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Risk factors for behavioural problems in foetal alcohol spectrum disorders

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Abstract

Aim—To examine risk and protective factors associated with behavioural problems of children and adolescents following prenatal alcohol exposure.

Methods—A total of 73 children and adolescents with foetal alcohol spectrum disorders (FASD) were assessed for internalizing, externalizing and total behavioural problems using the Child Behavior Checklist. Linear regression models were used to determine the effects of diagnostic and environmental risk and protective factors on behaviour, while controlling for age, sex and IQ.

Results—Length of time spent in residential care was the most pervasive risk factor associated with internalizing, externalizing and total behavioural problems. A low dysmorphology score was related to more internalizing and total problems.

Conclusions—Children and adolescents prenatally exposed to alcohol faced greater risk of substantive behavioural problems (i) if they were less visibly alcohol affected and (ii) the longer time they had spent in residential care. The results underscore the clinical importance of appropriate services and care for less visibly affected children with FASD and highlight the need to attend to children with FASD being raised in institutions.

Keywords

Behavioural problems; Foetal alcohol spectrum disorders; Prenatal alcohol; Risk factors

INTRODUCTION

The teratogenic effects of alcohol during pregnancy represent a continuum, most accurately termed FASD. According to guidelines set forth by the Institute of Medicine (IOM), an individual with prenatal alcohol exposure can be diagnosed with foetal alcohol syndrome (FAS), partial foetal alcohol syndrome (PFAS), alcohol-related neurodevelopmental disorder (ARND) or alcohol-related birth defects (1). Drinking during pregnancy can

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produce a range of morphological anomalies and cognitive dysfunction. Diagnostic criteria include characteristic facial dysmorphology, growth retardation and central nervous system/ neurodevelopmental abnormalities [see Hoyme et al. (1) for a complete description of the revised IOM diagnostic criteria for FASD].

Children and adolescents with FASD are also at risk for behavioural and mental health problems. Prenatal development is disrupted by significant teratogenic exposure, and the physical health and developmental capacity of these individuals are already compromised at birth. In addition to its direct effects on the developing brain, prenatal exposure to alcohol seems to increase the vulnerability to subsequent life stressors (2). Further, these children are often born into dysfunctional families with at least one alcohol abusing parent. In many countries, FASD children may at some stage be taken into custody and placed in residential care units and/or foster care (3,4). A study from Finland indicated that 50% of children born to mothers followed up at special maternity clinics for pregnant women with alcohol and drug abuse were taken into custody for some duration over a 12-year follow-up (4). Generally, children in foster and residential care are at increased risk for behavioural and psychiatric problems (5,6), attachment disorders (7), as well as with criminality and poor academic performance in school (6). Taken together, children growing up with FASD may face accumulating risk environments during development, increasing their vulnerability with respect to behavioural problems.

For individuals exposed to alcohol prenatally, behavioural problems have been reported in several domains. On an externalizing continuum, various forms of attention disorders (8,9) as well as oppositional defiant behaviour and conduct disorders are commonly described (9,10). Internalizing behaviours such as depressive symptoms (11) and anxiety (8) are also reported. Furthermore, children with prenatal alcohol exposure have been characterized by difficulties with interpersonal relationships (12). All in all, serious and pervasive behavioural consequences often accompany FASD, limiting their chances of successes in life.

Relatively few studies, however, have explored the effects of risk and protective factors influencing the adverse development in FASD, particularly with respect to effects of the social environment on ultimate functioning. Streissguth et al. interviewed 415 subjects prenatally exposed to alcohol and found mental health problems affecting over 90% of the sample. Protective factors associated with relatively better outcomes were an early diagnosis and a diagnosis of FAS rather than foetal alcohol effects (a condition where the individual does not display all of the physical features of FAS, not used as a clinical diagnosis). Both the early diagnosis and the clearer abnormality in FAS may make the need of early intervention more obvious and thus exert a protective influence. Other protective factors were no experienced violence, staying in each living situation for more than 2.8 years, experiencing a good-quality home from age 8 to 12, having been found eligible for developmental disabilities services, basic needs met for at least 13% of life, and a stable and nurturing home for over 72% of life (13,14). On the other hand, Spohr et al. (15) found that although almost all of the aforementioned protective factors were present for their subjects, the outcome in their sample was nevertheless significantly impaired. The researchers concluded that their results did not corroborate the benefits of the protective function of the factors cited by Streissguth et al. Koponen et al.(16) studied children exposed to alcohol who were placed in foster homes and found that early placement was a protective factor with respect to behavioural problems. The differences between diagnostic categories were generally small. However, alcohol exposed children with no FASD diagnosis had more behavioural problems than those who had a diagnosis. A recent prospective study by Robinson et al. (17) following a cohort of children up to 14 years comes to the conclusion that mild or low-to-moderate consumption of alcohol in pregnancy does not appear to be a

risk factor in the epidemiology of child behavioural problems. A similar view is taken by Rodriguez et al. (18) stating that low doses of alcohol during pregnancy does not relate to child inattention/hyperactivity symptoms once social adversity and smoking are taken into account. Taken together, data on risk and protective factors influencing the developmental trajectory for individuals with FASD are inconclusive at present. Identification of the most influential risk and protective factors is critical when considering how to best support these children.

In the present study, we examined potential risk and protective factors for behavioural adaptation in a group of heavily alcohol-exposed children and adolescents with FASD. Based on Streissguth (13,14), we focused on diagnostic and environmental factors. We expected that an early diagnosis (preferably being diagnosed before the age of 6 years) and a diagnosis of FAS rather than PFAS or ARND would be a protective factor. We also expected fewer behavioural problems in children living in foster or adoptive homes compared to children with FASD living with their biological parents or in residential care. To enable an assessment of the severity of behavioural problems, the FASD group was also compared with a normal control group.

METHODS

Participants

This study was conducted as part of a larger international project on FASD (the collaborative initiative on FASD) approved by the Coordinating Ethical Committee at the Hospital District of Helsinki and Uusimaa. The subjects have been described in detail elsewhere (19). Briefly, all children diagnosed as FASD born between 1984 and 1996 were identified from the Hospital for Children and Adolescents, University of Helsinki, Finland, as well as from a prospective follow-up study in the Helsinki area (20). All in all 104 children were ascertained, and parents or legal guardians were contacted by phone. Of these 77 agreed to participate in the study. Reasons for not participating in the study (n = 27) were biological parent not interested/giving permission for participation (n = 9), child not interested (n = 4), child too old to fit the sample (n = 4), dead (n = 1), child adopted from abroad (n = 2), other diagnosis than FASD according to parent (n = 2), family had moved too far away (n = 1), interviewer was not able to get in touch with the family (n = 4). Of those who chose not to participate the gender distribution was even; 13 were girls and 14 were boys. Maternal alcohol consumption during pregnancy was confirmed for all cases by review of patient records from the time of birth and/or other reliable collateral sources, including interview of biological parents and/or guardians. To ensure reliable diagnosis, all participants were assessed by a single experienced dysmorphologist (HEH) and were assigned diagnoses (FAS: n = 41, PFAS: n = 23; ARND: n = 9, other: n = 4) according to the revised IOM diagnostic criteria for FASD (1). They were also assigned a dysmorphology score, a weighted quantitative measure of associated major and minor anomalies (1). A higher dysmorphology score is associated with a larger number of dysmorphic features commonly observed in FASD, as well as growth deficiency and/or microcephaly.

Written informed consent for the assessment was obtained from all participants and also from an accompanying parent or legal guardian for underage subjects. The final group consisted of 73 children and adolescents with verified FASD. A majority of the participants were girls (60.3%). Age ranged from 8 to 21, with a mean age of 13 years, 5 months (see Table 1).

The participants were generally diagnosed at an early age. Most of them had lived the majority of their lives in a foster or adoptive home (68.5%) followed by biological parents' home (17.8%) and residential care (8.2%). Over 90% had been offered some form of special

education and about onefifth (19.2%) had had a personal aide at some stage of their education. According to informants, 11% (n = 8) had suffered from serious depression and threatened to suicide. One participant (1.4%) had also made a suicide attempt and two (2.7%) had experienced panic attacks. A majority was described with attention deficit problems (n = 44, 60.3%), but only 6 (8.2%) had been prescribed stimulant medication. Twelve participants (16.4%) had been in some form of psychotherapy.

For normative comparison on the Child Behavior Checklist (CBCL), a normal control group (NC, N = 40) was used. They were recruited through random sampling from the Finnish national population registry, yet so as to match the FASD subjects on age, sex and geographical region. Parents were questioned about alcohol intake during pregnancy, and any mention of alcohol intake during pregnancy was an exclusion criterion in the NC group. All normal controls were also assessed by the study dysmorphologist (HEH).

Assessment

The outcome variables were behavioural problems determined from the CBCL, ages 6–18 version translated to Finnish and Swedish (21), which was completed by an adult who knew the subject well (parent, foster parent or residential care personnel). Parents rated 113 items on a three-point Likert scale (0 = not true, 1 = somewhat or some-times true and 2 = very true or often true). The CBCL has proved to be a valid and reliable instrument, widely used and translated to at least 61 languages (21). It provides a syndrome profile from which two broad dimensions can be scored. Problems mainly within oneself such as anxiety, depressive symptoms, social withdrawal and somatic complaints are drawn together under *internalizing* problems. *Externalizing* problems comprise symptoms involving conflicts with other people and with inappropriate behaviour such as rule-breaking and aggressive behaviour. The CBCL also includes scales for social problems and problems with thought and attention categorized as neither internalizing nor externalizing, but included in the score for total behaviour problems. From the summary scores, T scores were derived, and internalizing, externalizing and total behaviour problems were extracted using a computer scoring system. Higher T scores indicate more behavioural problems. For externalizing, internalizing and total problem scale scores, T scores below 60 are considered to be in a normal behavioural range. Scores from 60 to 63 are classified as borderline and scores above 63 fall into clinical range functioning. US norms were used, but the clinical range cut-off has earlier been found similar in American and Finnish population samples (22). As CBCL is normed for ages 6–18 and a few of the subjects (n = 8) in this group were older, we checked for age-related bias by dividing the sample into two age groups: 8- to 18-year-olds and 19- to 20-year-olds. Using independent samples *t*-tests, no significant differences were found on any of the CBCL scales between the groups.

Information on risk and protective factors for the participants was collected through interviews with the accompanying adult. We conducted a short telephone interview and then an extensive in-person interview on risk/protective factors developed for the FASD population, the Life History Interview (LHI) (13,14). The LHI is a structured interview comprising questions about past and current events covering family history, personal development, independent living, education, employment and various problems areas. For this study, two areas of interest were chosen based on earlier research on risk and protective factors in FASD: diagnostic factors and living environment/home placement. In addition, the effect of remedial help in school was explored, as it may be assumed that also support in school might affect the outcome. Diagnostic factors were type of diagnosis within the FASD continuum, dysmorphology score and age at diagnosis. Factors relating to living environment were length of time spent in different placements: with biological parents, foster or adoptive parents as well as in residential care units. Also included was the total number of home placements or, in other words, how many times the child had moved back

and forth between different placements. The third area comprised of access to special education and classroom aide at school. Through ameliorating learning difficulties, remedial help in school was entered as a potential protective factor for diminishing behavioural problems.

IQ was measured using a brief form of the Leiter International Performance Scale-Revised, consisting of four subtests. It provides an assessment of nonverbal cognitive ability with an emphasis on fluid reasoning and visualspatial abilities (23).

Descriptive characteristics of age, sex, IQ, diagnostic assessment and risk/protective factors are illustrated in Table 1.

Statistical analysis

As the number of potential predictors was high in relation to the number of participants, it was not possible to include all predictors simultaneously in a single regression analysis. Therefore, we grouped the potential risk and protective factors into three categories: diagnostic factors, living environment and remedial help in school (see Table 3) and conducted separate regression analyses only including predictors from one category at a time. This way the number of predictors never exceeded the recommended ratio between predictors and cases. These separate regression analyses were then followed by a regression analysis in which the significant predictors from the separate regressions were included simultaneously. This procedure was followed for each of the three dependent variables, that is, internalizing, externalizing and total problem scale scores from the CBCL. The linear regression analyses were conducted using a simultaneous method (variables in a block were entered in a single step). To control for age, sex and IQ, these variables were always entered together as Block 1 (not reported in Table 3 for sake of brevity) and risk/protective variables as Block 2 in each analysis. The data were analysed utilizing an SPSS® for Windows® software package, version 19 (IBM SPSS Statistics, IBM Corporation, Somers, NY, USA).

RESULTS

Comparison of the FASD and NC groups on the CBCL

The NC group differed significantly from the FASD group on internalizing, externalizing and total problem scale scores on the CBCL. Percentage of participants in normal, borderline and clinical ranges is reported in Table 2.

Behavioural problems in the FASD group

There were significant effects of the longest living environments (biological parents, foster/adoptive home and residential care) on behavioural problems in the FASD group: CBCL total problems $F_{2,64} = 4.55$, $p < 0.05$; CBCL internalizing problems $F_{2,64} = 5.89$, $p < 0.01$; CBCL externalizing problems $F_{2,64} = 3.35$, $p < 0.05$. Participants whose longest placement had been in residential care experienced increased *total* problems and *internalizing* problems when compared with participants whose longest placement had been with biological parents or foster/adoptive parents ($p < 0.05$). Longest placement in residential care was also associated with increased *externalizing* problems when compared with longest placement in foster/adoptive home ($p < 0.05$). There were no significant differences on behavioural problems between longest placement in foster/adoptive home and biological parents.

As the age range was broad (8–20 years), a follow-up analysis was made to see whether age affected the results. The sample was divided into three age groups: 8–12 years (n = 35), 13–16 years (n = 26) and 17–20 years (n = 12). A one-way ANOVA revealed no significant differences between the age groups on any of the CBCL scales. We also did an analysis

where we used age relative risk variables (percentage of life in various living environments), and the results point in the same direction as reported in Table 3.

Further follow-up analyses revealed no significant differences on behavioural problems with regard to diagnostic subgroup (FAS/PFAS/ARND), sex or IQ (scores below average <90, average 90–109, above average >109) (all p values >0.05).

Risk and protective factors by category

Of the nine potential risk and protective factors presented in Table 2, two yielded significant effects on the outcome variables: dysmorphology score and length of time spent in residential care.

The *dysmorphology score* was negatively associated with externalizing problems. A lower number of visible dysmorphic signs were associated with more rule-breaking and aggressive behaviour. IOM diagnosis and age at diagnosis were not significantly associated with behavioural problems.

In the domain of living environments, time spent in *residential care* predicted internalizing, externalizing and total problems on the CBCL. Time spent in foster and/or adoptive home(s) and fewer living placements were not significant protective factors. Neither was the length of time spent with biological parents nor a high number of living placement risk factors for behavioural problems in this sample.

Furthermore, remedial help in school was not significantly associated with behavioural problems.

Final analysis on risk and protective factors

For the final regression analyses, we included the dysmorphology score and the time spent in residential care, as they were significantly associated with behavioural problems. After controlling for age, sex and IQ, the *dysmorphology* score was negatively associated with internalizing (r_p −0.357**, β −0.289, $p < 0.05$) and total problem scale scores (r_p −0.229*, β −0.267, $p < 0.05$). The longer the time spent in *residential care*, the more problems on internalizing (r_p 0.353**, β 0.267, $p < 0.01$), externalizing (r_p 0.342**, β 0.308, $p < 0.05$) and total problem scale scores (r_p 0.327**, β 0.273, $p < 0.05$). Age, sex and gender did not significantly affect the outcome variables.

DISCUSSION

The findings of the study partly confirmed hypotheses. We had expected fewer behavioural problems in children living in foster or adoptive homes compared to children with FASD living with their biological parents or in residential care. We found that childhood environment did exert the strongest influence on behavioural outcome; however, it was the time spent in residential care that was the most significant risk factor. The outcome of children living in foster homes and with biological parents did not differ significantly with respect to behavioural outcome. Second, we had expected that an early diagnosis and a diagnosis of FAS rather than PFAS and ARND would be protective factors. It turned out that diagnosis *per se* did not affect behavioural outcome. But *lower* dysmorphology scores were associated with higher scores, indicating behavioural problems. We had also tentatively expected that remedial help in school might exert a protective influence. This intervention did not show any effect.

Overall, about 42% of the children and adolescents with FASD scored in the borderline and clinical ranges of total problems on the CBCL. The corresponding figures were 29% for

internalizing problems and 27% for externalizing problems. In comparison, this was true for only 2.5% (total problems), 7.5% (internalizing problems) and 5% (externalizing problems) in the NC group. Clearly, the behavioural problems in the FASD group are substantial compared with normally developing peers.

The result that individuals affected by FASD who have fewer dysmorphic features are likely to have more behavioural problems (total problems and internalizing problems) is in line with Streissguth et al. (13) conclusion that having a diagnosis of FAS compared with alcohol-exposed individuals without full-blown FAS actually constitutes a protective factor. It can be speculated that the more dysmorphic signs, including growth retardation, an individual with FASD displays, the better her/his needs are recognized and the more help and understanding he/she receives. Conversely, an individual appearing more physically 'normal' may be less likely to be identified as requiring assistance and fail to comply with expectations in school and society in general.

While number of dysmorphic features was associated with outcome, the actual IOM diagnosis did not predict behavioural problems. This is consistent with the findings by Spohr et al. (15) and Koponen et al. (16) who found no differences on behavioural, emotional and neurocognitive abilities between groups of children with FAS compared with alcohol-exposed children not fulfilling the FAS diagnosis. The results from our study stress the clinical importance of attending to prenatal alcohol exposure per se and particularly children displaying fewer dysmorphic features, especially those with ARND.

Length of time spent in residential care turned out to be the strongest predictor of behavioural problems. Specifically, our findings indicated that more time spent in residential care was associated with more problems on internalizing, externalizing and total problem scale scores on the CBCL. This may be seen as a parallel to the findings by Streissguth (14) that good quality and stable homes were protective factors in children with FASD. In Finland, 1.3% of all children under the age of 18 were placed outside the home in 2008, the highest percentage being among adolescents (24). Children may be placed in residential care units for protection when the child's home is not safe or when the child's behaviour is a safety risk. In Finland, the need for adequate foster family care is not met. As the biological parents also have to agree to foster care, not all children can be moved to foster homes but have to remain in residential care. Residential care units in Finland are restricted to a maximum of seven children per unit and a minimum of seven employees in a caregiving function per unit. In a study from the UK, Roy et al. (25) concluded that despite regulations enforcing an adequate caregiver to resident ratio, residential institutions still tend to be characterized by larger units compared with family environments, less individualized caregiving, more turnover of caregivers, as well as more changes in the group within which the children are reared (other children coming and going from the unit). The residential setting itself does not necessarily provide possibilities for individualized and sensitive caregiving (26). A substantial body of research from different countries has described various behavioural and emotional problems in institutionalized children in general (25,27). Attachment models emphasize that children are adversely affected by the absence of a close and continuous relationship with a caregiving adult (28). These institutionally reared children are often described as attention seeking with a somewhat indiscriminate friendliness, a relative lack of differentiation in response to different adults, a tendency to go off readily with strangers and a lack of checking back with parents/adults in anxiety-provoking situations (7). In terms of attachment theory, these types of behaviours are characterized as disorganized attachment or nonattachment with indiscriminate sociability (29,30). Interestingly, children and adolescents with FASD are often described as overly friendly and indiscriminate in their social relationships, reminiscent of the description of the attachment difficulties of institutionally reared children. Given that a substantial portion of

these children prenatally exposed to alcohol may spend at least some time in an institutional setting, the rearing environment of these children should be taken into account as a contributing factor to their specific behavioural traits.

Thus, it is not surprising that length of time in an institutional setting is negatively associated with behavioural problems for individuals with FASD. It can be hypothesized that a prenatally alcohol-exposed child, already at high risk both biologically and with respect to early environment, may be more sensitive to the additional environmental risk of an institutional rearing (31).

However, for children prenatally exposed to alcohol, longer time spent with biological parents does not necessarily lead to more secure attachment or fewer behavioural problems. Insecure attachment has been rated as high as 70–80% in children with FASD living with their biological mothers (32). In the current study, there were no significant differences with respect to magnitude of behavioural problems between the groups of children who had been living the longest part of their lives with foster/adoptive parents compared with the ones living with their biological parents. Rather, differences were observed when children in residential care were compared with those living with biological parents or in foster/adoptive environments. It must be noted, however, that the groups might not be comparable primarily, as the gravest abusing biological families are more likely to lose custody of their children (4).

There are limitations to consider when interpreting our findings. We have no control group matched on social and environmental background, and interpretations of results as specific to the FASD group are therefore very tentative. With respect to the finding that longer placement in residential care was associated with more behavioural problems, we cannot exclude the possibility that the sample who remained longer in residential care was biased. This group could have comprised children who, because of behavioural problems, as age and intelligence were controlled statistically, were harder to place in foster families. Because children in residential care are characterized by behavioural and psychiatric problems, it is difficult to determine which problems might be because of prenatal alcohol exposure *per se* vs. rearing environment and adverse life experiences. Although we have a good sample size of FASD participants, it is clear that its size is only moderate for the regression analyses which may have resulted in all actual effects of the risk and protective factors not having been identified.

The CBCL profile of the FASD group cannot be said to be specific to this population. Internal and/or external problems are found in other neuropsychiatric categories such as ADHD (33,34), autism spectrum disorders (35) and mental retardation (36) as well. Children under child protection service are also a highly vulnerable group exhibiting high percentages of behavioural problems (37). The underlying mechanisms may, however, be partly different as the problems of children with FASD may reflect both a neurobiological susceptibility to impaired behavioural control and coping, and a nonoptimal rearing environment. Children under child protection service may run a comparable environmental risk (37), but for these children, the neurobiological contribution to the behavioural problems is not as clear as in FASD. Children with FASD thus often face the double burden of neurological sequelae in combination with a nonoptimal rearing environment.

The results have important implications for clinical practice, as they underscore the importance of appropriate services and care for less visibly affected children with FASD. Furthermore, the results highlight the need to attend to children with FASD being raised in institutions. With their background of early biological and psychological impairment

compounded with less opportunity for a close and continuous caregiver relationship, such children seem to run an especially great risk of adverse life outcomes.

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Abbreviations

ARBD	alcohol-related birth defects
ARND	alcohol-related neurodevelomental disorder
FAE	foetal alcohol effects
FAS	foetal alcohol syndrome
FASD	foetal alcohol spectrum disorders
PFAS	partial foetal alcohol syndrome

References

1. Hoyme HE, May PA, Kalberg WO, Kodituwakku P, Gossage JP, Trujillo PM, et al. A practical clinical approach to diagnosis of fetal alcohol spectrum disorders: clarification of the 1996 institute of medicine criteria. Pediatrics. 2005; 115:39–47. [PubMed: 15629980]
2. Hellemans KG, Sliwowska JH, Verma P, Weinberg J. Prenatal alcohol exposure: fetal programming and later life vulnerability to stress, depression and anxiety disorders. Neurosci Biobehav Rev. 2010; 34:791–807. [PubMed: 19545588]
3. Astley SJ. Profile of the first 1,400 patients receiving diagnostic evaluations for fetal alcohol spectrum disorder at the Washington State Fetal Alcohol Syndrome Diagnostic & Prevention Network. Can J Clin Pharmacol. 2010; 17:e132–64. [PubMed: 20335648]
4. Sarkola T, Kahila H, Halmesmäki E. Risk factors for out-of-home custody child care among families with alcohol and sub-stance abuse problems. Acta Paediatr. 2007; 96:1571–6. [PubMed: 17850394]
5. Maclean K. The impact of institutionalization on child development. Dev Psychopathol. 2003; 15:853–84. [PubMed: 14984130]
6. Vinnerljung B, Sallnäs M. Into adulthood: a follow-up study of 718 young people who were placed in out-of-home care during their teens. Child and Family Social Work. 2008; 13:144–55.
7. Rutter M, Colvert E, Kreppner J, Beckett C, Castle J, Groothues C, et al. Early adolescent outcomes for institutionally deprived and non-deprived adoptees. I: disinhibited attachment. J Child Psychol Psychiatry. 2007; 48:17–30. [PubMed: 17244267]
8. Steinhausen H, Willms J, Winkler Metzke C, Spohr H. Behavioural phenotype in foetal alcohol syndrome and foetal alcohol effects. Dev Med Child Neurol. 2003; 45:179–82. [PubMed: 12613774]
9. Fryer SL, McGee CL, Matt GE, Riley EP, Mattson SN. Evaluation of psychopathological conditions in children with heavy prenatal alcohol exposure. Pediatrics. 2007; 119:733–41.
10. D'Onofrio BM, Van Hulle CA, Waldman ID, Rodgers JL, Rathouz PJ, Lahey BB. Causal inferences regarding prenatal alcohol exposure and childhood externalizing problems. Arch Gen Psychiatry. 2007; 64:1296–304. [PubMed: 17984398]
11. O'Connor MJ, Paley B. The relationship of prenatal alcohol exposure and the postnatal environment to child depressive symptoms. J Pediatr Psychol. 2006; 31:50–64. [PubMed: 15802607]

12. Greenbaum RL, Stevens SA, Nash K, Koren G, Rovet J. Social cognitive and emotion processing abilities of children with fetal alcohol spectrum disorders: a comparison with attention deficit hyperactivity disorder. Alcohol Clin Exp Res. 2009; 33:1656–70. [PubMed: 19624575]
13. Streissguth, AP.; Barr, HM.; Kogan, J.; Bookstein, FL. Final Report: understanding the occurrence of secondary disabilities in clients with fetal alcohol syndrome (FAS) and Fetal Alcohol Effects (FAE); 1996. p. 71
14. Streissguth AP, Bookstein FL, Barr HM, Sampson PD, O'Malley K, Kogan J. Risk factors for adverse life outcomes in fetal alcohol syndrome and fetal alcohol effects. J Dev Behav Pediatr. 2004; 25:228–38. [PubMed: 15308923]
15. Spohr H, Willms J, Steinhausen H. Fetal alcohol spectrum disorders in young adulthood. J Pediatr. 2007; 150:175–9. [PubMed: 17236896]
16. Koponen AM, Kalland M, Autti-Rämö I. Caregiving environment and socio-emotional development of foster-placed FASD-children. Children and Youth Services Review. 2009; 31:1049–56.
17. Robinson M, Oddy WH, McLean NJ, Jacoby P, Pennell CE, de Klerk NH, et al. Low-moderate prenatal alcohol exposure and risk to child behavioural development: a prospective cohort study. BJOG. 2010; 117:1139–50. [PubMed: 20528867]
18. Rodriguez A, Olsen J, Kotimaa AJ, Kaakinen M, Moilanen I, Henriksen TB, et al. Is prenatal alcohol exposure related to inattention and hyperactivity symptoms in children? Disentangling the effects of social adversity. J Child Psychol Psychiatry. 2009; 50:1073–83. [PubMed: 19298478]
19. Autti-Ramo I, Fagerlund A, Ervalahti N, Loimu L, Korkman M, Hoyme HE. Fetal alcohol spectrum disorders in Finland: clinical delineation of 77 older children and adolescents. Am J Med Genet A. 2006; 140:137–43. [PubMed: 16353236]
20. Halmesmäki E. Alcohol counselling of 85 pregnant problem drinkers: effect on drinking and fetal outcome. Br J Obstet Gynaecol. 1988; 95:243–7. [PubMed: 3370196]
21. Achenbach, TM.; Rescorla, LA. Manual for the ASEBA school-age forms & profiles. University of Vermont, Research Center for Children, Youth, & Families; Burlington, VT: 2001.
22. Almqvist F, Bredenberg P, Suominen I, Leijala H. Social kompetens och beteendeproblem bland skolbam och bampsykiatriska patienter – en empirisk studie med CBCL. Nordic Journal of Psychiatry. 1988; 42:311–9.
23. Roid, GH.; Miller, JH. Leiter international performance scale-revised: examiner's manual. Stoelting, Co; Wood Dale, IL: 1997.
24. STAKES. Child welfare 2008. Official Statistics of Finland; 2009. Available at: http://www.stakes.fi/tilastot/tilastotiedot-teet/2009/liitetaulukot/Tt19_09Liitetaulukko1.pdf
25. Roy P, Rutter M, Pickles A. Institutional care: risk from family background or pattern of rearing? J Child Psychol Psychiatry. 2000; 41:139–49. [PubMed: 10750540]
26. Vorria P, Papaligoura Z, Dunn J, IJzendoorn van MH, Steele H, Kontopoulou A, et al. Early experiences and attachment relationships of Greek infants raised in residential group care. J Child Psychol Psychiatry. 2003; 44:1208–20. [PubMed: 14626461]
27. Min Y, Ullrich S, Roberts A, Coid J. Childhood institutional care and personality disorder traits in adulthood: findings from the British national surveys of psychiatric morbidity. Am J Orthopsychiatry. 2007; 77:67–75. [PubMed: 17352587]
28. Bowlby, J. A Secure Base. Routledge; New York: 1988.
29. Zeanah, CH.; Boris, NW. Disturbances and disorders of attachment in early childhood. In: Zeanah, CH., editor. Handbook of infant mental health. The Guildford Press; New York: 2000. p. 353-68.
30. Vorria P, Rutter M, Pickles A, Wolkind S, Hobsbaum A. A Comparative Study of Greek Children in Long-term Residential Group Care and in Two-parent Families: II. Possible Mediating Mechanism. J Child Psychol Psychiatry. 1998; 39:237–45. [PubMed: 9669236]
31. Hellemans KG, Verma P, Yoon E, Yu WK, Young AH, Weinberg J. Prenatal alcohol exposure and chronic mild stress differentially alter depressive- and anxiety-like behaviors in male and female offspring. Alcohol Clin Exp Res. 2010; 34:633–45. [PubMed: 20102562]
32. O'Connor MJ, Kogan N, Findlay R. Prenatal alcohol exposure and attachment behavior in children. Alcohol Clin Exp Res. 2002; 26:1592–602. [PubMed: 12394294]

33. Fussell JJ, Macias MM, Saylor CF. Social skills and behavior problems in children with disabilities with and without siblings. Child Psychiatry Hum Dev. 2005; 36:227–41. [PubMed: 16228149]

34. Hudziak JJ, Copeland W, Stanger C, Wadsworth M. Screening for DSM-IV externalizing disorders with the child behavior checklist: a receiver-operating characteristic analysis. J Child Psychol Psychiatry. 2004; 45:1299–307. [PubMed: 15335349]

35. Bauminger N, Solomon M, Rogers SJ. Externalizing and internalizing behaviors in ASD. Autism Res. 2010; 3:101–12. [PubMed: 20575109]

36. Koskentausta T, Iivanainen M, Almqvist F. CBCL in the assessment of psychopathology in Finnish children with intellectual disability. Res Dev Disabil. 2004; 25:341–54. [PubMed: 15193669]

37. Hukkanen R, Sourander A, Bergroth L, Piha J. Psychosocial factors and adequacy of services for children in children's homes. Eur Child Adolesc Psychiatry. 1999; 8:268–75. [PubMed: 10654120]

Key notes

• Children and adolescents with foetal alcohol spectrum disorders (FASD) exhibited substantial behavioural problems compared with normally developing peers. Risk factors associated with more behavioural problems within the FASD group were being less visibly alcohol affected and length of time spent in residential care.

Table 1

Descriptive statistics for background variables, diagnostic factors, living environments and remedial help in school for the FASD participants (N = 73)

Background variables	
Sex	
Female, n (%)	44 (60.3)
Male, n (%)	29 (39.7)
Age†, range 8–21 years, M (SD)	13.5 (3.9)
LIPS-R Brief IQ, range 50–127, M (SD)	90 (16.0)
Diagnostic factors	
IOM diagnosis	
FAS, n (%)	41 (56.2)
PFAS, n (%)	23 (31.5)
ARND, n (%)	9 (12.3)
Dysmorphology score‡, range 2–29, M (SD)	15.7 (6.2)
Age for FASD diagnosis†, range 0–11 years, M (SD)	1.6 (2.9)
Living environments	
Length of time lived with biological parents, range 0–17.3†, M (SD)	2.9 (3.9)
Length of time lived with foster or adoptive parents, range 0–17.6†, M (SD)	6.4 (5.2)
Length of time lived in residential care, range 0–13.6†, M (SD)	2.3 (3.4)
Number of different living environments during the first 17 years, range 1–6, M (SD)	3.1 (1.0)
Remedial help in school	
Special education, 0–10 years†, M (SD)	2.9 (3.1)
Classroom aide, 0–6 years†, M (SD)	0.9 (1.7)

FAS = foetal alcohol syndrome; PFAS = partial foetal alcohol syndrome; FASD = foetal alcohol spectrum disorders; IOM = Institute of Medicine; LIPSR = Leiter International Performance Scale-Revised; ARND = alcohol-related neurodevelopmental disorder (ref. 1).

† Time in years and months.

‡ A weighted quantitative measure of associated major and minor anomalies, scale range 0–36 (ref. 1).

Table 2

Comparison of child behavior checklist t-scores between children and adolescents with foetal alcohol spectrum disorders (FASD) compared with normal controls (NC)

	FASD (n = 73)	NC (n = 40)	p value
Total problems			
Mean (SD)	56.69 (8.89)	42.10 (8.76)	0.000
Normal range, %	57.7	97.5	
Borderline, %	19.7	2.5	
Clinical range, %	22.5	0	
Internalizing problems			
Mean (SD)	53.92 (10.22)	44.80 (8.08)	0.000
Normal range, %	70.4	92.5	
Borderline, %	11.3	5	
Clinical range, %	18.3	2.5	
Externalizing problems			
Mean (SD)	53.59 (10.77)	43.75 (8.66)	0.000
Normal range, %	73.2	95	
Borderline, %	12.7	5	
Clinical range, %	14.1	0	

T scores normal range <63, borderline range 60–63 and clinical range >63.

Table 3

Linear regression analyses for risk and protective factor categories of variables regarding behavioral problems in FASD. All analyses controlled for age, sex and IQ

	Total problems		
Analysis by category	**r_p**	**β**	**R^2**
Diagnostic factors			
IOM diagnosis	0.066	−0.224	0.126
Dysmorphology score	−0.175	−0.406	
Age for FASD diagnosis	−0.100	−0.159	
Living environments			
Lived with biological parents (time length in months)	0.033	0.257	0.225
Lived with foster or adoptive parents (time length in months)	−0.162	0.376	
Lived in residential care (time length in months)	0.344 *	**0.490** *	
Number of living environments during the first 17 years	0.127	0.065	
Remedial help in school			
Special education (time in years)	0.154	0.385	0.150
Classroom aide (time in years)	0.171	0.003	
	Internalizing problems		
	r_p	β	R^2
Diagnostic factors			
IOM diagnosis	0.257 *	0.001	0.169
Dysmorphology score	−0.315 *	−0.296	
Age for FASD diagnosis	−0.078	−0.103	
Living environments			
Lived with biological parents (time length in months)	0.047	0.111	0.228
Lived with foster or adoptive parents (time length in months)	−0.024	0.233	
Lived in residential care (time length in months)	0.388 *	**0.428** *	
Number of living environments during the first 17 years	0.216	0.082	
Remedial help in school			
Special education (time in years)	0.106	0.064	0.151

Analysis by category	Total problems r_p	Total problems β	Total problems R^2
Classroom aide (time in years)	0.181	0.060	
	Externalizing problems		
	r_p	β	R^2
Diagnostic factors			
IOM diagnosis	−0.025	−0.372	0.138
Dysmorphology score	−0.131	**−0.488** *	
Age for FASD diagnosis	−0.162	−0.208	
Living environments			
Lived with biological parents (time length in months)	0.041	0.185	0.182
Lived with foster or adoptive parents (time length in months)	−0.181	0.261	
Lived in residential care (time length in months)	0.349 *	**0.456** *	
Number of living environments during the first 17 years	0.116	0.031	
Remedial help in school			
Special education (time in years)	0.124	0.322	0.101
Classroom aide (time in years)	0.052	−0.102	

All analyses controlled for age, sex and IQ entered together as Block 1 (not reported for brevity) and risk/protective variables as Block 2 in each analysis. FASD = foetal alcohol spectrum disorders; r_p = Pearson's correlation coefficient; β = standardized regression coefficient; IOM = Institute of Medicine. Bold value indicates

* $p < 0.05$

** $p < 0.01$.