Eur Child Adolesc Psychiatry (2006)
15:183–188 DOI 10.1007/s00787-005-0517-0

ORIGINAL CONTRIBUTION

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# Does pervasive developmental disorder protect children and adolescents against drug and alcohol use?

Accepted: 7 November 2005 /
Published online: 7 April 2006

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**Abstract** *Aim* The aim of this paper is (1) to compare the rates of reported drug and/or alcohol use (DAU) in treatment seeking adolescents with Pervasive Developmental Disorders (PDD), and those with other psychiatric diagnoses (psychiatric controls) seen in tertiary child and adolescent mental health services and (2) to explore the relationship of psychopathology, environmental stressors, and social communication difficulties to DAU. *Method* Data from the chart review of children and adolescents aged between 12 and 18 years with psychiatric diagnosis seen in tertiary child and adolescent mental health services between 1992 and 2001 ($n$ = 1484) was used to investigate the relationship between DAU, psychopathology, environmental stressors and items related to social communication. *Results* A total of 97 subjects (7%) met criteria for PDD. Subjects with PDD report significantly lower DAU than psychiatric controls, 3% vs. 17% respectively ($P < 0.000$). Factors reflecting PDD such as speech and language difficulties, developmental difficulties, discordant peer relationships in adolescents are negatively associated with DAU, while conduct problems, affective symptoms, inadequate parental supervision or control have positive association with DAU. DAU was present in PDD only when comorbid with Attention Deficit Hyperactivity Disorder (ADHD). *Conclusion* Adolescents with speech and language difficulties, developmental difficulties and discordant peer relationships, all reflecting PDD, are less likely to have DAU.

**Key words** PDD – autism – alcohol – drug

## Introduction

Liability to substance use disorder – SUD (alcohol, nicotine and illicit substance use) [1] is multi-factorial and both genetic and non-genetic sources contribute to the liability variation [25]. The wide array of risk factors involved can be condensed into three domains: constitutional predisposition, psychosocial factors (family and peers) and life events. Research done regarding genetic factors i.e. constitutional predisposition indicate that SUD, at least in part, is a familial disorder that is genetically influenced [5]. High 'novelty seeking' and low harm avoidance are also well-recognized constitutional predispositions for developing SUD [17]. Genetic studies [3, 7] show an association between DRD4 7R allele and higher 'novelty seeking'. Psychosocial aspects of SUD have been widely explored. Swadi [24] found that peer affiliation is possibly the strongest social factor in

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predicting the onset and early pressure, and active peer affiliation have been shown to cause escalation of early substance use [13]. Fergusson [8] found that hazardous alcohol use is best predicted by the extent of affiliation with substance using peers. Smoking behaviour of best friends has been shown consistently to predict adolescent smoking progression to more advanced stages [27]. Drug use seems to serve a 'social' purpose for some adolescents. Peer influence is particularly important for initiation of the use of marijuana and is a strong predictor of use [14].

In child and adolescent psychiatric population many conditions are known to be associated with SUD. Perhaps the most commonly cited and investigated conditions are conduct disorder (CD), attention deficit hyperactivity disorder (ADHD) including coordination developmental disorder, major depressive disorder and antisocial personality disorder [4, 9, 12, 18]. Conduct Disorder is the most common disorder associated with SUD in adolescence [6] and some estimate that about half of adolescents with CD also meet criteria for SUD [20].

Substance use disorder has been studied in some neurodevelopmental disorders. An association between ADHD and SUD is well-established [2], while the association between Obsessive Compulsive Disorder (OCD) is less well understood. Karno [11] reported that in the Epidemiological Catchment Area Study [21] up to 24% of subjects with OCD also had alcohol abuse or dependency, but other studies [19] have shown no difference between OCD subjects compared to general population.

Currently there is little information about the relationship between SUD and Pervasive Developmental Disorders (PDD). Clinically, the authors have been aware that SUD is rare even in able adolescents with PDD. There are many reasons why subjects with PDD may have low rates of SUD. Poor social skills, poor peer interactions, low 'novelty seeking' and high harm avoidance [23] may all contribute to this.

This study explores the rate of 'Drug and Alcohol Use' (DAU) in treatment-seeking PDD adolescents attending tertiary Child and Adolescent Mental Health Services. DAU was defined as the documentation of taking drugs and/or other substance such as alcohol in the Maudsley item sheets (details given below).

The aim of this paper is to:

(1) To compare the rates of reported DAU in treatment-seeking adolescents with PDD, and those with other psychiatric diagnoses (psychiatric controls) seen in child and adolescent mental health services.
(2) To explore the relationship of DAU to psychopathology, environmental stressors, and items related to social communication.

We hypothesized that:

(1) DAU will be significantly lower in PDD as compared to psychiatric controls,
(2) symptoms of PDD and its associated environmental consequences will be negatively correlated to DAU.

## Methods

### Subjects and procedure

Subjects were retrospectively selected from a large computer-based system that uses a structured clinical data- recording sheet called the Maudsley Item Sheet. This system has been used at the Children and Adolescents' Department of the Maudsley and Bethlem Royal Hospital (London, UK) since 1968. This study focused only on the treatment-seeking adolescents aged 12–18 years ($n$ = 1484) out of total 3644 treatment seeking cases seen in this department between 1992 and 2001.

The patients included were seen at the in-patient and outpatient units and a variety of district and tertiary referral national teams. Children and adolescents coming for an assessment in the Department have a mental state examination and a parental interview undertaken according to a semi-structured format done by the Child and Adolescent Psychiatrist. The Maudsley item sheet also includes intelligence quotient (IQ) estimates. Intellectual disability (ID) was assessed using WISC or other appropriate instruments. The majority of the cases were assessed by the Clinical Psychologist. Intellectual disability was defined as IQ < 70. In a majority of those suspected of PDD, an Autism Diagnostic Interview – Revised (ADI-R) and Autism Diagnostic Observation Schedule (ADOS) [15, 16] were done in order to establish a diagnosis of PDD. The data from multiple sources are used to compile case-notes summaries, to make multi-axial diagnosis using ICD-10 diagnostic criteria [29] and finally to rate clinical data on the Maudsley item sheet [26]. The 55 items from the Maudsley item sheet, covering development, symptoms and family characteristics are rated as absent [0], dubious or minimal [1], or definitely present [2]. Of the 55 items 2 relate to drug or alcohol use i.e. 'taking drugs' and 'substance abuse other than drugs (alcohol, solvents etc)'. *Subjects were considered to have DAU if scoring '1' or '2' on these 2 items.* The data is maintained in the database complying with the rules of maintaining data according to the Data Protection Act. The reliability of the Maudsley item sheet ratings as recorded by trainee psychiatrists, senior house officers and

specialist registrars, who completed the majority of ratings, has been found to be generally high when compared with those of a Consultant Child & Adolescent Psychiatrist, with intra-class inter-rater correlations varying from 0.64 to 0.95 [10]. Written consent has been obtained from subjects to use the clinical information in the Maudsley item sheet for research purposes.

### Statistical analyses

Chi-Square test and Independent Samples *T*-test were used to compare PDD cases and psychiatric controls on intellectual disability, gender, age and presence of DAU. Logistic regression analysis was used to assess the association between the presence or absence of DAU (the dependant variable) and independent variables: 8 psychosocial domains, 9 environmental stressors and items related to social communication (details given below). The estimated odd ratios with confidence intervals and statistical significance were calculated for independent variables. A very stringent interpretation of the results could set the significance level at $P < 0.005$. However as this is an exploratory study we have presented all the variables with Odds Ratios with confidence intervals that do not span across 1 (Table 2).

### Psychopathology domains, environmental stressors and items related to social communication

Psychopathology domains were established from the total sample of 3644 cases (all the patients seen at The Maudsley and Bethlem Royal Hospital Child and Adolescent Department between 1992 and 2001), using a principal component analysis (PCA) with varimax rotation applied to the items from the Maudsley Item sheets describing psychopathology [22]. The following items were used in PCA: questions relates to *emotional symptoms* (abnormal suspiciousness, morbid anxiety, morbid depression, guilt, suicidal ideas, attempt or threat, etc.), *somatic symptoms* (anorexia, insomnia, pains of mental origin, encopresis, enuresis etc.), *speech and language difficulties* (disorders of rhythm, disorders of articulation, impaired use of language for social communication, etc.), *motor symptoms* (tics, abnormal repetitive movement, clumsiness/poor co-ordination, etc), *antisocial behaviour/abnormalities of conduct* (defiance, stealing, sexual misbehaviour, taking drugs etc.), *abuse of the patient* (physical and sexual), disorder of sex role, sex object or gender identity, impaired concentration, hallucinations, impulsive behaviour and self-injury. Items with a loading greater than 0.4 were accepted into each factor. Scores for each subject for each factor were assigned by summing the item scores for all items in that factor. The following factors (psychopathology domains) emerged: *conduct problems, speech and language difficulties, affective symptoms, ADHD symptoms, anxiety symptoms, tics and repetitive behaviour, somatoform symptoms, and developmental difficulties.*

Environmental stressors were part of the Maudsley item sheet. They were those that are coded in the Axis V of the Multiaxial Classification of Child Psychiatric Disorders [28]: *abnormal intrafamilial relationship* (lack of warmth in parent–child relationship, hostility/scapegoating of the child, intrafamilial discord among adults, physical child abuse, sexual abuse within family), *mental disorder/handicap in family* (parental mental disorder/handicap, disability in sibling), *inadequate familial communication* (significant problems in communication style within the family), *abnormal upbringing* (inadequate parental supervision, parental overprotection, inappropriate parental pressures, experiential privation), *abnormal environment* (institutional upbringing, anomalous parenting situation, isolated family, living conditions that create a potentially hazardous psychosocial situation), *acute life events* (loss of love relationship, removals from home carrying significant contextual threat, negatively altered pattern of family relationships, events resulting in loss of self-esteem, extra-familial sexual abuse, personal frightening experience), *social stressors* (persecution or adverse discrimination, migration or social transplantation), *school stressors* (discordant relationships with peers, scapegoating by teachers, unrest in the school) and *stress due to disorder* (institutional upbringing, removal from home carrying significant contextual threat, events resulting in loss of self-esteem).

Items related to social communication (recorded in the Maudsley item sheet) were: *disturbances in child–mother/father/other children/other adults/sibling/ relationship, autistic-type disturbance of social interaction and social disinhibition.*

## Results

During the 10-year period under investigation 1484 treatment seeking adolescents were identified. There were 97 subjects with PDD and 1387 with other psychiatric disorders – psychiatric controls (Table 1). The two groups were significantly different in relation to gender and the presence of learning disability. The dataset contained information on 97 subjects with an ICD-10 umbrella diagnosis of PDD, that is, 23 with childhood autism, 17 atypical autism, 32 Asperger's syndrome, 25 PDD non-otherwise specified. None of the subjects with a PDD diagnosis had Rett syndrome

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**Table 1** IQ, gender, age and frequency of reported drug or alcohol use (DAU) in the subjects with PDD and in psychiatric controls

| | PDD subjects $N = 97$ | Psychiatric controls $N = 1387$ | Statistics |
|---|---|---|---|
| IQ < 70 | 38 (39.2%) | 248 (17.9%) | Chi-Square 560.964, Significance < 0.000 |
| Boys | 79 (81.4%) | 766 (55.2%) | Chi-Square 13.252, Significance < 0.000 |
| Mean age ± Standard deviation | 14.27 ± 1.673 | 14.36 ± 1.637 | Independent samples *T*-test, $F = 0.308$, Significance < 0.579 |
| DAU IQ < 70 | 3, Mean age – 14.0 years | 205, Mean age – 14.9 years | Chi-Square 507.846, Significance < 0.000, *T*-test – NS |
| IQ < 70 | 0 | 27 | Chi-Square 154.169, Significance < 0.000 |
| Total | 3 | 232 | Chi-Square 690.124, Significance < 0.000 |

**Table 2** Significant bi-variate odds ratios for psychopathology domains and environmental stressors and Drug and Alcohol Use in the subjects ($n = 1484$)

| Associations | '*P*' value | Odds Ratio | 95% C.I. | |
|---|---|---|---|---|
| | | | Lower | Upper |
| **Positive associations** | | | | |
| Conduct Problems | 0.000 | 1.32 | 1.25 | 1.4 |
| Affective symptoms | 0.000 | 1.16 | 1.10 | 1.25 |
| Inadequate parental supervision or control | 0.003 | 1.44 | 1.13 | 1.84 |
| Institutional upbringing | 0.04 | 1.71 | 1.01 | 2.88 |
| Living in hazardous environment | 0.04 | 1.47 | 1.02 | 2.12 |
| **Negative associations** | | | | |
| Speech and Language Difficulties | 0.008 | 0.71 | 0.55 | 0.91 |
| Developmental Difficulties | 0.005 | 0.52 | 0.33 | 0.82 |
| Discordant relationship with peers | 0.04 | 0.74 | 0.56 | 0.98 |
| Scapegoating of child in school | 0.043 | 0.58 | 0.34 | 0.98 |

or childhood onset disintegrative psychosis. There were 38 cases with intellectual disability in the PDD group. The control group consisted of 1387 subjects, of whom 248 adolescents had intellectual disability. The major diagnostic categories in control group were: anxiety disorders (24%), conduct disorder (18%), mood disorders (11%), eating disorders (6%), schizophrenia (5%), hyperkinetic disorder (4%) etc.

All together there were 3 PDD (3.1%) subjects with DAU, out of which 2 reported use of both drugs and alcohol. These 3 subjects were boys with normal intelligence. When only the PDD subjects with normal intelligence were considered, the frequency of DAU was 3/59 (5.1%). All 3 subjects also had symptoms of hyperactivity, inattention and impulsivity, which would have lead to an independent diagnosis of ADHD, if it were not for the restrictions of the current classificatory symptoms. In the psychiatric controls the frequency of DAU was 232/1387 (16.7%) and for psychiatric controls with normal intelligence it was 205/1139 (18%).

Looking at the independent variables that were positively associated with DAU (Table 2), conduct problems and affective symptoms had the highest odds ratio (1.32 and 1.16 respectively). The factors that were negatively associated with DAU were speech and language difficulties, developmental difficulties, discordant relationship with peers and scapegoating of patient at school (all reflecting PDD).

## Discussion

To the best of our knowledge this is the first time that the association between DAU and PDD has been examined in children and adolescents. This study suggests that treatment-seeking adolescents with PDD are less likely to have DAU. This has not been previously directly explored and is a significant finding. Multiple mechanisms may be operating to decrease DAU in PDD. In the PDD group there were more individuals with intellectual disability than in the psychiatric controls. This could have contributed to the DAU difference. When we specifically looked at the children with no intellectual disability, the lower incidence of DAU in PDD group in comparison to psychiatric controls persisted. This clearly indicates that low IQ can only partially explain the difference.

Despite having significantly greater number of boys (evidence shows increased incidence of DAU in boys) in the PDD group compared to psychiatric controls, the incidence of DAU remained low. This suggests that gender is not a confounding factor contributing to low DAU in the PDD group.

Age was not different between the groups and hence cannot explain the difference.

Another possible explanation could be that the PDD group has lower access to drugs or alcohol because of close supervision both in school and at home.

However close supervision on the other hand may also have helped in getting more reliable data on DAU in this group compared to psychiatric controls.

One of the explanations could be that they lack a peer group who uses alcohol/drugs. They may lack the social skills required to procure drugs of abuse and communication skills to develop a peer group. Recreational DAU is less likely because of limited social interaction in pubs, clubs etc. Clinical experience suggests that they often have high moral standards and therefore may accept that using alcohol/drugs is wrong in a rather cognitively rigid manner, leading to lower experimentation with alcohol/drug. Low risk taking and high harm-avoidance [23] seen in PDD may also be protective against DAU. Apart from all the above, it could also be hypothesized that there may be possible biological mechanisms underlying typical reward circuits in the brain, which may be disrupted in PDD.

This study is restricted to adolescents and an extrapolation to adult PDD patients may not be justified. Adult PDD patients may experience very different adversities and access to alcohol and drug use may be different attractions to adolescent patients.

None of the above factors could be explored in this study and need to be investigated in future studies. The findings in this study should be regarded preliminary and the results need replication. As true of most advances, a great deal of work will need to be done to determine the optimal clinical applications of these findings.

## Limitations of the study

The study was carried out in clinically referred adolescents, not on an epidemiological sample. The data was not collected specifically looking at DAU. We are only discussing drug and alcohol use and not drug or alcohol dependence. Mechanisms may differ in those with only DAU and our findings may only reflect the pattern in DAU co-occurring with psychiatric disorders. Family history of DAU would be relevant but unfortunately these data were not available.

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