Title: Development and predictors of childhood mental health problems in former extremely preterm infants

Authors: Silje Katrine Elgen Fevang MD, PhD[1,2], Mari Hysing PsyD, PhD[3,4], Kristian Sommerfelt MD, PhD[1,2], Trond Markestad MD, PhD[1,5], Irene Bircow Elgen MD, PhD[1,6]

[1] Department of Clinical Science, Faculty of Medicine and dentistry, University of Bergen, Bergen, Norway

[2] Department of Pediatrics, Haukeland University Hospital, Bergen, Norway

[3] Regional Centre for Child and Youth Mental Health and Child Welfare, NORCE Norwegian Research Centre, Bergen, Norway

[4] Department of Psychosocial Science, Faculty of Psychology, University of Bergen, Norway

[5]Department of Pediatrics, Hospital Innlandet Trust, Lillehammer, Norway

[6] Department of Child and Adolescent Psychiatry, Haukeland University Hospital, Bergen, Norway

Email address of the authors: mari.hysing@uib.no, krisomm@gmail.com, trond.markestad@uib.no, irene.bircow.elgen@helse-bergen.no,

Corresponding author: Silje Katrine Elgen Fevang

Department of Clinical Medicine, Section of Pediatrics, University of Bergen, N-5021 Bergen

Telephone: + 47 97563853. E-mail: silje.katrine.elgen.fevang@helse-bergen.no

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Abstract:

Objective: To investigate development and predictors of mental health problems from five to eleven years of age in children born extremely preterm (EP).

Method: In a national Norwegian cohort of children born before a gestational age of 28 weeks or with a birthweight less than 1000 grams mental health was assessed by parents at five and eleven years of age using The Strengths and Difficulties Questionnaire. A Total Difficulties Score ≥90th percentile (TDS90) for a reference group was used as a measure of a mental health problem. Of 338 eligible EP children, 162 (48%) attended at both ages.

Results: The rate of TDS90 was 52 (32 %) at five and 37 (23%) at eleven years of age (p=0.025). Of the 52 children with TDS90 at five years, 25 had TDS90 at eleven years of age, and of 37 children with TDS90 at eleven, 25 had TDS90 at five years of age. Mental health problems and an IQ of 70-84 at five years were independent predictors of TDS90 at eleven years of age.

Conclusion: The rate of mental health problems decreased from five to eleven years, but individual stability was moderate. Mental health problems and intellectual function in the lower normal range at preschool age were independent predictors of later mental health problems.

Keywords: Extremely preterm, mental health, development, predictors, The Strengths and Difficulties Questionnaire (SDQ).

Abbreviations: Extremely preterm (EP), The Strengths and Difficulties Questionnaire (SDQ), Total Difficulties Score ≥90th percentile (TDS90), gestational age (GA), neonatal intensive care unit (NICU), cerebral palsy (CP), the Gross Motor Function for Classification (GMFCS), The Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R), full IQ (FIQ), the Movement Assessment Battery for children (ABC-test), negative predictive values (NPV), positive predictive value (PPV), retinopathy of prematurity (ROP).

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Introduction

Children born extremely preterm (EP- born before 28 weeks gestation) are at increased risk of later mental health problems such as inattention, peer problems and emotional problems, both at preschool [1-3] and middle school age [4-9].

The rate of mental health problems has been reported to be stable throughout childhood for children born premature (gestational age (GA) <37 weeks) [10, 11], but one study found that the rate increased from preschool to school age [12]. Changes in mental health during childhood is poorly explored in children born EP, but one study found that the rate of social isolation and oversensitivity was stable while the prevalence of victimization increased and aggressiveness decreased from seven to eleven years of age [13].

On an individual level, mental health may vary over time in children born preterm; both Miller et al [12] and Gray et al [10] found that only one half of children identified with a mental health problem at five years had problems at eight years of age. On the other hand, approximately half of children with a mental health problem at eight years already had a recognized problem at five years of age [10]. However, almost nine out of ten preterm children without an identified mental health problem at five had no problems at eight years of age [10]. To our knowledge, no study has addressed development of mental health over time limited to children born EP.

We and others have shown that pre-, peri-, and neonatal factors are considered to be of minor importance as predictors of later childhood mental health problems among children born EP [6, 9] as opposed to ex. non-optimal socioeconomic factors [6, 9]. Growing up, EP children are at

increased neurological risk such as low cognitive functioning, motor problems, and visual- and hearing impairment [14, 15]. Lower cognitive functioning and motor problems have been found to be associated with mental health problems in EP children [6], and may also impact on the development of mental health problems over time [6, 16, 17]. However, more research is needed to assess the significance of child preschool characteristics in order to provide guidance to parents and health care providers, and to establish evidence based preventive measures [17].

Aims of the study:

We have prospectively followed a national Norwegian cohort of children born EP, and the aims of the present study were 1) to investigate the development of mental health outcomes from five to eleven years of age, and 2) to identify predictors of mental health problems at eleven years from assessments at five years of age.

Material and methods

Population

The study population was a national cohort of all children born in Norway in 1999 and 2000 with a GA < 28 weeks or a birthweight (BW) < 1000 g. They were prospectively assessed during their stay in the neonatal intensive care unit (NICU), and at two, five, and eleven years of age. Major outcomes were known for all, except two children until two years of age, and characteristics of the cohort, definitions, and overall outcome in terms of mortality and morbidity until eleven years of age, have been published [8, 14, 18].

At both five and eleven years of age, 372 children from the EP cohort were alive. Children who at five years had an IQ <70 [19] or non-ambulatory cerebral palsy (CP) (class 4-5 on the Gross Motor Function for Classification for CP -GMFCS) [20], or were deaf or blind [14], were

excluded (n=33) since the mental health assessment tool used in the present study (The Strength and Difficulties Questionnaire -SDQ) has not been validated for such children [21, 22]. One child was excluded because of unknown IQ [8]. Thus, a total of 338 EP children were eligible at five and eleven years of age, but only 162 (48%) of them had parent-reported SDQ at both five and eleven years of age.

Functional disabilities

At five years of age, the EP children were examined at their local pediatric department by a pediatrician, a psychologist, and a physiotherapist. An experienced pediatrician performed a general clinical and neurological examination and assessed motor function according to the Gross Motor Function Classification of CP (GMFCS) for the children with CP. In short, this is a five-level classification where class 1 means freely ambulatory, class 2 inability to run or jump, class 3 dependency on devices for walking, and classes 4 and 5 means non-ambulatory [20]. A psychologist tested cognitive function with the Norwegian version of The Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R) [19]. The reference mean for the full IQ (FIQ) score is 100 (SD 15). A physiotherapist assessed motor function using the Movement Assessment Battery for children (ABC-test) [23]. The ABC-test consists of eight tasks in three major fields; manual dexterity, ball skills and balance (static and dynamic). Total age specific scores range from 0 to 40, with increasing scores indicating poorer function. A total score ≥ 95th percentile for children without CP was classified as a minor motor problem. All children in Norway have vision screened at four and pure tone audiometry at five years of age. Significant deviant results are referred to an ophthalmologist or otolaryngologist. A *functional disability* was defined as CP class 1-3, minor motor problem according to the ABC-test, IQ of 70-84, visual impairment without blindness, hearing loss with or without a need of hearing aid, but not deafness.

Mental health

The Strengths and Difficulties Questionnaire (SDQ) was administrated to the parents by mail at both five and eleven years of age. The SDQ is a general behavioural screening questionnaire for 4-17 year old children. It contains 20 items, which can be allocated to four subscales with five items in each; *emotional problems, hyperactivity/inattention,* c*onduct problems,* and *peer problems*. The items are collapsed to form the *Total Difficulties Score* (TDS) [24, 25]. Each item is scored on a three point scale "not true", "somewhat true", and "certainly true". Two unselected Norwegian populations, one at five and one at eleven years of age served as reference populations [2, 8, 9]. The total subscale scores range from 0 to10 and *TDS* from 0 to 40. For each of the subscales and the TDS, a score ≥ the 90th percentile for the reference children was defined as a *high score.* The *high score* TDS was named TDS90. The SDQ is widely used and validated, has good psychometric properties [24], with a sensitivity of 0.58 and specificity of 0.88 for parent reported TDS90 in comparison to a psychiatric diagnosis [25]. The SDQ scores at five and eleven years of age has been reported previous [2, 8, 9].

Statistics

The main statistical analyses were performed in five stages. In stage 1 we compared characteristics of the eligible children who were assessed and not assessed in order to explore risks of selection bias (Table 1). In stage 2 we investigated the development of mental health problems from five to eleven years of age using Paired Sampled t-test, Pearson Correlation, and McNemars tests (Table 2). In stage 3, we used high scorers of SDQ outcome, and negative (NPV) and positive (PPV) predictive values as measures to assess individual stability from five to eleven years of age (Table 3). In stage 4, we used univariate analyses with TDS90 at eleven as dependent variable and each of the SDQ subscales, TDS90 and functional disability (all

categorical variables) at five years of age as separate independent variables (Table 4). In stage 5, we performed binary multivariate regression analyses, both enter and backward conditional, with TDS90 at eleven years of age as dependent variable and five year SDQ subscales, TDS90, and functional disabilities (all categorical variables) as independent variables. In addition, we performed separate interaction analyses with TDS90 at eleven years of age as dependent variable, first, with minor motor problems x TDS90 at five years of age, and secondly, IQ 70-84 x TDS90 at five years of age, as independent variable. A precise description is presented in the footnote of Table 5.

In the univariate analyses, we used chi-square tests for categorical variables and independent samples t-test for continuous variables. A *p*-value less than 0.05 was considered statistically significant. Standard deviations (SD), differences in percentages, and 95% confidence intervals (CI) were calculated when appropriate. The SPSS statistical package version 23.0 was used for all analyses. When SDQ items were missing at both five and eleven years of age, which occurred in a few instances, the item was substituted with the individual mean score for the items from the subscale

Ethics

The Regional Committee on Medical Research Ethics and The Norwegian Data Inspectorate approved the EP study. Parents gave written informed consent.

Results

Population

Of 338 eligible EP children, 162 (48%) had parent-reported SDQ at five and eleven years of age. There were significantly higher proportions of mothers with high education at birth,

caesarian section, hearing impairment at five years of age, and no retinopathy of prematurity (ROP) for the EP children who were assessed compared to those not assessed at both five and eleven years of age (Table 1).

Development of mental health

The mean SDQ scores did not differ between five and eleven years of age, but the proportion of children with a high score, i.e. suggestive of mental health problems, was higher at five years for all subscales and TDS90 (Table 2).

Of the 52 EP children with TDS90 at five, 25 (48%) also had TDS90 at eleven years of age, and 25 (68%) of the 37 EP children with a TDS90 at eleven had TDS90 at five years of age (Table 3). Almost nine out of ten children, who did not score a TDS90 at five, also did not score TDS90 at eleven years of age (Table 3).

Early predictors of mental health at eleven years of age

In *univariate* analyses, all SDQ subscales, the TDS90, and IQ scores of 70-84 (vs. above 84) at five years of age were significantly, while minor motor problems were marginally not (p=0.05) associated with TDS90 at eleven years of age (Table 4).

In the *multivariate* analysis with all four SDQ subscales at five years of age as independent variables, only conduct and emotional problems were significantly associated with the dependent variable TDS90 at eleven years (Table 5). In a similar analysis without SDQ subscales, but with IQ scores of 70-84 vs. above 84, visual- and hearing impairments, and minor motor problems at five years as independent variables, only IQ of 70-84 was significantly

associated with TDS90 at eleven years of age (Table 5). Furthermore, with the independent variables TDS90 and IQ 70-84 vs. above 84 at five years, only TDS90 was associated with TDS90 at eleven years in a multivariate analysis (Table 5). Finally, both minor motor problems x TDS90 at five years and IQ 70-84 x TDS90 at five years were significantly associated with TDS90 at eleven years of age (Table 5).

Discussion

In this national Norwegian cohort of EP children, the rate of high SDQ scores, i.e. indicative of mental health problems, was higher at five than at eleven years of age, although the mean SDQ scores did not differ. The individual stability of high scores was moderate. However, a TDS90 at 11 years was highly unlikely if the child had a lower TDS score than TDS90 at five years of age. High scores on all the four sub-scales and TDS90 at five years, were predictive of TDS90 at eleven years of age, but in particular conduct problems and TDS90. An IQ of 70-84 at five years predicted TDS90 at eleven years, but the effect was not significant when adjusted for mental health problems at five years of age.

Mental health problems in EP children

We and others have found that the risks of inattention [3-6, 8, 9], peer problems [2, 4-9, 26] and emotional problems [2, 4, 5, 7-9, 26] are higher for children born EP than at term, both at preschool and school age. Previous studies have reported an increased risk of conduct problems among children born EP at five to six years of age (OR: 2.4-5.8) [2, 4], but not at middle school age (OR: 1.1-1.7) [6, 7, 26]. The present study affirms that conduct problems tended to decline with time in the EP children, which is in accordance with a previous study [13]. Interestingly, we found that having a preschool conduct problem was the strongest predictor of mental health problems at eleven years. We suggest that conduct problems at this early age are non-specific

symptoms of challenges in areas like social skills or developmental disabilities rather than conduct problems *per se*.

Development and predictors of mental health problems

Our finding of moderate individual stability of mental health problems from preschool to school age for the EP children is in agreement with some previous studies. Johnson et al. found that mental health problems at six years of age were associated with a five-fold increased risk of later mental health problems, in children born EP [6]. Furthermore, our finding that almost half of the EP children with a mental health problem at preschool age still had a mental health problem later in school is similar to what has been reported for prematurely born children in general [10, 12].

It has repeatedly been shown that IQ in the low normal range is associated with mental health problems, both in children born at term [27] and EP [1, 4, 6]. Furthermore, IQ tends to be relatively stable from late preschool to school age [28], and it may therefore not be surprising that IQ scores in the lower normal range (IQ 70-84) before entering school predicted a later mental health problem. This finding is in agreement with a previous study on children born EP [6]. It should be noted that such findings do not necessarily mean that lower IQ causes mental health problems, or vice versa, since an alternative explanation may be that both have a common cause, such as some degree of cerebral dysfunction related to extremely preterm birth.

Our finding that other functional disabilities than low normal IQ at five years were not significantly associated with mental health problems at 11 years of age, is contrary to the report by Johnson et al. [16] who found that motor problems at six years was associated with mental health problems at eleven years of age. We found a similar trend, although not statistically

significant, but in contrast to Johnson et al., we did not include children with CP who are known to be at increased risk of mental health problems [29]. Our study may have been underpowered to demonstrate a possible association between early minor motor problems and later mental health problems. Further studies are needed since motor function may be easier to assess than cognitive abilities in early childhood.

Several factors might interact when predicting later mental health outcome. In the present study we found both low IQ and motor problems interacting with TDS90 at five years of age. Noteworthy, the complexity of the child's condition increases the risk of mental health problems.

Strengths and limitations

Strengths of the present study were the large national population based sample of EP children, the prospective design, systematic assessments of the children by professionals at five years of age, and the use of the same questionnaire at five and eleven years of age. The study had several weaknesses, and the results should therefore be interpreted with caution: The relatively large loss to follow up was partly compensated by extensive knowledge regarding those who did not participate. A higher proportion of the participants had mothers with high education, possibly resulting in underestimation of mental health problems among EP children in general [30]. On the other hand, a higher proportion of the participants had minor hearing impairments, which may be associated with increased risk of mental health problems in EP children [1]. The use of a screening questionnaire instead of a diagnostic tool, is another limitation in the study. Johnson et al. [25] found in an EP population that that there were no significant difference in the estimated prevalence when based on abnormal parental TDS screen and those with a psychiatric diagnosis, but the agreement between abnormal parental TDS screens and

psychiatric diagnosis were moderate (Cohen's K=0.47), bringing some uncertainties to the findings. In addition, the different reference groups for the five and eleven year follow-up, and missing IQ scores and scores for minor motor function for some of the EP children, were also limitations. Finally, the low number of children with functional disabilities may have rendered the study underpowered to more fully assess the predictive strength of associated potential early risk factors.

Conclusion

From the present study we suggest that preschoolers born EP who are identified with possible mental health problems based on questionnaires or who have relatively low cognitive function, are at significant risk of later mental health problems and may benefit from further mental health assessment with the prospect of meaningful interventions.

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Table 1: Clinical characteristics of the extremely preterm[a] children who were assessed vs. not assessed for mental health[b] at both 5 and 11 years of age.

	Assessed n=162	**Not assessed** n=176	*p-value*[c]
Boys, n (%)	78 (48)	103 (59)	0.06
Mother high education at birth[d], n (%)	78 (48)	36 (35)	0.04
Mother's age at birth, years (mean, SD)	30 (5)	29 (6)	0.32
Birthweight, gram (mean, SD)	862 (171)	868 (167)	0.76
Gestational age, weeks (mean, SD)	27(2)	26 (2)	0.15
Gestational age< 28 weeks, n (%)	122 (75)	137 (78)	0.58
Small for gestational age[e], n (%)	36 (22)	25 (14)	0.06
Prenatal steroids, n (%)	119 (74)	115 (65)	0.11
Preeclampsia, n (%)	42 (26)	42 (24)	0.66
Caesarean section, n (%)	118 (73)	105 (60)	0.01
Multiple births, n (%)	39 (24)	37 (21)	0.50
Bronchopulmonary dysplasia[f], n (%)	79 (49)	70 (40)	0.10
NEC[g] (proven or suspected), n (%)	7 (4)	6 (3)	0.66
Normal Cerebral ultrasound[h], n (%)	144 (70)	119 (68)	0.58
No Retinopathy of prematurity, n (%)	123 (76)	115 (66)	0.04
IQ 70-84 at 5 years of age[i]	32 (22)	16 (19)	0.64
Visual impairment at 5 years of age	35 (22)	33 (19)	0.51
Hearing impairment at 5 years of age	24 (15)	7 (6)	0.03
Ambulatory Cerebral Palsy[j]	7 (4)	9 (5)	0.73
SDQ Total Difficulties Score at 5 years[k]	52 (32)	28 (40)	0.25

[a] Gestational age 22-27 weeks or birth weight 500-999 grams, [b] According to The Strengths and Difficulties Questionnaire (SDQ), [c] Chi-square test or Independent sampled t-test as appropriate, [d] At least 3 years' college education or a university degree, [e] Birth weight < 5th percentile for gestational age, [f] Assisted ventilation or oxygen supplementation at 36 weeks' postconceptional age, [g] Necrotizing enterocolitis, [h] No periventricular hemorrhage or periventricular cysts, [i] According to The Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R), [j] Cerebral Palsy Class 1-3 according

to the Gross Motor Function Classification for CP (GMFCS), [k] Total Difficulties Score ≥ 90th percentile (TDS90) for a reference group according to the SDQ at five years of age [2].

Table 2: Mean scores and proportion of high scores on the Strengths and Difficulties Questionnaire (SDQ) at 5 and 11 years of age, and correlations between the two assessments in the population of extremely preterm (EP)[a] children.

	EP 5 years	**EP 11 years**		
	Mean (SD)	Mean (SD)	*p*-value	*Pearson Correlation*
Mental Health	n=162	n=162		
SDQ				
Emotional Problems	2.3 (1.9)	2.5 (2.3)	0.17	0.58*
Hyper/Inatt[e] Problems	3.4 (2.5)	3.4 (2.5)	0.95	0.58*
Conduct Problems	1.1 (1.3)	1.1 (1.2)	0.76	0.49*
Peer Problems	1.1 (1.5)	1.4 (1.8)	0.12	0.32*
Total Problems	7.9 (5.0)	8.3 (5.8)	0.26	0.62*
	High scorers[b]	High scorers[c]		
Mental Health	n (%)	n (%)	*p*-value[d]	
SDQ				
Emotional Problems	65 (40)	49 (30)	0.018	
Hyper/Inatt[e] Problems	75 (46)	38 (24)	<0.001	
Conduct Problems	48 (30)	20 (12)	<0.001	
Peer Problems	52 (32)	20 (12)	<0.001	
Total Problems	52 (32)	37 (23)	0.025	

[a] Gestational age 22-27 weeks or birthweight 500-999 grams, [b] scorers ≥ the 90th percentile for the reference group at five years of age, [c] scorers ≥ the 90th percentile for the reference group at eleven years of age, [d] McNemars test, [e] Hyperactivity/Inattention problems, * $p<0.001$

Table 3: Stability of parent reported mental health problems from 5 to 11 years of age in the extremely preterm (EP)[a] children measured by the Strengths and Difficulties Questionnaire (SDQ)[b].

SDQ 11 years		***SDQ 5 years***						
		Present (n)	*Absent (n)*	*Total (n)*	***Sensitivity***	***Specificity***	***PPV[c]***	***NPV[d]***
Emotional Problems, (n)	*Present*	**37**	12	49	0.76	0.75	0.57	0.98
	Absent	28	**85**	113				
	Total	65	97	162				
Hyper/Inatt[e] Problems, (n)	*Present*	**27**	11	38	0.71	0.61	0.36	0.87
	Absent	48	**76**	124				
	Total	75	87	162				
Conduct Problems, (n)	*Present*	**14**	6	20	0.70	0.76	0.29	0.95
	Absent	34	**108**	142				
	Total	48	114	162				
Peer Problems, (n)	*Present*	**11**	9	20	0.55	0.71	0.21	0.92
	Absent	41	**101**	142				
	Total	52	110	162				
Total Difficulties, (n)	*Present*	**25**	12	37	0.68	0.78	0.48	0.89
	Absent	27	**98**	125				
	Total	52	110	162				

[a] Gestational age 22-27 weeks or birthweight 500-999 grams, [b] Problems defined as scoring ≥ the 90th percentile for the reference group, [c] Positive predicative value, [d] Negative Predicative Value, [e] Hyperactivity/Inattention problems

Table 4: Univariate analyses: Predictors of a general mental health problem (TDS90[a]) at 11 years based on mental health problems or functional disabilities at 5 years of age for a national cohort of extremely preterm[b] children born in Norway in 1999-2000.

	TDS90 at 11 years of age (n=37)			
	n/total n	OR	95% CI	*p-value*
Mental health problems[c] at 5 years of age				
Conduct Problems	48/162	9.2	4.1 to 21	***<0.001***
Emotional Problems	65/162	5.2	2.3 to 12	***<0.001***
Hyper/Inatt[d] Problems	75/162	5.2	2.2 to 12	***<0.001***
Peer Problems	52/162	2.5	1.2 to 5.4	***0.016***
TDS90	52/162	7.6	3.4 to 17	***<0.001***
Functional disabilities at 5 years of age				
Low IQ (70-84)[e]	32/148	4.0	1.7 to 9.3	***0.002***
Motor problems[f]	36/158	2.3	1.0 to 5.2	*0.050*
Hearing impairment[g]	24/162	1.9	0.7 to 4.8	*0.19*
Visual impairment[h]	35/162	1.2	0.5 to 2.9	*0.64*

Univariate analyses were performed with TDS90 at eleven years of age as dependent variable, and separately, each mental health problem and functional disability at five years of age as independent variables, all of categorical character.

[a] Total difficulties score from the Strengths and Difficulties Questionnaire with a score ≥ the 90th percentile from the Bergen Child Study reference group, [b] Gestational age 22-27 weeks or birthweight 500-999 grams, [c] Scores from the Strengths and Difficulties Questionnaire ≥ the 90th percentile from the Bergen Child Study reference group, [d] Hyperactivity/Inattention Problems, [e]According to The Wechsler Preschool and Primary Scale of Intelligence-Revised, [f] According to the Movement Assessment Battery for children; score ≥ 95th percentile, and not having cerebral palsy, [g] hearing loss with or without need of hearing aid, but not deafness, [h] but not blind.

Table 5: Multivariate analyses: Predictors of a general mental health problem (TDS90[a]) at 11 years of age based on mental health problems or functional disabilities at 5 years of age for a national cohort of extremely preterm[b] children born in Norway in 1999-2000.

	TDS90 at 11 years of age (n=37)			
	n/total n	Exp(B)	95% CI	*p-value*
Mental health problems [c] ***at 5 years of age***				
Enter analysis [d]				
Emotional Problems	65/162	3.4	1.4 to 8.4	***0.007***
Hyper/Inatt[e] Problems	75/162	2.3	0.9 to 6.1	*0.084*
Conduct Problems	48/162	5.6	2.2 to 14	***<0.001***
Peer Problems	52/162	1.8	0.7 to 4.3	*0.22*
Backward analysis [f]				
Conduct Problems	48/162	7.7	1.7 to 9.7	***<0.001***
Emotional Problems	65/162	4.1	3.3 to 18	***0.002***
Functional disabilities at 5 years of age				
Enter analysis [g]				
Low IQ (70-84)[h]	32/148	3.9	1.5 to 10	***0.006***
Hearing impairment[i]	24/162	2.3	0.8 to 6.7	*0.12*
Motor problem[j]	36/158	1.4	0.5 to 3.8	*0.51*
Visual impairment[k]	35/162	0.8	0.3 to 2.2	*0.60*
Functional disabilities				

and mental health at 5 years of age				
Enter analysis [l]				
TDS90 at five years	52/162	5.5	2.3 to 14	***<0.001***
Low IQ (70-84)	32/148	2.1	0.8 to 5.6	*0.12*
Enter analysis				
Motor problem x TDS90 at five years (interaction)	19/158	6.7	2.4 to 18	***<0.001***
Enter analysis				
Low IQ (70-84) x TDS90 at five years (interaction)	20/148	8.1	2.9 to 22	***<0.001***

[a] Total difficulties score from the Strengths and Difficulties Questionnaire with a score ≥ the 90th percentile from the Bergen Child Study reference group, [b] Gestational age 22-27 weeks or birthweight 500-999 grams, [c] Scores from the Strengths and Difficulties Questionnaire ≥ the 90th percentile from the Bergen Child Study reference group, [d] Binary enter regression analysis with TDS90 as dependent variable, and conduct problems, emotional problems, hyperactivity/inattention, and peer problems as independent categorical variables, [e] Hyperactivity/Inattention Problems, [f] Binary Backward conditional regression analysis with TDS90 as dependent variable, and conduct problems, emotional problems, hyperactivity/inattention, and peer problems as independent categorical variables, [g] Binary enter regression analysis with TDS90 as dependent variable, and low IQ, hearing impairment, motor problem, and visual impairment as independent categorical variables, [h] According to The Wechsler Preschool and Primary Scale of Intelligence-Revised, [i] hearing loss with or without need of hearing aid, but not deafness, [j] According to the Movement Assessment Battery for children; score ≥ 95th percentile, and not having cerebral palsy, [k] but not blind, [l] Binary enter regression analysis with TDS90 at 11 years of age as dependent variable, and TDS90 and IQ (70-84 and ≥ 85) at five years of age, as independent categorical variables.