Received Date : 12-Jan-2017

Revised Date : 16-Jan-2017

Accepted Date : 24-Jan-2017

Article type : Editorial

**Understanding the relationship between behaviour and motor impairments in
extremely low birth weight preterm children**

Associate Professor Alicia Spittle^{1, 2, 3}

¹ Department of Physiotherapy, The University of Melbourne, Parkville, Victoria, Australia

² Physiotherapy Department, The Royal Women's Hospital, Parkville, Victoria, Australia

³ Victorian Infant Brain Studies, Murdoch Childrens Research Institute, Parkville, Victoria, Australia.

Email: alicia.spittle@mcri.edu.au

There is an increasing recognition of the important role that motor development plays in social and emotional development, with some behavioural problems hypothesized to result from problems with motor competence (1). This is thought to be due to numerous factors including the importance of early motor skills such as crawling allowing an infant to interact with others and explore their environment to motor competency at school age allowing a child to

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as [doi: 10.1111/apa.13759](https://doi.org/10.1111/apa.13759)

This article is protected by copyright. All rights reserved

participate in both recreational and organised play and sport (2). According to the World Health Organisation International Classification of Function, motor impairment is influenced by several factors including activity, participation and body structure and function, along with environmental and personal factors (3).

For a child, play and sport have numerous benefits including the development of social skills and self-esteem but depending on the activity a certain level of motor competence is required, which can be challenging for those with a motor impairment. The relationship between behaviour and motor development is complex and likely bi-directional rather than motor development driving behavioural development, nonetheless there are several studies reporting that children with motor impairment are more likely to have poorer mental health, and externalizing and adaptive behaviour problems compared with children with no motor impairments (4).

Children who are born preterm are at increased risk of both motor and behavioural impairments compared with children born at term (4, 5). In this issue, Danks et al (2) investigate whether the prevalence of behaviour problems in children born extremely low birth weight (ELBW; birth weight < 1000g) and preterm, is related to mild motor impairment, independent of risk factors including being born ELBW compared with being born at term, small for gestational age, gender and social risk status. In their study, which included 48 out of 105 non-disabled ELBW preterm recruited at birth from a single-tertiary hospital in Australia, compared with 55 term born peers, there were significant differences in behaviour and motor outcomes at 11-13 years of age between groups. Whilst findings of preterm children at school age performing poorer on parent based questionnaires of behaviour (Child Behaviour Checklist - CBCL) and objective assessment of motor performance (Movement Assessment Battery for Children – Movement ABC) are well known, this study furthers our understanding of the influence of motor performance on behavioural outcomes. The authors reported that Movement ABC total impairment score was the only predictor of the CBCL Total Problem Scores at age 11-13 years, in their model.

The strongest associations between motor impairment scores and behaviour were for the domains of social syndromes and attention. This finding of a relationship between motor impairment and social syndromes supports the important role that motor skills have in developing social relationships. Children who have motor skill impairment are consistently reported to participate less in their preferred activities (6). Further, children with motor impairments perceive themselves to be less social accepted and less likely to be invited to participate in team sports.

This study is focusing on mild motor impairment. Although there have been improvements in the rates of major neurodevelopmental impairments such as cerebral palsy over the past three decades for children born preterm, the rates of mild motor impairments remain too high, occurring in up to 50% of children born very preterm (VPT < 32 weeks' gestation) (4). The rates of behavioural impairments are also much higher in children born very preterm compared with children born full term (FT 38 ≤ 42 weeks' gestation) with one study reporting higher rates of anxiety disorders (11% VPT vs 8% term), attention deficit hyperactivity disorder (ADHD: 10% VPT, 3% term) and autism spectrum disorder (4.5%, 0% term) (7). The mechanisms and casual pathways of adverse neurodevelopmental outcomes of preterm are complex and understanding the relationships between deficits in different neurodevelopmental domains such as motor and behaviour is important for the families, clinicians and researchers.

A continued challenge for the field is whether motor and behavioural impairments results from distinct neurological mechanisms and casual pathways or whether given the nature of the disorders that can be attributable to each other (8). For example, problems with fine motor skills may lead to poor handwriting, which can then lead to academic problems, frustration and reluctance to do tasks involving handwriting, which could be perceived as a behaviour problem. On the other hand, a child with a behaviour problem may have difficulty understanding the instructions of a standardised test, which requires a task completed in a set order and often in a set time frame. In the study by Danks et al (2) both behaviour and motor impairment are assessed

concurrently and thus we they can only determine an association between the two domains rather than a predictive model. Behaviour was assessed by parent report, as is often done at this age. Parent's perceptions of their child's behaviour may different between the home and the school environment, where challenges for the child are different and where possible it would be useful in future research to include parent, teacher and child report. Previous research investigating the relationship between ADHD, social problems and motor skills showed that when using teacher report motor skills remained a significant predictor of social problems over and above the ADHD symptomatology whereas using parent report, motor skills did not significantly predict social problems after controlling for ADHD symptomatology (1).

The findings by Danks et al whilst advancing the field are limited by the small sample size, with a large number of children lost to follow-up reducing the power to examine the influence of numerous perinatal predictors and generalizability of the results. Although the authors report that was no significant interaction between ELBW and full term children, this may have been limited ability to detect a difference may have been limited by the sample size. Further, although there were no differences in perinatal variables in those preterm children who did and did not participate in follow-up at 12 years, there was a difference in maternal characteristics between groups. Mothers in the group that participated in follow-up were older and had a higher-level of education than those who didn't, a common challenge in research studies (9). It is likely that there would be a higher rate of behavioural problems if all children participated in follow-up, given that maternal social-demographic factors including level of education are associated with behavioural outcomes.

Although it is still unknown whether motor impairment is causative of behavioural impairment or whether they are actually co-occurring impairments, further investigation, as suggested by Danks et al, on supporting mild motor deficits to improve behavioural outcomes of children, especially for those born preterm is warranted. Further, social skills have been shown to mediate the relationship between motor skills and internalising problems in preschool age

children (10), highlighting that behavioural interventions may have a positive effect on motor outcomes. Children with motor impairments, whether born ELBW and preterm or at term, are more likely to have behavioural challenges. It is essential to optimise motor and behavioural outcomes to ensure the best outcomes for children and their families and ensure children can actively participate in structured and unstructured play and sport.

References

1. Goulardins JB, Rigoli D, Loh PR, Kane R, Licari M, Hands B, et al. The Relationship Between Motor Skills, Social Problems, and ADHD Symptomatology: Does It Vary According to Parent and Teacher Report? *J Atten Disord* 2015;
2. Danks M, Cherry K, Burns YR, Gray P. Are behavioural problems in extremely low birth weight children related to their motor ability. *Acta Paediatr* 2017; DOI: 10.1111/apa.13712
3. World Health Organisation. International Classification of Functioning, Disability and Health. Geneva: World Health Organisation; 2001
4. Spittle AJ, Orton J. Cerebral palsy and developmental coordination disorder in children born preterm. *Semin Fetal Neonatal Med* 2014; 19: 84-9
5. Bhutta AT, Cleves MA, Casey PH, Cradock MM, Anand KJ. Cognitive and behavioral outcomes of school-aged children who were born preterm: a meta-analysis. *JAMA* 2002; 288: 728-37
6. Woodmansee C, Hahne A, Imms C, Shields N. Comparing participation in physical recreation activities between children with disability and children with typical development: A secondary analysis of matched data. *Res Dev Disabil*. 2016; 49-50: 268-76
7. Treyvaud K, Ure A, Doyle LW, Lee KJ, Rogers CE, Kidokoro H, et al. Psychiatric outcomes at age seven for very preterm children: rates and predictors. *J Child Psychol Psychiatry* 2013; 54: 772-9
8. Cairney J, Veldhuizen S, Szatmari P. Motor coordination and emotional-behavioral problems in children. *Curr Opin Psychiatry* 2010; 23: 324-9

9. J LO, McGinley JL, Fox LM, Spittle AJ. Challenges of neurodevelopmental follow-up for extremely preterm infants at two years. *Early Hum Dev* 2015; 91: 689-94
10. Wilson A, Piek J, Kane R. The mediating role of social skills in the relationship between motor ability and internalizing symptoms in preprimary children. *Infant Child Dev* 2013; 22: 151-64

Minerva Access is the Institutional Repository of The University of Melbourne

Author/s:

Spittle, A

Title:

Understanding the relationship between behavioural and motor impairments in extremely low birthweight preterm children

Date:

2017-04-01

Citation:

Spittle, A. (2017). Understanding the relationship between behavioural and motor impairments in extremely low birthweight preterm children. ACTA PAEDIATRICA, 106 (4), pp.526-527. <https://doi.org/10.1111/apa.13759>.

Persistent Link:

<http://hdl.handle.net/11343/292666>