

Pragmatic use of Language by Adolescents who did not develop Schizophrenia until adulthood.

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Abstract

At eleven years of age all children in a UK national birth cohort wrote short stories about the life they expected to be leading at age 25.

Using a data linkage exercise, we identified those who later developed schizophrenia , affective psychosis , or other non-psychotic psychiatric disorders in later life based on the PSE CATEGO diagnostic system. The majority of these had completed the written essays. Controls from the reference population were selected , matched for gender, IQ and social and economic status.

The essays were scored using well established methods for assessing pragmatic use of language, namely narrative coherence and linguistic cohesion.

We hypothesised that children pre-morbid for schizophrenia (Pre-Scz) would obtain low scores on all these measures. However this general hypothesis was largely disproved by the data, although some unpredicted gender effects were found.

It is concluded that once one controls for reduced general cognitive ability (nb IQ) thought appears to be organised in an unexceptional way, in adolescents prior to their developing schizophrenia.

1. Introduction

Understanding the full meaning of what someone says is typically influenced by your perceptions of the speaker ie who it is, and the social context in which the utterance is made. 'I've had it' or 'I'm done' are all but meaningless. In the context of the speaker trying to complete a task, one infers a generic meaning 'S/he is ceasing to do a difficult task' but the full meaning can be embellished further with great understanding of the context to include assumptions such as the speaker being too tired, bored, or frustrated to continue. This aspect of communication is referred to as 'pragmatics' since to understand the full meaning one has to appreciate the practical, or social, setting. The study of pragmatics in linguistics covers those aspects of communication that refer to word use in spoken or written communication which is informed by the social context in which the spoken utterance, or written text, is produced. Pragmatics is just as relevant to written language too. We understand the notice in a shop window "Baby Sale - lots of bargains" to be about a clothes sale, not a sale of babies. 'I've had it' or 'I'm done' in the context of trying to complete a task, which means 'I am stopping my efforts on this task because I am tired/bored/frustrated'. one will not make any more effort on the task at hand. This aspect of communication is referred to as 'pragmatics' since to understand the full meaning one has to appreciate the practical, social setting. The meaning cannot be reduced to the semantics of words or syntactical structures.

Following in the tradition of Eugen Bleuler and Emil Kraepelin, who noted the distinctiveness of the formal thought disorder, Sass (2003) suggested, "Schizophrenic language disturbances are distinct from the aphasia, for they particularly affect what linguists call the pragmatic dimension of speech..... that is to say, between what emerges as the shared focus at a given moment of a conversation and what would normally serve as the tacit and taken-for-granted background" (Sass 2003)

Disturbance of this pragmatic aspect of speech in schizophrenia has typically been measured using cohesion analysis (Halliday and Hasan (1976)). However two main ways of assessing the use of pragmatics are now commonly assumed namely—cohesion and coherence analysis is more commonly used in pragmatics than cohesion analysis.

Cohesion refers to the use of certain words, whose sole purpose is to link together the individual meanings of sentences, phrases or clauses in order to convey an intended meaning. For example the

pronouns e.g. he, it, that, are commonly used to specify the subject of a sentence, or clause, that was made explicit in the previous sentence. And the listener /reader has to infer the referent themselves to ensure sense is made. More examples of use of cohesion are provided in Appendix C

Coherence refers to the organization of ideas in any communication which, if combined well, produce a coherent story. Good coherence results if the ideas follow a systematic and logical structure (e.g. follow chronological, or serial order). In longer narratives (e.g. an essay) coherence is achieved when the organization of ideas, across the whole narrative, tells an unfolding story comprising on many ideas or themes that the narrator intends the listener /reader to understand as a whole (Tiernay and Mosenthal 1983, Liles 1993).

Cohesion refers to the use of certain words, often referred to as 'cohesive ties', or grammatical links whose purpose is to tie sentences, phrases or clauses together in order to convey an intended meaning. 'However, therefore' are good examples of cohesive ties. Pronouns e.g. he, it, that, are especially important cohesive ties since they indicate that the current subject must be understood as the same one used previously. The listener /reader has to infer this themselves to ensure sense is made. More examples of use of cohesive ties are provided in Appendix C

Reduced use of cohesion distinguishes thought disordered from non-thought disordered speech in adult (Rochester and Martin 1979, Harvey 1983), and childhood schizophrenia (Caplan 1994). In addition some studies of pre-psychotic high risk cohorts of children have found reduced use of cohesion (Harvey et al 1982, Gooding et al 2010) although others reported negative findings (Griffith et al 1980, Parnas and Schulsinger 1986).

Of the few studies of narrative coherence in psychosis, reduced narrative coherence has been reported in non-thought disordered adult patients (Tavano et al 2008, Saavedra 2010, Raffard et al 2010).

However we could find no studies which examined narrative coherence in pre-morbid children.

Liles (1993) provides a framework for measuring narrative coherence much of which features in recent neuropsychologically informed research on narrative production following stroke (e.g. Mar 2004). This framework comprises assessment of a) relevant goals, b) selection of themes to achieve these goals c)

appropriate ordering of themes , d) elaboration of themes, with sub-themes, to get across the intended message of the narrator (sometimes referred to as 'meta-narrative').

The development of narrative ability increases steadily from age 8 years through age 16 years (Purcell and Liles 1992, Roth and Speckman 1986) This may well be related to the substantial anatomical and neuronal changes to the various pre-frontal structures during this period (Blakemore and Choudhury 2006) which are known to be engaged in narrative production (Mar 2004).

In the study reported here we examined the use of narrative coherence , and cohesion, in written narratives produced by eleven year old adolescents who later either developed schizophrenia (Pre-Scz) or affective psychosis (Pre-AP) or other non-psychotic psychiatric disorders (Pre-NPPD) in adult life.

We propose the following main hypothesis:

1. Pre- Scz children will show poorer use of pragmatics during communication due to reduced use of cohesion and coherence when compared to their peers without a history of psychiatric disorder (Limited pPragmatics hHypothesis).
2. The frequency of bizarre or abnormal pragmatics will be found more frequently in the Pre-Scz adolescents than in their peers without a history of psychiatric disorder (aAbnormal pPragmatics hHypothesis)
3. Neither the limitRestricted, nor aAbnormal , pPragmatics hypotheses will apply to the Pre-AP and Pre-NPPD adolescents since they will perform normally.

~~In order to evaluate these hypotheses we first had to established a system for measuring coherence since there was not one readily available, unlike cohesion analysis. The system we developed was based on Liles' framework which we believed would be sensitive enough to detect the hypothesised differences between the Pre-Scz children and their peers. We were also mindful of the need to match cases and controls not only for age, and gender but also cognitive ability.~~

2. *Materials and Method*

2.1 Patient and Control Samples

Participants are members of the National Child Development Study (NCDS), an ongoing longitudinal birth cohort study following up children from the British Perinatal Mortality Survey, which included about 98% (N = 17419) of all registered births in England, Scotland and Wales during the week of 3rd – 9th of March 1958 (Done 1999). Participants' physical, educational and social development as well as their health was assessed at 8 time points, the most recent being in 2004-5. In this study we utilise data collected in school at age 11 years (N=15145).

2.2 Psychiatric status after age 16

After obtaining relevant approval from regional ethics committees, a systematic search of computerised records in the UK's National Health Service, covering ~~held by Regional Health Authorities in~~ England, Wales and Scotland, took place to identify individuals, likely to be NCDS cohort members, who had also been admitted to psychiatric hospitals between 1974-94, when cohort members were between ages 16 and 36 (Leask 2005). We then linked the identifiers from their case notes with those in the NCDS. Although such a data linkage approach can miss out less severe cases of mental disorder, it is unlikely to miss cases of schizophrenia, as only a small proportion of such patients did not have contact with hospitals in this period before the rise of Early Intervention in Psychosis and other community teams in the UK (Eaton 1985, McCreadie 1982). From the case note histories psychiatric diagnoses were made by a psychiatrist (described in Done et al 1991) based on the Present State examination (PSE) CATEGO system (Wing et al 1974). The CATEGO diagnosis of schizophrenia (S+) is defined by the presence of one or more of Schneider's first-rank symptoms. The population estimate for morbid risk of S+ is between 0.26-0.54% (Jablensky et al 1992) which makes it a conservative diagnosis compared to the life time morbid risk of 0.72% (0.31% – 2.71%) (Saha et al 2005) for various diagnostic schemes used during the period 1965-2002. M+/M? corresponds to mania and mixed affective psychosis; D+/D? corresponds to depressive psychosis; N+/N? corresponds with non-psychotic psychiatric disorders (NPPD).

Comment [JD1]: Removal of '45 years' reduces the confusion that arose concerning lifetime risk used up.

Insert Table 1 about here.

When making reference to these groups in the premorbid stage we shall refer to them as Pre-Schizophrenia (Pre-Scz), Pre-Affective Psychosis (Pre-AP) , and Pre-Non Psychotic Psychiatric Disorder (Pre-NPPD) respectively.

A sub sample of matched control subjects (n= 70) was taken from the original cohort, blind to that control's performance on the essay.

2.3 Materials

At the age of eleven the NCDS participants were asked to write an essay and given the following instructions: 'Imagine that you are NOW 25 years old. Write about the life you are leading, your interests, your home life and your work at the age of 25(You have 30 minutes to do this)'. The students were supervised throughout by their class teacher. The essay thus provides a substantial piece of narrative for children of this age.

Choice of narrative is important if it is to provide a sensitive index of developmental level.

These instructions requested a free generation of narrative, as opposed to other narrative elicitation methods such as reciting a story. Vocabulary age and verbal IQ also influence narrative production (Griffith et al 1985) and hence we matched cases and controls on a measure of verbal IQ prior to the analysis of the essays (see Table 1) . Other confounding

variables used in the matching process included i) gender , since girls essays were longer than boys, ii) geographical region in the UK, and iii) social class (the latter two [were](#) reported to influence [essay length](#) in the NCDS [by are noted as influential in](#) Richardson et al 1976).

2.4 Methods of Data Analysis

The essays were analysed principally for coherence and cohesion .

2.4.1. Coherence

[In order to evaluate the hypotheses we first had to established a system for measuring coherence since there was not one readily available, unlike cohesion analysis. The system we developed was based on](#)

Liles' framework (Liles 1993) which we believed would be sensitive enough to detect the hypothesised differences between the Pre-Scz children and their peers .

The resulting system we developed for scoring coherence is summarized in Appendix A . The measures of narrative coherence Appendix A also provides operation definitions which included i) total number of appropriate and inappropriate themes , ii) appropriate and inappropriate ordering of themes and subthemes iii) elaborations of themes to provide additional information for the listener (sometimes referred to as meta-narrative) . Given the two hypotheses described in the Introduction, namely the limited as opposed to abnormal pragmatics hypotheses, different ratings were required used to evaluate assess each hypothesis. made on the basis of either lower coherence scores, perhaps without any abnormal examples of pragmatics as opposed to bizarre or abnormal examples of pragmatics measured by the frequency of inappropriate coherence. We therefore adopted separate measures to assess each of these hypotheses. Operationally limited use of coherence is deemed to occur results when low coherence scores are obtained although the themes, their ordering or their elaboration is appropriate. Abnormal coherence results when inappropriate themes, ordering or elaboration occurs.

Inter-rater reliability for coherence measures can be poor unless the scorers are highly trained (Liles 1993). We recruited a lecturer in linguistics (Principle Rater) who had been trained in scoring transcripts for coherence and cohesion . Initially the Principle Rater and one of the authors (EL) worked through some sample essays to agree on scoring procedure. The Principle Rater subsequently scored some 20% of the essays blind as to whether they were cases or controls. A random sample of 10 of these were then scored by EL blind to the scores of the Principle Rater s . Inter-rater reliabilities at this stage were high (see Section 3.1) and so the Principle Rater continued as agreed with the remainder of the essays.

2.4.2. Decontextualizing

Given the topic , the narrator is required to make a leap forward in time. We refer to this as 'decontextualizing' since the narrator is required to write a narrative as if aged 25 rather than from the current moment in time . We deemed this to also be a pragmatic requirement to aspect of language, peculiar to the task demands. Since this is not a measure of coherence according to Liles criteria we will report it separately. The scoring criteria , based on tense of verb, are presented in Appendix B.

2.4.3 Cohesion

The framework for cohesion analysis was based on that of Halliday and Hasan(1976) from which 10 separate measures were derived. Operational definitions , with examples are provided in Appendix B (Cohesion). Wikipedia also provides a very useful introduction to [the ways in which cohesion can be measured](#) – search for ‘[Cohesion](#) (linguistics)’.

3. Results

3.1 Coherence

The average intraclass correlations (ICC) between the 2 raters , for all measures of coherence , was for +0.91 (95% CI = .84-.98)

Since the hypotheses require separate comparisons of [each pre-morbid group \(Pre-S,Pre-AP, Pre-NPPD\)](#) vs controls ~~as opposed to comparisons of the other pre-morbid groups vs controls~~, three separate ANOVAs were calculated for each measure ~~to compare each pre-morbid group (Pre-S,Pre-AP, Pre-NPPD) against controls.~~

Gender was included as the second factor in the ANOVA, given the large difference in essay length at this age. The average essay length in the healthy control group was 228.8 words for girls and 180.7 words for boys which was statistically significant. ($t(60) = -3.1, p < .01$).

Results are presented in the order i) main effects for both factors (Group and Gender) for each of the 3 ANOVAs followed by , Group by Gender interactions for each ANOVA.

Insert Table 2 about here

3.1.1 Frequency of Themes

3.1.1.1 Appropriate Themes

The measure used here was the frequency of appropriate themes use by each participant in their essay . In the healthy control population , girls produced a greater number of appropriate themes than boys ($t(60) = -3.1, p < .01$). This might be expected given the longer essays of the girls. For the main effect of Group, Pre-Scz adolescents produced significantly fewer appropriate themes than controls ($p = .03$). A similar trend was noted in both Pre-AP and Pre-NPPD adolescents compared to controls although this failed to reach statistical significance ($p = .10$ in both cases) .

~~For the~~ For the Group by Gender interaction , ~~this~~ this was significant in the Pre-S vs Control ANOVA , ($F(1, 82) = 6.1, p < .02$). Pre-Scz girls produced significantly fewer themes than the control girls whereas Pre-Scz boys produced a similar number of themes as the control boys. A similar interaction was found for the Pre – NPPD cases vs Controls ($F(1, 111) = 5.8, p < .05$) and the post hoc analysis produced a similar pattern of findings ; pre-NPPD girls produced fewer themes than control girls (($t(56) = 2.75, p < .01$) whereas Pre-NPPD boys produced a similar number of themes ($t(55) = -0.75, p = .46$) to control boys. For the Pre-AP analysis the interaction effect was not significant.

3.1.1.2 Inappropriate Themes

The measure used here was the frequency and percentage, of participants within each group producing one or more inappropriate themes . This categorical measure was used since the frequency of occurrence of inappropriate themes was very low . These data are presented in Table 2 . No group differences were found . It should be noted that only one male (8%) and one female (8%) from the Pre-Scz group produced an inappropriate theme.

3.1.2 Ordering of Themes.

Data are presented in Table 2

3.1.2.1 Appropriate ordering of themes and sub-themes

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Each participant's essay was scored ~~as the sum of~~ ~~according to the number of~~ new , appropriate themes ~~plus introduced together with~~ the ~~number frequency~~ of appropriate subthemes so long as these were in the right place, typically contingent with the main theme. ~~A higher score indicates greater ability of ordering themes and subthemes to form a coherent narrative.~~ All of the pre-morbid groups produced slightly *higher* average scores than their matched controls (see Table 2), although this difference was not statistically significant in any of the three analyses. No interactions with gender were found either. It should be noted that a high score on this measure signifies a more coherent narrative.

3.1.2.2 *Inappropriate ordering of themes and sub-themes*

Each participant's essay was scored ~~as the sum of~~ ~~according to the number of~~ inappropriate themes introduced ~~plus together with~~ the ~~number frequency~~ of ~~either in~~ inappropriate subthemes or appropriate sub-themes but in the wrong place, typically being not contingent with the main theme. A higher score indicates greater abnormality. All groups of cases produced similar scores to those of the controls (see Table 2). No group comparison remotely approached statistical significance (min $p=0.3$). The Group by Gender interaction in all three analyses was not significant.

3.1.3 *Evaluation of Themes (Meta-Narrative)*

The summed score was corrected for total number of clauses in each essay . This score represents how much the narrator chose to evaluate a theme, or sub-theme, in order to get across to the listener the intended message. Results are presented in Table 2.

For all of the 3 ANOVAs the main effect of group failed to reach statistical significance : Pre-Scz cases vs Controls $F_{1,80} = .001, p = .995$; Pre-AP cases vs controls $F_{1,83} = 0.28, p=.6$ and for Pre-NPPD vs Controls $F_{1,113} = 1.2, p=.27$). This result indicates a comparable use of evaluation in each of the pre-morbid groups to that employed as used by the healthy control group.

†The Group by Gender interaction was highly significant for the Pre-S cases vs controls ANOVA ($F_{1,80}=8.55, p<.01$) . Pre-Scz males obtained a summed score which was significantly lower than that of the

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control males ($t(40) = 2.2, p < .05$) whereas Pre-Scz females obtained slightly higher scores than controls, ($t(40) = -1.9, p = .06$). A large gender difference in the Pre-Scz group was noted, with males (Mean (SD) = 7.1(0.9) scoring significantly lower ($p < .01$) than females (Mean (SD) = 13.9(2.06)). No such gender difference was found in the healthy controls.

This Group by Gender interaction was not significant in either the Pre-AP vs controls ANOVA ($p = .6$) or the Pre-NPPD vs controls ANOVA ($p = .8$)

~~Average scores for the 'frames of mind' measure are presented in Table 2. Pre-Scz cases did not differ significantly from controls, and there were no significant gender effect. However the Pre-NPPD cases produced a significant lower frequency of frames of mind ($F(1, 113) = 7.1, p < .01$), and this was true for both male and female Pre-NPPD cases, since there was no significant Group by Gender interaction. The Pre-AP cases did not differ from controls on this measure and the interaction term was also not significant.~~

3.1.4 Decontextualizing

No significant differences between any of the 3 pre-morbid groups and the control children were found. Subgroup analysis by gender for the Pre-Scz group also did not reveal any group differences.

Need a Table ?

3.2 Cohesion

~~The mean scores for each of the 10 measures are given in Table 3 (note No. of clauses is not a cohesion measure).~~ For cohesion it is important to take account of essay length. Thus all measures were adjusted for the total number of clauses in each essay . essay length. Since most studies have summed across these 10 measures of cohesion, we also used a summed -score.

Pre-Scz cases did not differ significantly from controls ($F(1, 83) = 0.5, p = .5$). Similarly a non-significant group comparison was found in the Pre-AP analysis ($F(1, 84) = 0.3, p = 0.6$) and Pre-NPPD analysis ($F(1, 115) = 0.7, p = 0.4$).

For the Group by Gender interaction a significant result occurred for the analysis of the Pre-S cases vs Controls ($F(1, 83) = 4.3, p < .05$). This was predominantly due to a reduced total cohesion score in the Pre-Scz girls, compared to their controls, ($t(40) = 2.0, p < .05$).

Table 3 also presents the mean scores for the 10 separate measures together with simple t-tests comparing each group of cases with the controls. On none of the 10 t-tests was there any statistically significant difference between Pre-Scz cases and controls.

For the comparisons of Pre-AP and Pre-NPPD cases with controls the Group by Gender interaction was not statistically significant.

4.0 Discussion

In this study we reported results from an analysis of the pragmatic linguistic abilities of 11 year old adolescents who were either pre-morbid for adult schizophrenia, or affective psychosis, or non-psychotic psychiatric disorder. Two different methods for assessing pragmatic linguistic ability were used, namely cohesion and coherence analysis. When we compared the group who were pre-morbid for schizophrenia (Pre-S) with a matched group of healthy controls we found:

- Pre-Scz adolescents produced fewer appropriate themes.
- Pre-Scz adolescents did not produce goal inappropriate themes.
- Pre-Scz adolescents produced narratives which were well ordered given their level of general intelligence, without any occurrences of bizarre or otherwise abnormal ordering of themes
- Pre-Scz adolescents evaluated, and developed themes no differently from their controls.
- Pre-Scz adolescents use cohesive ties no differently from the control group.

Taking the group as a whole then the only marked finding is that they produced fewer themes than the matched control group. Their ability to organize these substantial written narratives, especially how they introduced themes and sub-themes look to be quite normal. However it should be emphasised that a very thorough matching procedure was used. In particular matching according to verbal IQ. Without such matching substantial group differences might have resulted.

A similar trend of fewer themes was found in the adolescents who were pre-morbid for affective psychosis or non-psychotic disorder too, although this was not significant. Thus there was little difference in the results from the three separate analyses comparing Pre-S or Pre-Ap or Pre NPPD adolescents with their controls. Our findings are therefore in keeping with the negative findings of the Dunedin birth cohort (Cannon et al 2002) or the follow-back study of Watt (1978). That is to say that communication is not exceptionally deviant in adolescents prior to the onset of psychosis who developed schizophrenia later in adult life. There is therefore a marked difference between these findings and those reported in childhood onset schizophrenia in which language disturbance has been frequently reported (e.g. Caplan 1994).

Given that this sample of Pre-Scz children did have reduced IQ (see Table 1 and also Jones and Done 1997), it can be concluded that some cognitive abilities in these same children, most notably intelligence, are impaired early on in childhood, whereas incoherent narrative and abnormal use of cohesive devices does not appear at this age and therefore it either starts to appear during the development of the disorder (i.e. during the prodromal period) or it appears later than age 11 in the premorbid period.

We did find a number of significant gender differences in the Pre-Scz group, which were not predicted a priori. This suggests that there may be notable qualitative differences in language production between Pre-Scz girls and boys which has not been previously reported.

There have been numerous studies reporting gender differences in pre-morbid functioning in Pre-S adolescents and children (e.g. Castle and Glodstein 2012; Done et al 1994; Watt 1978). Most notable is the poorer social skills in pre-morbid boys (Watt 1978), poorer pre-morbid adjustment and earlier onset of adult psychosis. Given the importance of pragmatic language skills in forming and maintaining peer relationships one might expect poorer pragmatic skills in pre-morbid boys rather than the girls. Such a generalised picture is not supported by our findings since pragmatic deficits occurred in both boys and girls.

Grice (1969), who introduced pragmatics into the discipline of linguistics, regarded pragmatics to be the process of inferring a speaker's mental state. As such there is considerable theoretical overlap between 'theory of mind' in cognitive science and pragmatics in linguistics. The coherence measure of 'evaluation'

includes a number of measures which assume the writer has a second order representation ie is mindful of the context of the reader, and the need to provide supplementary information. However on this measure of coherence the group difference was again not significant, suggesting intact theory of mind in these pre-morbid adolescents.

Narrative production appears to require intact frontal cortex in order to generate good coherence and meta-narrative(Godbout and Doyon 1995; Janowsky et al 1989 ; Mar 2004). Given the substantial executive and meta-cognitive load demanded in writing these essays we suggest that these essays should be able to tease out pre-morbid executive or meta-cognitive dysfunction. We conclude that 11 year old Pre-Scz males did not manifest any particular executive dysfunction given their current level of IQ , although there were some signs of lower meta-cognitive ability, which might implicate more medial frontal regions . Pre-Scz females showed the opposite pattern - some executive dysfunction with intact meta-cognitive ability. However these findings were not restricted to the Pre-Scz group of children. There were some noteworthy similarities particularly with the Pre-NPPD group. Given these unexpected gender effects in both groups it could be that either these are not confined to pre-morbid schizophrenia or that there might have been a sampling bias in the selection of the control groups. However given the precise matching and sample size of the control group this is unlikely. ~~Given that this sample of Pre-Scz children did have reduced IQ (see Table 1 and also Jones and Done 1997), it can be concluded that some cognitive abilities in these same children , most notably intelligence, are impaired early on in childhood, whereas incoherent narrative and abnormal use of cohesive devices does not appear at this age and therefore it either starts to appear during the development of the disorder (i.e. during the prodromal period) or it appears later than age 11 in the premorbid period.~~

Conflict of Interest

None

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Table 1

NCDS samples used in the study: Cases (PSE CATEGO) documented by the teacher at age 11, recorded in the Mental Health Enquiry between 1974 and 1986, and matched normal controls.

	Schizophrenia (S+)	Affective Psychosis M+/M?, D+/D?	Non-Psychotic Psychiatric Disorder N+/N?	Healthy Control
No. documented by teacher at age 11	30	31	70	13953
No. with essays available for analysis (% documented by teacher)	22 (73%)	24 (77%)	56 (80%)	64 ¹ (80%)
IQ Mean(SD)	91.9 (16.9)	94.5 (13.8)	93.5 (13.5)	95.3 (14.5)
Social and Economic Status ² Median (Range)	4 (1- 6)	4 (1-6)	4(1-6)	4(1-6)

1. This is the sub-sample of control cases matched according to the criteria mentioned in the text.

2.. Based on the occupation of child's father using General Registrar's Office of Great Britain, 1960.

Classification of social class: 1=professional, 2=intermediate groups, 3 = Skilled non-manual, 4=skilled manual, 5=Semi-skilled non-manual/manual, 6= Unskilled manual.

Table 2. Narrative Coherence

Dependent Variable	Group			
	Control N=63	Pre-Scz N=22	Pre-AP N=24	Pre-NPPD N=56
Freq. Appropriate Themes	2.4 (0.1)	1.96 [*] (0.2)	2.0 ^{ns} (0.2)	2.2 ^{ns} (0.1)
Freq. Abnormal Themes	6 (9.5 %)	2 ^{ns} (8%)	3 ^{ns} (12.5%)	7 ^{ns} (13%)
Ordering (Appropriate Score)	22.0 ^{ns} (1.0)	25.4 ^{ns} (2.6)	24.7 ^{ns} (1.3)	23.4 ^{ns} (1.2)
Ordering (Inappropriate score)	4.2 ^{ns} (0.4)	4.1 ^{ns} (0.7)	3.4 ^{ns} (0.5)	4.3 ^{ns} (0.4)
All Evaluative Devices	10.5 (0.6)	10.7 ^{ns} (1.4)	9.8 ^{ns} (1.3)	9.4 ^{ns} (0.7)
Frames of Mind	— 3.0 — (0.4)	— 2.3 ^{ns} — (0.7)	— 2.1 ^{ns} — (0.4)	— 1.8 ^{**} — (0.2)

For case-control comparisons

^{ns} p > 0.05 for case –control comparison

* p<.05

** P<.01

Table 3 Cohesion Analysis. Means (SE)

	Control n=67	Pre-Scz n=22	Pre-AP n=25	Pre-NPPD n=56
No. Clauses	25.2(1.8)	29.3 (3.3)	28.1 (4.2)	26.5 (2.3)
Lexical Cohesion	32.0 (1.7)	28.8 (2.1)	28.6 (2.0)	29.3 (1.4)
Explicit Reference	5.9 (0.6)	5.4 (0.9)	5.8 (0.9)	7.6 (0.8) ¹
Situational Reference	17.2 (1.0)	18.2 (1.1)	15.5 (1.2)	16.3 (0.8)
Implicit Reference	1.4 (0.2)	1.8 (0.5)	1.3 (0.3)	1.5 (0.2)
Unclear Reference	1.0 (0.3)	1.3 (0.6)	2.3 (1.0)	1.2 (0.5)
Ambiguous Reference	0.0 (0.0)	0.1 (0.1)	0.0 (0.0)	0.0 (0.0)
Generic Reference	1.8 (0.3)	1.7 (0.4)	2.8 (0.5)	1.8 (0.3)
Substitution	0.3 (0.1)	0.4 (0.2)	0.2 (0.1)	0.2 (0.1)
Ellipsis	0.4 (0.1)	0.35 (0.1)	0.4 (0.1)	0.3 (0.11)
Conjunction	10.6 (1.1)	9.4 (0.9)	10.5 (1.1)	10.2 (0.7)

All comparisons of cases and controls were not statistically significant ($p > .05$)

Appendix A - Narrative Coherence– definitions and operational criteria for scoring

1. Frequency of Themes Themes

The title of the essay asked the children to write about 4 topics (goals), namely the life you are leading, your interests, your home life and your work. For Frequency of Appropriate Themes score 1 for each appropriate theme. For Frequency of Inappropriate Themes score 1 for each inappropriate theme. Sum scores are used for both measures.

2. Ordering of Themes

i) Frequency of appropriate themes and sub-themes

For each new and appropriate theme , or appropriate and contingent subtheme a score of 1 was awarded.

~~,or inappropriate themes, resulted in two separate scores.~~

ii) Frequency of inappropriate themes and sub-themes.

If a subtheme, or theme was inappropriate then a score of 1 was allocated. Also when a sub-theme was not contingent with- its main themes (ie did not follow on appropriately) then a score of 1 was allocated.

1. Evaluation of Themes (Meta-Narrative).

Score 1 for each occurrence of the following:

a. Hedges (see Wikipedia – hedges(linguistic)

~~Informing the reader of your expectations , uncertainty or reluctance to give a precise value or specification. Providing information about quantity, quality, manner~~

e.g. “ I have a car. It’s kinda red with a blue stripe down the middle from back to front. “

b. The use of a negative for evaluation

e.g. “I try not to spend too much money.”

c. Causal evaluations

e.g. “Today is Wednesday and it is very busy in the morning because as you know early closing day is Wednesday.”

c. Intensifiers

e.g. “ I was very astonished for a minute.”

- d. Frames of Mind (e.g. knowing, being interested in something, being frightened)

These refer to mental states of the writer or others. e.g. "She could not believe the news. "

Appendix B Categories of Decontextualizing

Category 1. Future expressed appropriately using past and present tense'

e.g. "I got married when I was 17, and had children at 20 . I work as an airline pilot...."

Category 2. Future only expressed solely in the present tense e.g. "I am married with 2 children..."

Category 3. Minimal decontextualizing - the future is expressed with future tense e.g. "I will be married with 2 children..." (Future expressed in the future tense)

Category 4. No decontextualizing due to describing the present. e.g. I am at school and I live in Manchester

Appendix C. Cohesion Measures – definitions and operational criteria for scoring

Each occurrence of the following obtains a score of 1

1. Lexical Cohesion

This refers to the repetition, in successive clauses, of the same word, a synonym, a word from the same root, or a general term that is related to the earlier clause.

e.g. "I live in a big house. Our house is the nicest one in our street."

2. Reference (6 measures)

Referential cohesion is the process of relating information in one clause/sentence to an earlier clause/sentence , typically with pronouns. 6 different measures were used.

Explicit reference: "Simon's job is a football player. He plays for 1st Shipman."

Situational reference: "Look at that"

Implicit reference: "I would be a mechanic .Working at Dunn's garage..."

Unclear reference: "I like the film." (No previous or subsequent mention of film).

Ambiguous reference: “My Dad and Granddad work all hours. He is fed up with it.”

Generic reference: “The people didn’t mind.”

3. Substitution

The meaning of a word such as ‘one’, or ‘ones’ needs to be recovered from a previous or a following sentence/clause. E.g. “I won’t have a husband. I wouldn’t want one.”

4. Ellipsis

A sentence/clause is grammatically incomplete and hence meaning is left unsaid and needs to be recovered from a previous sentence/clause.

e.g. “I aren’t married but (I am) engaged to a girl in third year at my old college.”

5. Conjunction:

“And, but, when ,or “ are words whose sole purpose is to join phrases/sentences together