Bullying of preterm children and emotional problems at school age: Cross-culturally invariant effects

Authors: Dieter Wolke[1,2], PhD; Nicole Baumann[1], BSc; Victoria Strauss[3], PhD; Samantha Johnson[4], PhD; Neil Marlow[5], DM

Affiliations: [1]University of Warwick, Department of Psychology, Coventry, UK; [2]Warwick Medical School, Division of Mental Health and Wellbeing, Coventry, UK; [3]University of Oxford, Centre for Statistics in Medicine, Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences, Oxford, UK; [4]University of Leicester, Department of Health Sciences, Leicester, UK; [5]UCL Institute of Women's Health, University College London, London, UK

Address correspondence to: Dieter Wolke, Ph.D., Department of Psychology, University of Warwick, Coventry CV4 7AL, UK, [D.Wolke@warwick.ac.uk], Tel: +44 (0)24 7657 3217, Fax: +44 (0)24 7652 4225

Short title: Peer bullying of preterm children

Abbreviations: CBCL – Child Behavior Checklist; CP – Cerebral Palsy; SDQ – Strengths and Difficulties Questionnaire; SES – Socio-economic status; VP/VLBW – Very Preterm (<32 weeks gestation) /Very Low Birth Weight (birth weight <1,500g); EP – Extremely Preterm (<26 weeks gestation); RRadj – Adjusted Relative Risk; BLS – Bavarian Longitudinal Study

Key Words: bullying, peer victimization, emotional problems, preterm, very low birth weight, Bavarian Longitudinal Study, EPICure Study

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What's Known on This Subject

Preterm children are at greater risk for cognitive and developmental problems in childhood and emotional problems in adolescence than term-born peers. There is also emerging evidence that they may be more often bullied by peers at school age.

What This Study Adds

Preterm children are especially vulnerable to being bullied at school and those bullied over a number of years are at highly increased risk of emotional problems in early adolescence. Reducing bullying may alleviate emotional problems in preterm children.

Contributor's Statement Page

D. Wolke: designed, conceptualized, and supervised the Bavarian Longitudinal Study and partly designed and supervised the EPICure study and data analysis, drafted and revised the manuscript, critically reviewed the manuscript, and approved the final manuscript as submitted.

N. Baumann: coordinated data preparation, carried out the data analyses, participated in drafting the manuscript, and approved the final manuscript as submitted.

V. Strauss: provided support in the data analysis, critically revised and approved the final manuscript.

S. Johnson: partly designed, supervised and data documented the EPICure study, critically revised and approved the final manuscript.

N. Marlow: conceived and supervised the EPICure study, critically reviewed and approved the final manuscript.

ABSTRACT

OBJECTIVES. To investigate whether adolescents born extremely (<26 weeks gestation; EP) or very preterm or with very low birth weight (<32 weeks gestation or <1500g birth weight; VP/VLBW) are more often bullied and whether this contributes to higher emotional problem scores.

STUDY DESIGN. Two whole population samples: the German Bavarian Longitudinal Study (287 VP/VLBW; 293 term comparisons) and the UK EPICure Study (183 EP; 102 term comparisons). Peer bullying was assessed by parent report in both cohorts in school years 2 and 6/7. The primary outcome was emotional problems in year 6/7. The effects of prematurity and bullying on emotional problems were investigated with regression analysis and controlled for sex, socioeconomic status, disability, and pre-existing emotional problems.

RESULTS. Preterm children were more often bullied in both cohorts than term comparisons (BLS: RR 1.27, 95% CI 1.07-1.50; EPICure: RR 1.69, 95% CI 1.19-2.41). Both prematurity and being bullied predicted emotional problems, but after controlling for confounders, only being bullied at both ages remained a significant predictor of emotional problem scores in both cohorts (BLS: B (95% CI) 0.78 (0.28, 1.27); p<.01; EPICure: 1.55 (0.79, 2.30); p<.001). In the EPICure sample, being born preterm and being bullied just at one time point additionally predicted emotional problems.

CONCLUSIONS. Preterm children are more vulnerable to being bullied by peers. Those children who experience bullying over years are more likely to develop emotional problems. Health professionals should routinely ask about peer relationships.

INTRODUCTION

Victims of bullying are repeatedly exposed to aggressive behavior, engaged by an individual or peer group with more power than the victim.[1] Bullying may be verbal, physical or relational[2] and has been found to predict a range of mental health problems[3] including emotional problems and depression.[4,5] The longer children have been bullied the more severe mental health effects have been reported.[5] Those who are targeted by bullies are often physically weak, unassertive, or poor in understanding social cues[6] look different or are less popular than other peers.[7] Pediatric populations may be at increased risk[8] and three cross-sectional studies reported that preterm children are more often bullied (victims)[9-11] whereas a fourth reported no differences.[12] Both, prematurity[13] and being bullied[4,5] predict emotional problems in adolescence. It is not known whether the emotional problems of preterm adolescents may be partly the result of being more often targeted by bullies than term born children, or of being more sensitive to being bullied by peers. This would open avenues for interventions to reduce adverse mental health outcomes in preterm children.

This study investigated peer bullying of children in year 2 and year 6/7 of schooling and emotional problems in year 6/7 of schooling (early adolescence) in two prospective cohort studies of preterm children born 10 years apart: The Bavarian Longitudinal Study (BLS) (born 1985/86; Germany) and the EPICure Study (born 1995; United Kingdom). This allowed us to determine whether effects of bullying and prematurity are invariant across cultures, in different school systems and across time. We investigated, firstly, whether preterm (very preterm/very low birth weight (<32 weeks gestation or <1500g; VP/VLBW) or extremely preterm (<26 weeks gestation; EP)) children are more often bullied and more stable bullied (i.e., in both school years 2 and 6/7) than their term born counterparts. Secondly, we investigated whether being bullied, in particular, being stable bullied related to increases in emotional problems from school year 2 to 6/7as reported by parents in early

adolescence.

METHODS

Sample description and participants

Two prospective geographically defined birth cohort studies were included, the BLS and the EPICure study.

BLS cohort. The enrolment and data collection procedures have been described in detail elsewhere.[14] Briefly, of all 682 VP/VLBW children born alive between January 1985 and March 1986 in Southern Bavaria, Germany, and who required admission to a children's hospital within the first 10 days after birth, 453 were alive and eligible for follow-up assessments. Of those, 287 children and their families participated at the 8 and 13-year study assessments and had complete data (63%). The term comparisons were recruited from the same hospitals at birth and, of the 350 healthy comparisons, 293 had complete data at 8 and 13 years of age (84%). In Germany, children at age 8-9 years are in year 2 of elementary school and at age 13 in year 6 or 7 of secondary school. Thus children had moved from elementary school lasting 4 years to secondary school at age 10-11 years. Ethical approval was obtained from the Ethics committee of the University of Munich Children's Hospital and the Bavarian Health Council (Landesärztekammer) and parents provided informed consent.

EPICure. The EPICure study included EP infants who were born before 26+0 weeks of gestation in the United Kingdom and Ireland from March through December 1995. The sampling of the study population has been described previously.[15] Of 308 survivors at 6 years of age, 183 were assessed at 6 and 11 years of age and had complete data for this study (59%). At 6 years of age, children were in year 2 of elementary school, and at 11 years of age in year 6, the final year of elementary school in the UK; most children had remained in the same schools between the two ages. Comparison children were recruited in school year 2 and were in the same classes as EP children matched on sex and ethnic group for those in mainstream school. Comparisons were born at term and assessed at year 2 (aged 6 years;

n=160) and year 6 (aged 11 years; n=153) and those comparison children, 102 had complete data for this study (67%). No neonatal data were collected for class comparisons. Ethics approval was granted by the Trent Multicenter Research Ethics Committee and written informed consent was provided by all parents.

Descriptive characteristics of BLS and EPICure study participants are shown in Table 1.

Measures

Bullying experience. BLS: Bullying experience in elementary school (year 2) was assessed via a structured parent interview. Parents were asked whether their child had been a victim of bullying by peers in the last 6 months: (1) the child had been insulted, teased or bullied by peers; or (2) the child had been beaten up by peers. Those children who were being bullied 'several days/month' to 'every day' were considered being bullied.

At age 13 years (year 6/7) being bullied was assessed using one item of the Strengths and Difficulties Questionnaire (SDQ)[16] completed by the parents: "other children pick on or bully him/her".[9] The parents' responses were on a 3-point scale. If they answered 'certainly true' or 'somewhat true' the child was considered being bullied.

EPICure: Parents reported on peer bullying in one item of the Strengths and Difficulties Questionnaire (SDQ)[16] ("other children pick on or bully him/her") at both ages. The parents' responses were on a 3-point scale. If they answered 'certainly true' or 'somewhat true' the child was considered being bullied.

We constructed the following bullying measures for both cohorts: (1) Any bullying: being bullied in year 2 or year 6/7, (2a) Being bullied at one time point (year 2 or year 6/7) and (2b) Being bullied at two time points (year 2 and year 6/7), and (3) non-involved children who were not bullied in year 2 or 6/7.

Outcome Measure at year 6/7. Emotional Symptoms were assessed with the five item emotional problems subscale of the SDQ completed by parents (e.g. "many worries, often

seems worried"; "often unhappy, down-hearted or tearful"). The SDQ has been shown to be reliable and valid in identifying mental health problems.[16,17] Cronbach's Alpha was 0.72 for VP/VLBW (BLS); 0.75 for EP (EPICure); 0.68 for term comparisons (BLS and EPICure).

Potential Confounders/Mediators. Potential risk factors for bullying involvement (e.g.[6,18]) or emotional problems were assessed at birth: sex, socioeconomic status (SES: low, moderate or high according to parental education and job status[14,19]) and disability was defined as suffering cerebral palsy (CP[20]), blindness or deafness[14,21] in year 2 in both cohorts. Emotional problems in year 2 were assessed with the Internalizing Scale of the Child Behavior Checklist (CBCL) in the BLS and with the Emotional Problems subscale of the SDQ in the EPICure study. Gestation and birth weight were in both cohorts recorded from birth records (Table 1).

Statistical analyses

Data were analysed with SPSS 21 and Stata 12.1. Differences between VP/VLBW or EP (Preterm) and term comparisons in baseline measures were tested with t-test or Chi-Square (Table 1). To assess whether preterm children were more often bullied, frequencies of being bullied at one or both time points between preterm and controls were compared and relative risk with 95% CI were computed (reference: non-involved children) (Table 2). In a second step, relative risk computations were adjusted for child sex, disability, SES and emotional problems in year 2 (RRadj). Linear regression analysis was used to determine whether emotional problems in year 6/7 were explained by prematurity or being bullied. Model 1 assessed the effect of either prematurity or being bullied. Model 2 included both prematurity and being bullied and controlled for sex, disability, SES and pre-existing emotional problems at year 2. Finally, we tested for interaction terms (moderation effect) prematurity x being bullied at both time points and prematurity x being bullied at one time point. Regression coefficients are reported as B-coefficients with 95% CIs (Table 3).

RESULTS

Baseline characteristics and emotional problems of preterm and term-born comparison groups

By definition, preterm children had lower gestation and birth weight. Groups did not differ in sex distribution or socioeconomic status in the BLS. However, EPICure preterm children were more likely to be of low SES than comparison children (Table 1).

In elementary school compared to comparison children, preterm children in both cohorts had more often neurosensory disability, in particular CP and as a result, fewer attended a mainstream school (Table 1).

Preterm children in both cohorts had higher emotional problem scores (EPICure study: SDQ emotionality; BLS: CBCL internalizing problems) in year 2 and in year 6/7, than their respective comparison groups (Table 1).

Bullying involvement in school

Being bullied in school was reported more frequently in preterm children in both the BLS and EPICure cohorts and these differences remained after adjustment for sex, SES, disability and pre-existing emotional problems in the BLS cohort but not in the EPICure cohort (Table 2). Between 47% and 54% of preterm children had experienced bullying compared to 28% and 43% of term comparison children. At school year 6/7 compared to comparison groups, preterm children experienced significantly more bullying in both, BLS (RRadj 1.95 (95% CI 1.44-2.64)) and EPICure (RRadj 1.76 (95% CI: 1.07-2.87)) (Table 4; online). BLS preterm children experienced bullying at both time points, but in contrast EPICure children were more likely to be bullied in year 6/7 (Table 2).

Bullying and emotional problems in year 6/7

Both prematurity and being bullied, whether having experienced bullying at one or both ages, predicted emotional problems in the unadjusted analysis (Model 1) (Table 3). When adjusted

for each other (prematurity, being bullied) and for sex, SES, disability and pre-existing emotional or internalizing problems, in both cohorts bullying at both ages predicted emotional problems in year 6/7. While adjustment deemed the effect of prematurity and bullying at one time point non-significant in the BLS cohort, prematurity and being bullied at one or two time points continued to be significant predictors in the EPICure cohort only (Model 2) (Table 3). No interaction effects between bullying at one or two time points and prematurity were found. The full model explained 23.8% (95% CI: 17.8%-29.7%) of variance in the emotionality problems scores in the BLS and 33.2% (95% CI: 24.5%-42.0%) in the EPICure cohort.

DISCUSSION

We observed in two cohorts from two countries (Germany, United Kingdom) recruited 10 years apart that preterm children were at increased risk of being bullied at school compared to term comparison children. Being bullied at both time points during schooling was found to be the strongest predictor of emotional problem scores in adolescence in both cohorts, while being born extremely preterm and being bullied at one time point was an additional independent predictor of emotional problems in the EPICure cohort.

That preterm children are at increased risk for being bullied at school age in Germany and the UK is consistent with previous cross-sectional reports from the USA,[11] Norway[9] and Canada.[10] Bullying occurs in forced group settings such as classrooms where children are grouped purely by age and many are strangers to each other initially. It is one strategy to obtain social dominance[22] that allows access to social or romantic relationships and material resources (e.g. lunch packages or money).[23] Bullies initially target all children but select those that are seen as vulnerable as repeated targets, i.e. those who show a reaction (e.g. cry), have few friends who can help them and have poor physical, social or cognitive skills to defend themselves.[24] Preterm children have more often cognitive, attention or internalizing problems and are shorter than term children[11,13,25,26] making them more likely to become victims or remain chronic victims of bullying even as they move from elementary to secondary school.

Bullying is a global problem with an average of 32% of children being bullied by peers[27] and 10-12% of children being chronically bullied.[5] Our findings in both cohorts are consistent with general population studies: being bullied, in particular when stable over time, predicts emotional problems independently of pre-existing internalizing problems.[4,5,28] This study further indicates that emotional problems found in preterm adolescents may be exacerbated by being more frequently bullied by their peers. Those who are bullied are at

highly increased risk for anxiety and depression[29,30] and for adverse economic and health outcomes lasting into adulthood.[31] Bullying is an environmental risk factor that is potentially modifiable by intervention.[32] As preterm children are at heightened risk for a range of adverse outcomes, reducing bullying may be one way to lower the overall burden of very or extremely preterm birth.

There was one difference in the findings between the two cohorts. EP birth (EPICure) but not VP/VLBW birth (BLS) continued to be an additional independent predictor of emotional problems in adolescence once being bullied was considered. It may be that being extremely preterm (<26 weeks gestation) has independent adverse effects on brain development, structure and networks involved in social and emotional processing and reward systems.[33] In contrast, the effects of very preterm birth (26-31 weeks gestation) may affect the same structures and networks[34] but are only leading to adverse emotion outcome when exposed to being bullied, a highly potent social stressor.[35,36] Recent evidence indicates that preterm children may be particularly sensitive to adverse social stimulation for a range of outcomes.[37] However, the statistical interactions of prematurity and being bullied were not found to be significant in our analysis providing little support for this interpretation.

The study has several strengths. Both cohort studies are longitudinal, regionally defined population studies of preterm birth with bullying assessed repeatedly. Furthermore, both early school emotional problems and a range of other potential confounders for bullying or emotional problems[38] were controlled in analysis of the association between prematurity and being bullied and early adolescent emotional problems. There are also limitations. Firstly, although the majority of preterm and comparison children were assessed at each time point, full longitudinal data were available for only 63% of VP/VLBW and 84% of term comparisons (BLS cohort) and 59% EP and 67% term born classmates (EPICure cohort). As previously reported, those who dropped out had more developmental problems and lived in

families with more social disadvantage. This pattern of loss to follow-up has been previously observed in longitudinal studies.[39] It is likely to have worked against our hypotheses as subject loss affects statistical power and children with social disadvantage are more likely to experience emotional problems.[40] Nevertheless potential bias cannot be excluded. Secondly, being bullied was assessed via parent reports in both cohorts. In the EPICure study the parent report comprised only one item in the SDQ in year 2 and year 6 while in the BLS information about being bullied was obtained in a parent interview in year 2 and the SDQ 1 item in year 6/7. Longitudinal findings using child or parent reports of being bullied whether in interviews or single items in the SDQ have been previously shown to obtain similar relationships to adverse outcomes such as suicide ideation or depression.[5,41] Our findings here show that being bullied at several time points whether measured with parent interview or a single item in the two cohorts was consistently associated with emotional problems in early adolescence. This adds to the generalizability of the findings. Furthermore, it would have been advantageous to have had also self-reports or teacher reports to determine which may best predict emotional problems.[42] Thirdly, emotional problems were assessed with a screening questionnaire rather than assessed by expert based clinical interview allowing for psychiatric diagnosis. However, SDQ scores have been shown to linearly increase probability of psychiatric diagnosis.[16] Both cohorts are currently being followed up in early adulthood and will include psychiatric diagnoses for future examination.

To conclude, our findings strongly suggest that preventing or dealing with bullying could reduce emotional problems in all children and, in particular, those who are vulnerable. While all children have a right to grow up in a safe environment, very preterm children are at increased vulnerability for being bullied.[11] Preterm children are often in contact with primary and specialist health service providers - they should routinely ask about peer relationships and are in a unique position to help reduce peer bullying, liaise with schools and reduce emotional

problems.[43] These may include the delivery of parenting training[44] with warm, authoritative and supportive parenting likely to reduce being bullied.[45] Furthermore, individual cognitive-behavioral or innovative computer based interventions[46,47] may help children learn to cope with bullies and being bullied and prevent long term adverse consequences.

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REFERENCES

1. Olweus D. Bullying in schools: what we know and what we can do. Oxford: Blackwell Publishers; 1993.
2. Nansel TR, Overpeck M, Pilla RS, Ruan WJ, Simons-Morton B, Scheidt P. Bullying behaviors among US youth: prevalence and association with psychosocial adjustment. JAMA 2001; 285:2094-2100.
3. Arseneault L, Bowes L, Shakoor S. Bullying victimization in youths and mental health problems: "Much ado about nothing"? Psychol Med 2010; 40:717-29
4. Reijntjes A, Kamphuis JH, Prinzie P, Telch MJ. Peer victimization and internalizing problems in children: a meta-analysis of longitudinal studies. Child Abuse Negl 2010; 34:244-52.
5. Zwierzynska K, Wolke D, Lereya TS. Peer victimization in childhood and internalizing problems in adolescence: a prospective longitudinal study. J Abnorm Child Psychol 2013; 41:309-23.
6. Stassen Berger K. Update on bullying at school: science forgotten? Dev Rev 2007; 27:90-126.
7. Rodkin PC, Berger C. Who bullies whom? Social status asymmetries by victim gender. Int J Behav Dev 2008; 32:473-85.
8. Saylor CF, Williams KD, Nida SA, McKenna ME, Twomey KE, Macias MM. Ostracism in pediatric populations: review of theory and research. J Dev Behav Pediatr 2013; 34:279-87.
9. Grindvik AS, Hodøl JS, Vik T, Evensen KA, Skranes J, Brubakk AM, et al. Bullying among adolescents with very low birth weight. Acta Paediatr 2009; 98:1049-51.
10. Nadeau L, Tessier R, Robaey P. Victimization: a newly recognized outcome of prematurity. Dev Med Child Neurol 2004; 46:508-13.

11. Yau G, Schluchter M, Taylor HG, Margevicius S, Forrest CB, Andreias L, et al. Bullying of extremely low birth weight children: associated risk factors during adolescence. Early Hum Dev 2013; 89:333-8.

12. Johnson A, Bowler U, Yudkin P, Hockley C, Wariyar U, Gardner F, et al. Health and school performance of teenagers born before 29 weeks gestation. Arch Dis Child Fetal Neonatal Ed 2003; 88:F190-8.

13. Johnson S, Wolke D. Behavioural outcomes and psychopathology during adolescence. Early Hum Dev 2013; 89:199-207.

14. Wolke D, Meyer R. Cognitive status, language attainment and prereading skills of 6-year-old very preterm children and their peers: the Bavarian Longitudinal Study. Dev Med Child Neurol 1999; 41:94-109.

15. Johnson S, Fawke J, Hennessy E, Rowell V, Thomas S, Wolke D, et al. Neurodevelopmental disability through 11 years of age in children born before 26 weeks of gestation. Pediatrics 2009; 124:e249-57.

16. Goodman A, Goodman R. Population mean scores predict child mental disorder rates: validating SDQ prevalence estimators in Britain. J Child Psychol Psychiatry 2011; 52:100-8.

17. Goodman A, Goodman R. Strengths and Difficulties Questionnaire as a dimensional measure of child mental health. J Am Acad Child Adolesc Psychiatry 2009; 48:400-3.

18. Analitis F, Velderman MK, Ravens-Sieberer U, Detmar S, Erhart M, Herdman M, et al. Being bullied: associated factors in children and adolescents 8 to 18 years old in 11 European countries. Pediatrics 2009; 123:569-77.

19. Osborn AF. Assessing the socioeconomic status of families. Sociology. 1987;21:429-48.

20. Hagberg B, Hagberg G, Olow I, von Wendt L. The changing panorama of cerebral palsy in Sweden. Acta Paediat Scand 1989;78:283-90.

21. Marlow N, Wolke D, Bracewell MA, Samara M, EPICure Study Group. Neurologic and developmental disability at six years of age after extremely preterm birth. N Engl J Med 2005; 352:9-19.

22. Olthof T, Goossens FA, Vermande MM, Aleva EA, van der Meulen M. Bullying as strategic behavior: relations with desired and acquired dominance in the peer group. J Sch Psychol 2011; 49:339-59.

23. Volk AA, Camilleri JA, Dane AV, Marini ZA. Is adolescent bullying an evolutionary adaptation? Aggress Behav 2012; 38:222-38.

24. Juvonen J, Graham S, Schuster MA. Bullying among young adolescents: the strong, the weak, and the troubled. Pediatrics 2003; 112:1231-7.

25. Aarnoudse-Moens CSH, Weisglas-Kuperus N, van Goudoever JB, Oosterlaan J. Meta-analysis of neurobehavioral outcomes in very preterm and/or very low birth weight children. Pediatrics 2009; 124:717-28.

26. Samara M, Johnson S, Lamberts K, Marlow N, Wolke D. Eating problems at age 6 years in a whole population sample of extremely preterm children. Dev Med Child Neurol 2010; 52:e16-22.

27. World Health Organization. Risk Behaviours: Being bullied and bullying others. In: Currie C, Zanotti C, Morgan A, et al, eds. Social determinants of health and well-being among young people. Health Behaviour in School-aged Children (HBSC) study: international report from the 2009/2010 survey. Copenhagen: WHO Regional Office for Europe (Health Policy for Children and Adolescents, No. 6); 2012. p. 191-200.

28. Arseneault L, Walsh E, Trzesniewski K, Newcombe R, Caspi A, Moffitt TE. Bullying victimization uniquely contributes to adjustment problems in young children: a nationally representative cohort study. Pediatrics 2006; 118:130-8.

29. Takizawa R, Maughan B, Arseneault L. Adult health outcomes of childhood bullying victimization: evidence from a five-decade longitudinal British birth cohort. Am J Psychiatry 2014; 171:777-84.

30. Copeland WE, Wolke D, Angold A, Costello E. Adult psychiatric outcomes of bullying and being bullied by peers in childhood and adolescence. JAMA Psychiatry 2013; 70:419-26.

31. Wolke D, Copeland WE, Angold A, Costello EJ. Impact of bullying in childhood on adult health, wealth, crime, and social outcomes. Psychol Sci 2013; 24:1958-70.

32. Farrington DP, Ttofi MM. Reducing school bullying: evidence-based implications for policy. Crime and Justice. 2009; 38:281-345.

33. Healy E, Reichenberg A, Nam KW, Allin MP, Walshe M, Rifkin L, et al. Preterm birth and adolescent social functioning-alterations in emotion-processing brain areas. J Pediatr 2013; 163:1596-1604.

34. Bäuml JG, Daamen M, Meng C, Neitzel J, Scheef L, Jaekel J, et al. Correspondence between aberrant intrinsic network connectivity and gray-matter volume in the ventral brain of preterm born adults. Cereb Cortex (2014). pii: bhu133

35. Ouellet-Morin I, Wong CCY, Danese A, Pariante CM, Papadopoulos AS, Mill J, et al. Increased serotonin transporter gene (SERT) DNA methylation is associated with bullying victimization and blunted cortisol response to stress in childhood: a longitudinal study of discordant monozygotic twins. Psychol Med 2013; 43:1813-23.

36. Copeland WE, Wolke D, Lereya ST, Shanahan L, Worthman C, Costello EJ. Childhood bullying involvement predicts low-grade systemic inflammation into adulthood. Proc Natl Acad Sci U S A 2014; 111:7570-5.

37. Wolke D, Jaekel J, Hall J, Baumann N. Effects of sensitive parenting on the academic resilience of very preterm and very low birth weight adolescents. J Adolesc Health 2013; 53:642-7.

38. Tippett N, Wolke D. Socioeconomic status and bullying: a meta-analysis. Am J Public Health 2014; 104:e48-59.

39. Hille ET, Elbertse L, Gravenhorst JB, Brand R, Verloove-Vanhorick SP, Dutch POPS-19 Collaborative Study Group. Nonresponse bias in a follow-up study of 19-year-old adolescents born as preterm infants. Pediatrics 2005; 116:e662-6.

40. Jackson B, Goodman E. Low social status markers: do they predict depressive symptoms in adolescence? Race Soc Probl 2011; 3:119-28.

41. Winsper C, Lereya T, Zanarini M, Wolke D. Involvement in bullying and suicide-related behavior at 11 years: a prospective birth cohort study. J Am Acad Child Adolesc Psychiatry 2012; 51:271-82.

42. Rønning J, Sourander A, Kumpulainen K, Tamminen T, Niemelä S, Moilanen I, et al. Cross-informant agreement about bullying and victimization among eight-year-olds: whose information best predicts psychiatric caseness 10–15 years later? Soc Psychiatry Psychiatr Epidemiol 2009; 44:15-22.

43. Dale J, Russell R, Wolke D. Intervening in primary care against childhood bullying: an increasingly pressing public health need. J R Soc Med 2014; 107:219-23.

44. Ttofi MM, Farrington DP. Effectiveness of school-based programs to reduce bullying: a systematic and meta-analytic review. J Exp Criminol Mar 2011; 7:27-56.

45. Lereya ST, Samara M, Wolke D. Parenting behavior and the risk of becoming a victim and a bully/victim: a meta-analysis study. Child Abuse Negl 2013; 37:1091-1108.

46. Salmivalli C, Kärnä A, Poskiparta E. Counteracting bullying in Finland: the KiVa program and its effects on different forms of being bullied. Int J Behav Dev 2011; 35:405-11.

47. Sapouna M, Wolke D, Vannini N, Watson S, Woods S, Schneider W, et al. Virtual learning intervention to reduce bullying victimization in primary school: a controlled trial. J Child Psychol Psychiatry 2010; 51:104-12.

Table 1. Comparison of preterm and term comparison children on neonatal characteristics, disability, type of school and school year 2 and 6/7 emotional symptoms.

	BLS (N=580)			**EPICure (N=285)**		
	VP/VLBW n=287 (49.5%)	Term Comparisons n=293 (50.5%)	*p*-value	EP n=183 (64.2%)	Term Comparisons n=102 (35.8%)	*p*-value
Neonatal						
Gestation (weeks)	30.4 (2.3)	39.7 (1.2)	<.001	24.5 (0.7)	n/a	n/a
Birth weight (gram)	1,311 (313)	3,388 (448)	<.001	751 (120)	n/a	n/a
Gender			ns			ns
male	156 (54.4%)	144 (49.1%)		85 (46.4%)	43 (42.2%)	
female	131 (45.6%)	149 (50.9%)		98 (53.6%)	59 (57.8%)	
Socioeconomic status at birth			ns			.026
High	64 (22.4%)	91 (31.1%)		58 (32.4%)	34 (34.3%)	
Middle	123 (43.0%)	114 (38.9%)		55 (30.7%)	43 (43.4%)	

Low	99 (34.6%)	88 (30.0%)		66 (36.9%)	22 (22.2%)	
School (year 2)						
Disability	45 (15.7%)	1 (0.3%)	<.001	39 (21.3%)	0 (0.0%)	<.001
Cerebral palsy	41 (14.3%)	0 (0.0%)	n/a	26 (14.3%)	0.0 (0.0%)	n/a
Blind or deaf	4 (1.4%)	1 (0.3%)	ns	16 (8.8%)	0.0 (0.0%)	n/a
Pre-existing emotional problems						
CBCL, Internalizing problems	7.63 (5.39)	6.73 (4.69)	.032	n/a	n/a	n/a
SDQ, Emotional problems	n/a	n/a	n/a	2.62 (2.16)	1.84 (1.76)	.001
Type of school at year 6/7						
Mainstream school	248 (86.4%)	288 (98.3%)	<.001	167 (91.3%)	102 (100.0%)	.002
Psychological Outcome (year 6/7)						
SDQ, Emotional symptoms	2.74 (2.22)	2.12 (1.89)	<.001	2.66 (2.48)	1.44 (1.79)	<.001

Note. Data presented as mean (SD) or n (%); SDQ=Strength and Difficulties Questionnaire; CBCL=Child Behavior Checklist.

VP/VLBW=Very Preterm/Very Low Birth Weight; EP=Extremely Preterm.

Table 2. Any bullying and bullying at one or two time points in the BLS and EPICure cohorts.

Peer Bullying		Term Comparisons N (%)	Preterm Children N (%)	Relative Risk (RR (95% CI))	Adj. Relative Risk (RR (95% CI))[1]
BLS	**Bullying**				
	Non-involved	168 (57.3%)	132 (46.0%)	1	1
	Any bullying	125 (42.7%)	155 (54.0%)	1.27 (1.07, 1.50)**	1.20 (1.01, 1.42)*
	Non-involved	168 (57.3%)	132 (46.0%)	1	1
	Being bullied at one time point	98 (33.5%)	109 (38.0%)	1.42 (0.99, 2.02)	1.39 (0.94, 2.04)
	Being bullied at two time points	27 (9.2%)	46 (16.0%)	2.17 (1.28, 3.67)**	2.01 (1.13, 3.59)*
EPICure	**Bullying**				
	Non-involved	74 (72.6%)	98 (53.6%)	1	1
	Any bullying	28 (27.5%)	85 (46.5%)	1.69 (1.19, 2.41)**	1.41 (0.97, 2.05)
	Non-involved	74 (72.6%)	98 (53.6%)	1	1
	Being bullied at one time point	18 (17.7%)	58 (31.7%)	2.43 (1.32, 4.47)**	1.97 (1.02, 3.77)*
	Being bullied at two time points	10 (9.8%)	27 (14.8%)	2.04 (0.93, 4.47)	1.15 (0.45, 2.93)

* p<.05, **p<.01

[1] Adjusted for sex, SES, disability, and pre-existing emotional problems (BLS: CBCL Internalizing problems; EPICure: SDQ Emotional problems scale).

Table 3. Regressions of prematurity and being bullied at one or two time points on emotional problem scores in year 6/7 of schooling.

Predictors	**Model 1 (unadjusted)**	**Model 2 (adjusted[1])**
	Main Effects (B (95% CI))	Effects (B (95% CI))
BLS		
VP/VLBW	0.48 (0.15, 0.81)**	0.25 (-0.06, 0.57)
Being bullied at one time point	0.68 (0.32, 1.04)***	0.26 (-0.08, 0.60)
Being bullied at two time points	1.46 (0.94, 1.97)***	0.78 (0.28, 1.27)**
EPICure		
EP	0.91 (0.39, 1.42)**	0.73 (0.22, 1.24)**
Being bullied at one time point	1.37 (0.80, 1.95)***	1.33 (0.60, 1.67)***
Being bullied at two time points	2.43 (1.68, 3.18)***	1.55 (0.79, 2.30)***

**p<.01, ***p<.001

[1] Predictors adjusted for each other and sex, SES, disability and pre-existing emotional problems (BLS: CBCL Internalizing problems; EPICure: SDQ Emotional problems scale).

VP/VLBW=Very Preterm/Very Low Birth Weight; EP=Extremely Preterm.

Table 4. Being bullied in year 2 and 6/7 in the BLS and EPICure cohorts.

Peer Bullying	Term Comparisons N (%)	Preterm Children N (%)	Relative Risk (RR (95% CI))	Adj. Relative Risk (RR (95% CI))[1]
BLS				
Being bullied at 8 years (year 2)				
Non-involved	193 (65.9%)	190 (66.2%)	1	1
Being bullied	100 (34.1%)	97 (33.8%)	0.99 (0.79, 1.24)	0.92 (0.73, 1.15)
Being bullied at 13 years (year 6/7)				
Non-involved	241 (82.3%)	183 (63.8%)	1	1
Being bullied	52 (17.8%)	104 (36.2%)	2.04 (1.53, 2.73)***	1.95 (1.44, 2.64)***
EPICure				
Being bullied at 6 years (year 2)				
Non-involved	82 (80.4%)	138 (75.4%)	1	1
Being bullied	20 (19.6%)	45 (24.6%)	1.25 (0.78, 2.00)	0.89 (0.53, 1.49)
Being bullied at 11 years (year 6/7)				
Non-involved	84 (82.4%)	116 (63.4%)	1	1

Being bullied	18 (17.7%)	67 (36.6%)	2.07 (1.31, 3.29)**	1.76 (1.07, 2.87)*

* p<.05, **p<.01, ***p<.001

[1] Adjusted for sex, SES, disability, and pre-existing emotional problems (BLS: CBCL Internalizing problems; EPICure: SDQ Emotional problems scale).