(86;96)

Data are composite scores and percentages (95% Confidence Intervals). §Cut-off with the optimal sensitivity and specificity to predict MABC-2 motor scores ≤15th centile and ≤5th centile at 4.5 years' corrected age. There were no children with motor scores < 70 on Bayley-III at 2 years. MABC-2, Movement Assessment Battery for Children, second edition; Bayley-III, Bayley Scales of Infant and Toddler Development, third edition. CI, Confidence Intervals.

Figure 1. Flow-chart of study participants. MABC-2, Movement Assessment Battery for Children, second edition; Bayley-III, Bayley Scales of Infant and Toddler Development, third edition. ǂThe test was not administered because trained assessors were unable to assess the child in person (only questionnaire data obtained).

Figure 2. Scatterplot of the relationship between 4.5 year MABC-2 total standard score and 2 year Bayley-III Motor Composite Score. Regression line plotted (β=0.4 [95% CI 0.3, 0.6]; R^2=0.07; p<0.0001). Vertical lines indicate cut-off values of 70 (2SD below mean) and 85 (1SD below mean) on the Bayley-III motor scale. Horizontal lines indicate cut-off values of 5th and 15th centiles on the MABC-2 total scores. MABC-2, Movement Assessment Battery for Children, second edition; Bayley-III, Bayley Scales of Infant and Toddler Development, third edition.

Appendix

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