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**Social/behavioural and Cognitive
Development at 3-4 years in relation
to family background March 2001**

The Effective Provision of Pre-School Education (EPPSE) Project

The Effective Provision of Pre-School Education [EPPE] Project

**A longitudinal Study funded by the DfES
(1997 – 2003)**

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years in relation to family background**

March 2001

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Technical Paper 7

SOCIAL/BEHAVIOURAL AND COGNITIVE DEVELOPMENT AT 3–4 YEARS IN RELATION TO FAMILY BACKGROUND

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Effective Provision of Pre-school Education

“EPPE”

Overview of the Project

This series of 12 reports describes the research on effective pre-school provision funded by the UK Department for Education & Employment (DfEE). Further details appear in Technical Paper 1 (Sylva, Sammons, Melhuish, Siraj-Blatchford & Taggart 1999). This longitudinal study assesses the attainment and development of children followed longitudinally between the ages of 3 and 7 years. Three thousand children were recruited to the study over the period January 1997 to April 1999 from 141 pre-school centres. Initially 114 centres from four types of provision were selected for the study but in September 1998 an extension to the main study was implemented to include innovative forms of provision, including ‘combined education and care’ (Siraj-Blatchford et al. 1997).

Both qualitative and quantitative methods (including multilevel modelling) have been used to explore the effects of individual pre-school centres on children's attainment and social/behavioural development at entry to school and any continuing effects on such outcomes at the end of Key Stage 1 (age 7). In addition to centre effects, the study investigates the contribution to children's development of individual and family characteristics such as gender, ethnicity, language, parental education and employment. This overview describes the research design and discusses a variety of research issues (methodological and practical) in investigating the impact of pre-school provision on children's developmental progress. A parallel study is being carried out in Northern Ireland.

There have been many initiatives intended to improve educational outcomes for young children. Will these initiatives work? Will they enable children to enter school ‘more ready’ to learn, or achieve more at the end of Key Stage 1? Which are the most effective ways to educate young children? The research project described in this paper is part of the new emphasis on ensuring ‘a good start’ for children.

PREVIOUS RESEARCH ON THE EFFECTS OF EARLY EDUCATION IN THE UK

There has been little large-scale, systematic research on the effects of early childhood education in the UK. The ‘Start Right’ Enquiry (Ball 1994; Sylva 1994) reviewed the evidence of British research and concluded that small-scale studies suggested a positive impact but that large-scale research was inconclusive. The Start Right enquiry recommended more rigorous longitudinal studies with baseline measures so that the ‘value added’ to children's development by pre-school education could be established.

Research evidence elsewhere on the effects of different kinds of pre-school environment on children's development (Melhuish et al. 1990; Melhuish 1993; Sylva & Wiltshire 1993; Schweinhart & Weikart 1997; Borge & Melhuish, 1995; National Institute of Child Health Development 1997) suggests positive outcomes. Some researchers have examined the impact of particular characteristics, e.g. gender and attendance on children's adjustment to nursery classes (Davies & Brember 1992), or adopted cross-sectional designs to explore the impact of different types of pre-school provision (Davies & Brember 1997). Feinstein, Robertson & Symons (1998) attempted to evaluate the effects of pre-schooling on children's subsequent progress but birth cohort designs may not be appropriate for the study of the influence of pre-school education. The absence of data about children's attainments at entry to pre-school means that neither the British Cohort Study (1970) nor the National Child Development Study (1958) can be used to explore the effects of pre-school education on children's progress. These studies are also limited by the time lapse and many changes in the nature of pre-school provision which have

occurred. To date no research using multilevel models (Goldstein 1987) has been used to investigate the impact of both type of provision **and** individual centre effects. Thus little research in the UK has explored whether some forms of provision have greater benefits than others. Schagen (1994) attempted multilevel modelling but did not have adequate control at entry to pre-school.

In the UK there is a long tradition of variation in pre-school provision both between types (e.g. playgroup, local authority or private nursery or nursery classes) and in different parts of the country reflecting Local Authority funding and geographical conditions (i.e. urban/rural and local access to centres). A series of reports (House of Commons Select Committee 1989; DES Rumbold Report 1990; Ball 1994) have questioned whether Britain's pre-school education is as effective as it might be and have urged better co-ordination of services and research into the impact of different forms of provision (Siraj-Blatchford 1995). The EPPE project is thus the first large-scale British study on the effects of different kinds of pre-school provision and the impact of attendance at individual centres.

OVERVIEW OF RESEARCH METHODS

The EPPE project is a major study instituted in 1996 to investigate three issues which have important implications for policy and practice:

- the effects on children of different types of pre-school provision,
- the 'structural' (e.g. adult-child ratios) and 'process' characteristics (e.g. interaction styles) of more effective pre-school centres, and
- the interaction between child and family characteristics and the kind of pre-school provision a child experiences.

An educational effectiveness research design was chosen to investigate these topics because this enabled the research team to investigate the progress and development of individual children (including the impact of personal, socio-economic and family characteristics), and the effect of individual pre-school centres on children's outcomes at both entry to school (the start of Reception which children can enter between the ages of 4 and 5 plus) and at the end of Key Stage 1 (age 7 plus). Such research designs are well suited to social and educational research with an institutional focus (Paterson & Goldstein 1991). The growing field of school effectiveness research has developed an appropriate methodology for the separation of intake and school influences on children's progress using so called 'value added' multilevel models (Goldstein 1987, 1995). As yet, however, such techniques have not been applied to the pre-school sector, although recent examples of value added research for younger ages at the primary level have been provided by Tymms et al. 1997; Sammons & Smees 1998; Jesson et al. 1997; Strand 1997; and Yang & Goldstein 1997. These have examined the relationship between baseline assessment at reception to infant school through to Key Stage 1 (age 7 plus years).

School effectiveness research during the 1970s and 1980s addressed the question "*Does the particular school attended by a child make a difference?*" (Mortimore et al. 1988; Tizard et al. 1988). More recently the question of internal variations in effectiveness, teacher/class level variations and stability in effects of particular schools over time have assumed importance (e.g. Luyten 1994; 1995; Hill & Rowe 1996; Sammons 1996). This is the first research to examine the impact of individual pre-school centres using multilevel approaches. The EPPE project is designed to examine both the impact of type of pre-school provision as well as allow the identification of particular pre-school characteristics which have longer term effects. It is also designed to establish whether there are differences in the effects of individual pre-school centres on children's progress and development. In addition, the project explores the impact of pre-school provision for different groups of children and the extent to which pre-schools are effective in promoting different kinds of outcomes (cognitive and social/behavioural).

The 8 aims of the EPPE Project

- To produce a detailed description of the 'career paths' of a large sample of children and their families between entry into pre-school education and completion (or near completion) of Key Stage 1.
- To compare and contrast the developmental progress of 3,000+ children from a wide range of social and cultural backgrounds who have differing pre-school experiences including early entry to Reception from home.
- To separate out the effects of pre-school experience from the effects of education in the period between Reception and Year 2.
- To establish whether some pre-school centres are more effective than others in promoting children's cognitive and social/emotional development during the pre-school years (ages 3-5) and across Key Stage 1 (5-7 years).
- To discover the individual characteristics (structural and process) of pre-school education in those centres found to be most effective.
- To investigate differences in the progress of different groups of children, e.g. second language learners of English, children from disadvantaged backgrounds and both genders.
- To investigate the medium-term effects of pre-school education on educational performance at Key Stage 1 in a way which will allow the possibility of longitudinal follow-up at later ages to establish long-term effects, if any.
- To relate the use of pre-school provision to parental labour market participation.

The sample: regions, centres and children

In order to maximise the likelihood of identifying the effects of individual centres and also the effects of various types of provision, the EPPE sample was stratified by type of centre and geographical location.

- Six English Local Authorities (LAs) in five regions were chosen strategically to participate in the research. These were selected to cover provision in urban, suburban and rural areas and a range of ethnic diversity and social disadvantage. (Another related project covering Northern Ireland was instituted in April 1998 [Melhuish et al. 1997]. This will enable comparison of findings across different geographical contexts.)
- Six main types of provision are included in the study (the most common forms of current provision; *playgroups*, local authority or voluntary *day nurseries*, *private day nurseries*, *nursery schools*, *nursery classes*, and centres *combining care and education*. Centres were selected randomly within each type of provision in each authority.

In order to enable comparison of centre and type of provision effects the project was designed to recruit 500 children, 20 in each of 20-25 centres, from the six types of provision, thus giving a total sample of approximately 3000 children and 140 centres¹. In some LAs certain forms of provision are less common and others more typical. Within each LA, centres of each type were selected by stratified random sampling and, due to the small size of some centres in the project (e.g. rural playgroups), more of these centres were recruited than originally proposed, bringing the sample total to 141 centres and over 3000 children.

¹ The nursery school and combined centre samples were added in 1998 and their cohorts will be assessed somewhat later; results will be reported separately and in combined form.

Children and their families were selected randomly in each centre to participate in the EPPE Project. All parents gave written permission for their children to participate.

In order to examine the impact of no pre-school provision, it was proposed to recruit an additional sample of 500 children pre-school experience from the reception classes which EPPE children entered. However in the five regions selected a sample of only 200+ children was available for this 'home' category.

The progress and development of pre-school children in the EPPE sample is being followed over four years until the end of Key Stage 1. Details about length of sessions, number of sessions normally attended per week and child attendance have been collected to enable the amount of pre-school education experienced to be quantified for each child in the sample. Two complicating factors are that a substantial proportion of children have moved from one form of pre-school provision to another (e.g. from playgroup to nursery class) and some will attend more than one centre in a week. Careful records are necessary in order to examine issues of stability and continuity, and to document the range of pre-school experiences to which individual children can be exposed.

Child assessments

Around the third birthday, or up to a year later if the child entered pre-school provision after three, each child was assessed by a researcher on four cognitive tasks: verbal comprehension, naming vocabulary, knowledge of similarities seen in pictures, and block building. A profile of the child's social and emotional adjustment was completed by the pre-school educator who knew the child best. If the child changed pre-school before school entry, he or she was assessed again. At school entry, a similar cognitive battery was administered along with knowledge of the alphabet and rhyme/alliteration. The Reception teacher completed the social emotional profile.

Further assessments were made at exit from Reception and at the end of Years 1 and 2. In addition to standardised tests of reading and mathematics, information on National Assessments will be collected along with attendance and special needs. At age 7, children will also be invited to report themselves on their attitudes to school.

Measuring child/family characteristics known to have an impact on children's development

- 1) Information on individual 'child factors' such as gender, language, health and birth order was collected at parent interview.
- 2) Family factors were investigated also. Parent interviews provided detailed information about parent education, occupation and employment history, family structure and attendance history. In addition, details about the child's day care history, parental attitudes and involvement in educational activities (e.g. reading to child, teaching nursery rhymes, television viewing etc) have been collected and analysed.

Pre-school Characteristics and Processes

Regional researchers liaised in each authority with a Regional Coordinator, a senior local authority officer with responsibility for Early Years who arranged 'introductions' to centres and key staff. Regional researchers interviewed centre managers on: group size, child staff ratio, staff training, aims, policies, curriculum, parental involvement, etc.

'Process' characteristics such as the day-to-day functioning within settings (e.g. child-staff interaction, child-child interaction, and structuring of children's activities) were also studied. The Early Childhood Environment Rating Scale (ECERS) which has been recently adapted (Harms, Clifford & Cryer 1998) and the Caregiver Interaction Scale (Arnett 1989) were also administered. The ECERS includes the following sub-scales:

- Space and furnishings
- Personal care routines
- Language reasoning
- Activities
- Interaction
- Programme structure
- Parents and staffing

In order that the more educational aspects of English centres could be assessed, Sylva, Siraj-Blatchford, Taggart & Colman (unpublished) developed four additional ECERS sub-scales describing educational provision in terms of: Language, Mathematics, Science and the Environment, and Diversity.

Setting the centres in context

In addition to describing how each centre operated internally, qualitative interviews were conducted with centre managers to find out the links of each setting to local authority policy and training initiatives. Senior local authority officers from both Education and Social Services were also interviewed to find out how each local authority implemented Government early years policy, especially the Early Years Development Plans which were established to promote education and care partnerships across providers in each local authority.

Case Studies

In addition to the range of quantitative data collected about children, their families and their pre-school centres, detailed qualitative data will be collected using case studies of several "effective" pre-school centres (chosen retrospectively as 'more effective' on the basis of the multilevel analyses of intake and outcome measures covering the period baseline to entry into reception). This will add the fine-grained detail to how processes within centres articulate, establish and maintain good practice.

The methodology of the EPPE project is thus mixed. These detailed case studies will use a variety of methods of data gathering, including documentary analysis, interviews and observations and the results will help to illuminate the characteristics of more successful pre-school centres and assist in the generation of guidance on good practice. Particular attention will be paid to parent involvement, teaching and learning processes, child-adult interaction and social factors in learning. Inevitably there are difficulties associated with the retrospective study of process characteristics of centres identified as more or less effective after children in the EPPE sample have transferred to school and it will be important to examine field notes and pre-school centre histories to establish the extent of change during the study period.

ANALYTIC STRATEGY

The EPPE research was designed to enable the linking of three sets of data: information about children's attainment and development (at different points in time), information about children's personal, social and family characteristics (e.g. age, gender, SES etc), and information about pre-school experience (type of centre and its characteristics).

Identifying individual centre effects and type of provision at entry to school

Longitudinal research is essential to enable the impact of child characteristics (personal, social and family) to be disentangled from any influence related to the particular pre-school centre attended. Multilevel models investigate the clustered nature of the child sample, children being nested within centres and centres within regions. The first phase of the analysis adopts these three levels in models which attempt to identify any centre effects at entry to reception class.

Given the disparate nature of children's pre-school experience it is vital to ensure that the influences of age at assessment, amount and length of pre-school experience and pre-school attendance record are accounted for when estimating the effects of pre-school education. This information is also important in its own right to provide a detailed description of the range of pre-school provision experienced by different children and any differences in the patterns of provision used by specific groups of children/parents and their relationship to parents' labour market participation. Predictor variables for attainment at entry to reception will include prior attainment (verbal and non-verbal sub scales), social/emotional profiles, and child characteristics (personal, social and family). The EPPE multilevel analyses will seek to incorporate adjustment for measurement error and to examine differences in the performance of different groups of children at entry to pre-school and again at entry to reception classes. The extent to which any differences increase/decrease over this period will be explored, enabling equity issues to be addressed.

After controlling for intake differences, the estimated impact of individual pre-school centres will be used to select approximately 12 'outlier' centres from the 141 in the project for detailed case studies (see 'Case Studies' above). In addition, multilevel models will be used to test out the relationship between particular process quality characteristics of centres and children's cognitive and social/behavioural outcomes at the end of the pre-school period (entry to school). The extent to which it is possible to explain (statistically) the variation in children's scores on the various measures assessed at entry to reception classes will provide evidence about whether particular forms of provision have greater benefits in promoting such outcomes by the end of the pre-school period. Multilevel analyses will test out the impact of measures of pre-school process characteristics, such as the scores on various ECERS scales and Pre-School Centre structural characteristics such as ratios. This will provide evidence as to which measures are associated with better cognitive and social/behavioural outcomes in children.

Identifying continuing effects of pre-school centres at KS1

Cross-classified multilevel models have been used to examine the long term effects of primary schools on later secondary performance (Goldstein & Sammons, 1997). In the EPPE research it is planned to use such models to explore the possible mid-term effects of pre-school provision on later progress and attainment at primary school at age 7. The use of cross classified methods explicitly acknowledges that children's educational experiences are complex and that over time different institutions may influence cognitive and social/behavioural development for better or worse. This will allow the relative strength of any continuing effects of individual pre-school centre attendance to be ascertained, in comparison with the primary school influence.

THE LINKED STUDY IN NORTHERN IRELAND 1998-2003

The Effective Pre-school Provision in Northern Ireland (EPPNI) is part of EPPE and is under the directorship of Professor Edward Melhuish, Professor Kathy Sylva, Dr. Pam Sammons, and Dr. Iram Siraj-Blatchford. The study explores the characteristics of different kinds of early years provision and examines children's development in pre-school, and influences on their later adjustment and progress at primary school up to age 7 years. It will help to identify the aspects of pre-school provision which have a positive impact on children's attainment, progress, and development, and so provide guidance on good practice. The research involves 70 pre-school centres randomly selected throughout Northern Ireland.

The study investigates all main types of pre-school provision attended by 3 to 4 year olds in Northern Ireland: playgroups, day nurseries, nursery classes, nursery schools and reception groups and classes. The data from England and Northern Ireland offer opportunities for potentially useful comparisons.

SUMMARY

This “educational effectiveness” design of the EPPE research study enables modelling of the complicated effects of amount and type of pre-school provision (including attendance) experienced by children and their personal, social and family characteristics on subsequent progress and development. Assessment of both cognitive and social/behavioural outcomes has been made. The use of multilevel models for the analysis enables the impact of both type of provision and individual centres on children's pre-school outcomes (at age 5 and later at age 7) to be investigated. Moreover, the relationships between pre-school characteristics and children's development can be explored. The results of these analyses and the findings from the qualitative case studies of selected centres can inform both policy and practice. A series of 12 technical working papers will summarise the findings of the research.

EPPE Technical Papers in the Series

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EXECUTIVE SUMMARY

In the first stage of the EPPE study parents were interviewed concerning child and family characteristics and also children were assessed on social/behavioural and cognitive development. The data provided on child and family characteristics and social/behavioural and cognitive development at the start of the study were used to investigate social/behavioural and cognitive development at 3-4 years in relation to a range of parental, family, child, home and childcare factors. The analysis provides information about associations between variables and should not be automatically interpreted in terms of causality. It is possible that unmeasured factors are producing the effects found. The explanation of cognitive development provided by the analyses presented here is strong whereas the explanation of social/behavioural development leaves much of the variation between children unexplained. This may be explained in part by variation in the sophistication and reliability of measurement available for the two aspects of development. The findings can be summarised as follows:

Parents:

- Socio-economic status showed effects upon both cooperation/conformity and confidence. For these social/behavioural variables the children of professional parents were rated more highly than other children.
- Mother's age had a small effect upon the amount of antisocial behaviour. Children with very young mothers tended to be rated higher for antisocial behaviour than other children.
- For cognitive development two parent variables were significant; socio-economic status and mother's qualifications, showed powerful effects.

Family:

- If English was not the child's first language, this was associated with lower co-operation/conformity, and lower cognitive development scores.
- The number of siblings had varied effects.
- Only children were rated higher on antisocial behaviour than children with siblings. Children with one or two siblings scored higher on co-operation/conformity. Children with three or more siblings scored lower on peer sociability and confidence. For social/behavioural development, having one or two siblings but not more, was most advantageous.
- Children with three or more siblings scored lower on cognitive development. Larger families may result in less parent attention being available for any individual child. This decreased individual attention from parents may be the reason for the effects on cognitive development.

Child:

- Gender had several significant effects. Girls showed more co-operation/conformity, peer sociability and confidence. Girls also had higher cognitive development scores. These results suggest that pre-school gender differences are precursors of later gender differences often found in school.
- Aspects of health had some slight effects in that children with more perinatal health problems (first two months) had lower cooperation/conformity. Also children with low birthweights had lower cognitive development scores. Where children had previous developmental problems (e.g. speech problems, late to walk), they were more likely to have lower cognitive development scores. They also had lower cooperation/conformity, peer sociability and confidence. These may reflect a general developmental delay in children with health related problems.

- Where children had previous behaviour problems reported by the parent, they had lower cooperation/conformity, peer sociability and confidence, and increased antisocial behaviour reported by their pre-school carers. This indicates that early behaviour problems observed at home continue into the pre-school setting.
- The effects on cognitive development of belonging to a particular ethnic group are primarily mediated by language. Similar results have been reported in a multi-level analysis of EPPE data by Sammons et al. (1999). Several ethnic groups showed lower cognitive scores than the White UK group, these were White European, Black African, Pakistani, Bangladeshi, Other and Mixed Heritage. However, an analysis of nonverbal scores showed no effects for whether English was a first language and all ethnic group effects except one disappeared. Those children of Bangladeshi heritage had lower nonverbal scores than children of White UK heritage, but the size of this effect was considerably smaller than when verbal scores were included.
- It is possible that language or communication difficulties may mediate ethnic effects on the social/behavioural measures in that these depend upon ratings of children made by pre-school staff. There were some ethnic group differences associated with antisocial and worried/upset behaviour. Black Caribbean, Black African and Mixed Heritage children were reported as showing more antisocial behaviour than White UK children. Black Caribbean children were rated as showing more worried/upset behaviours and White European children as showing less than White UK children. However these ethnic group effects on social/behavioural development occurred in weak regression models and should be interpreted with caution.

Home:

- Those children who had more experience of playing with friends outside of the home showed higher peer sociability and confidence.
- The variable, whether the child had a regular bedtime, could be regarded as a marker for the degree of structure in the child's home life. This variable was associated with increased co-operation/conformity and higher cognitive development scores.
- Higher home learning environment was associated with increased co-operation/conformity, peer sociability and confidence, and lower antisocial and worried/upset behaviour and higher cognitive development scores. The effect on cognitive development was particularly pronounced. After age, **it was the variable with strongest effect on cognitive development**. Its effect was stronger than either social class or parental education, which have often been found to be amongst the strongest predictors of children's cognitive development in previous studies.
- The importance of the home learning environment indicates that what parents do is more important than who parents are.

Childcare History:

- Being cared for by a relative e.g. grandmother before entering the study showed modest effects but was associated with higher co-operation/conformity and less antisocial behaviour.
- Being cared for in a group of children outside the home (e.g. nurseries) before entering the study was slightly associated with increased antisocial behaviour and had a slight significant association with higher cognitive development scores.
- Children attending private day nursery or LA centres who started at the centre at younger ages and had much more time in the target centre showed increased co-operation/conformity, peer sociability and confidence. These children also showed increased antisocial and worried/upset behaviour and increased cognitive development scores.

INTRODUCTION

The Effective Provision of Pre-School Education (EPPE) project is a research study of children's progress and development aged from 3 to 7 years, and how progress relates to their pre-school centre experience and family background. An overview of the study including the aims is contained in Overview of the Project at the beginning of this technical paper. Further details are provided in the first technical paper of this series, *The Effective Provision of Pre-School Education (EPPE) Project: Technical Paper One* (Sylva *et al.* 1999).

In the first stage of the study parents were interviewed concerning child and family characteristics and also children were assessed on social/behavioural and cognitive development. The data provided on child and family characteristics and social/behavioural and cognitive development at the start of the study can be used to investigate social/behavioural and cognitive development at 3–4 years in relation to a range of parental, family, child, home and childcare factors. A previous paper in this series (Melhuish *et al.* 1999) provides a description of the range of parental, family, child, home and childcare information provided by parental interviews. This previous paper also discussed how these aspects vary in relation to type of pre-school centre used.

Much of the data on parents, families and the home has been related to cognitive development by Sammons *et al.* (1999). This paper considered whether the differences in children's level of cognitive attainment was related to the pre-school centre that they attended. Sammons *et al.* demonstrated that much of the variance in cognitive attainment was related to selected child, parent and home variables. It was further demonstrated that, after allowing for the effects of these child, parent and home variables, there was no significant relationship between cognitive attainment and the type of pre-school attended at the start of the study.

The current paper considers the relationship of social development and cognitive attainment to the range of variables available in the study that measure characteristics of the children, their parents, their family, their home and childcare history. A wide range of variables is considered and the nature of associations between family background and children's development are explored.

THE SAMPLE

The focus of the EPPE study is on the effectiveness of pre-school centres. The EPPE sample was stratified by type of centre and geographical location, as described in the overview.

The first stage of the study involved 2,857 children recruited from 141 pre-school centres, including 588 children from nursery classes, 606 children from playgroups, 517 children from private day nurseries, 433 children from Local Authority centres, 517 children from nursery schools and 192 children from combined centres. The children were aged between 3 years and 4 years 3 months (mean 40.4 months; s.d. = 4.6 months) at the beginning of the study. For a small number of families' (64), parents were unavailable for interview. Hence this paper is based on the analysis of data for 2,793 children (98 per cent of the sample).

METHOD OF DATA COLLECTION

Cognitive development

Once children had been recruited to the study, four sub-scales of the British Ability Scales (BAS) were administered in a one-to-one situation by a trained research officer. These sub-scales consisted of: Block Building, Verbal Comprehension, Picture Similarities and Naming Vocabulary. These sub-scales were used to provide an overall BAS score as a measure of overall cognitive development. The sub-scales of Block Building and Picture Similarities were used to produce a measure of non-verbal cognitive development.

Social/behavioural development

Following the BAS assessment, a pre-school centre worker who was familiar with the child was asked to complete the Adaptive Social Behavior Inventory (ASBI) (Hogan *et al.*, 1992). The ASBI provided measures of social/behavioural development.

The Adaptive Social Behavior Inventory (ASBI)

The ASBI was developed by Hogan *et al.* (1992) as a general measure of the social and behavioural development of pre-school children. It was developed because there was not a measure then available that produced measures of social competence, pro-social and antisocial behaviours for pre-school children. A copy of the Adaptive Social Behavior Inventory is included in Appendix 1.

Conceptually, social competence was regarded as multi-faceted and separate from behaviour problems. Hence, a child might have varying degrees of social skills and behaviour problems simultaneously.

The inventory contains 30 items that were chosen:

- ◆ to be appropriate to pre-school children, particularly 3-year-olds
- ◆ to have wording suitable for adults of varying education
- ◆ to have content relevant to a range of home, neighborhood and day-care settings
- ◆ to sample behaviours related to social skills
- ◆ to sample behaviours related to social knowledge
- ◆ to sample behaviours related to positive emotion
- ◆ to sample behaviours related to self-control
- ◆ to sample behaviours related to behaviour problems.

Another consideration was to choose positive and negative behaviours that had been identified as potentially related to children experience with adults and other children.

The response choices for each of the 30 items are

'1' – rarely or never, '2' – sometimes and '3' – almost always.

The three-scale resolution of the ASBI items used by Hogan *et al.* (1992) is described in Appendix 2.

Parental interview

Shortly after these assessments of cognitive and social/behavioural development had been completed, one of the child's parents or guardians was interviewed. In the vast majority of cases the interview was with the child's mother. Parents were interviewed either in person when they were at the pre-school centre, or by telephone. Where the parent's command of English made it preferable, an interpreter was used to conduct the interview in the interviewee's first language. The interview followed a semi-structured format with answers to most questions being coded into an established set of categories, and a small number of open-ended questions that were coded post hoc. The length of the interviews varied, depending on the complexity of the information to be collected, the conciseness of the parents and other factors. A typical interview might take between fifteen and forty minutes of the parent's time depending upon the complexity of the information supplied by the parent. The interview contained questions dealing with the parents, the family, the child's health, development and behaviour, the child's activities in the home, the use of pre-school provision and the childcare history.

RESULTS

SECTION A DEVELOPING THE OUTCOME VARIABLES

Social/behavioural development – factor analysis of ASBI items

It was considered important to establish the underlying factors revealed by the empirical data available on the large UK sample provided by EPPE. In order to establish the factor structure of the ASBI data a factor analysis was used. The data from the 30 items of the ASBI were entered into a factor analysis using the SPSS software. The method used was Principal Components Analysis with a varimax rotation. This analysis initially produced 5 orthogonal factors; i.e. factors that are not correlated with each other. This is the 5-factor resolution of the ASBI data.

The ASBI items that loaded most heavily on the 5 factors were identified. These items were averaged for each factor to produce factor scores. Examination of the ASBI items loading most heavily on the 5 factors led to the following names being assigned to the factors:

Factor 1 Co-operation/conformity

Example item: is obedient and compliant

Factor 2 Peer sociability

Example item: will join a group of children playing

Factor 3 Confidence

Example item: is confident with other people

Factor 4 Antisocial

Example item: teases other children, calls them names.

Factor 5 Worried/upset

Example item: gets upset if you don't pay enough attention

The interrelationships between the five factors can be seen in Table 1.

Table 1 Correlations between the five factors

	Peer sociability	Confidence	Antisocial	Worried/upset
Co-operation/Conformity	0.56**	0.40**	-0.45**	-0.19**
Peer sociability	1.00	0.66**	-0.02	0.06**
Confidence		1.00	0.07**	0.15**
Antisocial			1.00	0.35**

** significant at the 0.01 level (2 – tailed)

The correlations reveal the moderately strong positive association between co-operation/conformity, peer sociability and confidence, the moderately strong negative association between co-operation/conformity and antisocial behaviour and the weak negative association between co-operation/conformity and worried/upset behaviour. In addition peer sociability is strongly associated with confidence, and antisocial and worried/upset behaviour are moderately associated. Rather surprisingly there is a weak positive association between confidence and worried/upset behaviour.

Measures of cognitive development

At the start of the study all children were administered four sub-scales of the British Ability Scales (BAS). These were block building, picture similarities, verbal comprehension and picture naming. These four sub-scales were used to compute a total BAS score as an index of children's cognitive attainment at the start of the study. The scores on the four sub-scales and the total score were correlated as shown in Table 2.

Table 2 Correlations between BAS sub-scales

	Picture similarities	Verbal comprehension	Picture naming	Total score
Block building	0.44**	0.44**	0.45**	0.71**
Picture similarities		0.41**	0.47**	0.75**
Verbal comprehension			0.63**	0.81**
Picture naming				0.83**

** significant at the 0.01 level (2 – tailed)

Relationship between the five ASBI factors and cognitive development

Five social/behavioural factors and cognitive development

The 5-factor solution to ASBI was also correlated with BAS sub-scales and BAS total score and this is shown in Table 3.

Table 3 Correlations between BAS and ASBI 5-factor solution

	Block building	Picture similarities	Verbal comprehension	Picture naming	Total score
Co-operation/Conformity	0.18**	0.20**	0.26**	0.24**	0.32**
Peer sociability	0.10**	0.15**	0.25**	0.23**	0.26**
Confidence	0.10**	0.14**	0.23**	0.22**	0.25**
Antisocial	0.04	-0.05**	-0.05**	0.02	0.05**
Worried/Upset	0.00	-0.01	0.01	0.02	0.00

** significant at the 0.01 level (2 – tailed)

The pattern of correlations is of low to moderate associations between co-operation/conformity, peer sociability, confidence and all BAS sub-scales, with no association between antisocial and worried/upset behaviours and BAS sub-scales.

SECTION B DEVELOPING A MODEL OF FACTORS AFFECTING CHILDREN'S DEVELOPMENTAL LEVEL

In order to establish which variables have a significant association with the child development variables of ASBI scores and BAS scores a multiple linear regression was chosen. The first stage of such an analysis requires the selection of possible predictor variables, i.e. the independent variables to be used in the analysis. This section describes the choice of variables from the areas of parental, family, child, home and childcare characteristics.

Parental characteristics

Parental socio-economic status and employment

The parental interview collected information on the employment of the parents. The occupations of the parents were classified according to the Office of Populations Census and Surveys (OPCS) (1995) occupational classification. Hence the paternal and maternal occupational classifications are available as a basis for a classification of socio-economic status (SES). In much research the father's occupational status is taken as the basis for the classification of the socio-economic status of the family. In this study, however, there are many fathers (486, 23 per cent of the sample) for whom data are unavailable: often these are absent fathers. An alternative is to use the occupational classification of the mother, but many mothers live in households with the father as sole breadwinner. A way of overcoming these problems is to assign to the family a socio-economic classification based upon the occupation of the parent with the highest occupational status. This strategy has been adopted here based upon employment at the start of the study. Hence, there are three occupational status measures based on mother's occupation, father's occupation, and mother's and father's occupations combined. Of these three measures, the mother's and father's occupations combined showed the highest correlation with the child's total BAS score at the start of the study. Hence, this was chosen as the measure of socio-economic status of the family for subsequent multi-variate analyses. Other variables related to occupation are the level of employment from part- to full-time of either the mother or the father and mother's part/full-time employment and fathers part/full-time employment will be entered into the regression models predicting child's developmental level.

Educational qualifications of parents

Qualifications of parents are correlated with each other. Hence, in predicting child's outcomes, similar results often occur when either parent's qualifications are used as a predictor variable. In this study, mother's qualifications showed a higher correlation with the child's BAS score at the start of the study, and was chosen as the most appropriate measure of parental education for analyses of child outcome variables.

Parental occupations and qualifications are themselves associated. Hence measures of socio-economic status and parental education are similarly related. The question is raised of whether variables of socio-economic status and parental education should be used together as predictor variables. In this case, including both socio-economic status of the family and mother's qualifications as predictor variables in a multiple regression accounted for significantly more variance than only using one as a predictor variable. When both of these variables, socio-economic status of the family and mother's qualifications, were used in a multiple regression predicting child's total BAS score, adding any other parental occupation or parental education variable did not significantly increase the variance accounted for in the regression model.

Parental age

Data were also available on parental ages. Mother's age and father's age were used in the multiple linear regression models of a child's development level.

Marital status

Parent's marital status was coded as married vs. not married. The issue of whether the child was living with one or both parents was dealt with by the lone parent variable considered under family characteristics below.

Family characteristics

The next set of explanatory variables to be considered concern the characteristics of the child's family. These reflect the number of siblings, whether it is a lone parent family or not, whether English is the child's first language, and a range of dummy variables reflecting the child's ethnic group. The ethnic groups considered in the analysis are: White UK heritage, White European heritage, Black Caribbean, Black African, Indian, Pakistani, Bangladeshi, Other, and Mixed heritage. Each of these variables was compared with the White UK heritage group. The ethnic groups of Black Other and Chinese were too small to be used as variables in the analysis.

The variables of number of siblings, and whether English was the child's first language, were added to the predictor variable to be tested in a stepwise regression model.

Ethnic group variables were interdependent, i.e. a child who scores 1 on one dummy ethnic variable must score 0 on all other dummy ethnic variables (a child is assigned to only one ethnic group). Hence these variables should be entered into the regression model as a block. This was done by entering this block of dummy ethnic variables to the regression model after all other variables had been entered using the stepwise procedure.

Child characteristics

Gender and age

Children's development is influenced by gender and age and these two explanatory variables were entered into a multiple linear regression model of development.

Perinatal variables

The parental interview produced several variables concerned with the birth and early postnatal period of the child's life. These variables were birth weight, prematurity and early health difficulties (e.g. breathing, stomach, heart or other problems in the first two months of life). These variables were entered into the regression analyses.

Child health, development and behaviour

Data were collected on the incidence and help/treatment received for health, developmental and behaviour problems since birth. These data were used to construct indices of previous health problems, previous developmental problems, and previous behaviour problems. Another child variable was health in the last six months.

Life events

From the interview the number of potentially disruptive life events for each child was recorded. This variable is described more fully in Melhuish *et al.* (1999).

All of these child variables were tested in the regression models for child developmental outcomes.

Home characteristics

Home learning environment

The parental interview asked several questions concerned with learning and play activities in the home. An index of the home learning environment (HLE) was constructed from the answers to these questions. There were seven types of home learning activities covered in the parental interview. These were

- ◆ reading
- ◆ library visits
- ◆ playing with letters or numbers
- ◆ painting and drawing
- ◆ playing/teaching alphabet or letters
- ◆ playing/teaching with numbers/shapes
- ◆ playing/teaching of songs/nursery rhymes.

From the answers given in the interview each activity was rated on a scale 0–7 where 0 is not occurring and 7 is occurring very frequently. These ratings were then combined to form the Home Learning Environment index (HLE). This index was related to the scores on the British Ability Scales (BAS) for the children at the start of the study. The correlation between the index of Home Learning Environment and total BAS score was 0.38. This index was also related to both measures of socio-economic status of the family ($r=0.32$) and educational qualifications of the parents ($r=0.35$), as previously described by Melhuish *et al.* (1999). While there is a positive association between HLE and parents' socio-economic status and qualifications, there are parents who are high on SES and qualifications who provide a home environment low on the HLE index. Conversely there are parents low on SES and qualifications who provide a home high on the HLE index.

Other aspects of the home environment

Other aspects of the home environment that were available from the parental interview include:

- ◆ whether there were rules about bed time
- ◆ whether there were rules about TV watching
- ◆ the amount of TV watching
- ◆ the frequency of playing with friends at home
- ◆ the frequency of playing with friends out of home.

These home environment variables were all included in the range of variables used in developing regression models of the child's social/behavioural and cognitive development.

Childcare history

Parents were asked about their use of childcare from the child's birth. For each childcare arrangement, the child's age at the start and end of the period of childcare, and the number of hours per week were recorded. From this record the child's experience of childcare besides attending the target centre was established in terms of:

- ◆ Total amount of relative care before entering the study
- ◆ Total amount of other individual care before entering the study
- ◆ Total amount of group care before entering the study
- ◆ Time in the target pre-school centre before entering the study.

Total amount of relative care

This referred to care by a relative of the child and might be grandparent, aunt, uncle, elder sibling or other relative. Overwhelmingly the most common form of relative care was by grandparents.

Total amount of individual care

This referred to care by an individual who was not a relative of the child. It might be care by a childminder, nanny, neighbour or friend.

Total amount of group care

This referred to care in group settings such as day nursery or playgroup, before starting at the target centre, where the child was recruited to the study.

Time in target centre

Children in the study start at the target pre-school centre at different ages and attend for different times. These variations have been discussed in Melhuish *et al.* 1999. Variables reflecting the early age of starting are the child's age when starting at the target pre-school, and the elapsed time since the start at pre-school and the child entering the study. Variables affecting the attendance of the child are the sessions and hours per week attended. From these variables it is possible to construct a variable of the time at the target pre-school centre before the start of the study. This latter variable shows the highest correlation of these interrelated variables with the child's total BAS score at the start of the study. When any other of the variables related to previous attendance at the target pre-school are added to a multiple regression model of child's BAS score, which includes this predictor variable of previous target attendance, no significant increase in variance accounted for occurred. Hence this was the variable reflecting age of starting and time at the target centre used in regression models of child's developmental level.

These variables reflecting the child's childcare history were used in regression models of child developmental level. The total list of independent variables in the regression model is included here.

Parental characteristics

- Socio-economic status
- Mother's level of employment
- Father's level of employment
- Mother's qualifications
- Father's qualifications
- Mother's age
- Father's age
- Marital status

Family characteristics

- Lone parent
- Number of siblings
- English first language

Child characteristics

- Birth weight
- Perinatal health difficulties
- Previous developmental problems
- Previous behaviour problems

Previous health problems

- Health in the last 6 months
- Life events

Home characteristics

- Home learning environment
- Rules about bedtime
- Rules about TV
- Time TV watching

Play with friends at home
Play with friends elsewhere

Childcare history

Total relative care before entering the study
Total individual care before entering the study
Total group care before entering the study
Time in target centre before entering the study

After including the above variables, ethnic variables were included in the regression model.

Ethnic variables

These variables are included as dummy variables with the White UK group as the comparison.

White European
Black Caribbean
Black African
Indian
Pakistani
Bangladeshi
Other
Mixed Heritage

Analysis strategy

The regression model was developed in two stages. In the first stage the parent, family, child, home and childcare variables were entered using the forward entry procedure into the regression model. The variables that had statistically significant effects were retained in the model. In the second stage the significant variables from the first stage were entered as a block to the model and then the ethnic group variables were added as a block. This approach ensured that all other significant effects had been taken into account before testing for ethnic group effects. The final regression models for each outcome variable retained only the predictor variables found to have statistically significant effects on the outcome variable.

The data on social behavioural development are dealt with in terms of the five-factor solution as this provides the most detailed breakdown of results. The five-factor resolution of social/behavioural data is used in regression analyses in Section C. Following the analyses of social behavioural factors, the cognitive data is used in regression analyses in Section D.

The analysis of the three-scale solution for ASBI data as used by Hogan *et al.* (1992) is presented in Appendix 2.

SECTION C SOCIAL/BEHAVIOURAL DEVELOPMENT

Analysis of the five social/behavioural factors

The Principal Components Analysis produced five factors, which are analysed in this section. These are the factors of co-operation/conformity, peer sociability, confidence, antisocial and worried/upset behaviour. These factors were analysed for the effects of parent, family, child, home and childcare variables as described earlier. In the following pages only the variables which emerged with statistically significant effects are shown in the final regression models.

Co-operation/conformity

The Principal Components Analysis produced co-operation/conformity. (This factor was essentially equivalent to compliance in the three-factor resolution of ASBI data.)

Final regression model of predictors for co-operation/conformity

$$R = 0.35$$

$$R^2 = 0.12$$

$$\text{Adjusted } R^2 = 0.12$$

$$F(21, 2747) = 18.53, \text{ significance } p < 0.0001$$

Variable	Standardized β	Significance
PARENTS		
<i>S.E.S – comparison to professional</i>		
Intermediate	-0.06	0.037
Skilled non-manual	-0.07	0.019
Skilled manual	-0.09	0.001
Semi-skilled	-0.09	0.001
Unskilled	-0.04	0.042
Not in employment category	-0.06	0.002
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	0.07	0.005
Sibs = 2	0.06	0.021
Sibs = 3+	n.s.	
English 1 st language	-0.12	0.0001
CHILD		
<i>Gender – girls vs. boys</i>		
Age	0.12	0.0001
<i>Previous developmental problems – comparison to none</i>		
Low	-0.05	0.006
Moderate–high	-0.09	0.0001
<i>Previous behaviour problems – comparison to none</i>		
Low	-0.05	0.004
Moderate–high	-0.09	0.0001
Perinatal health problems	-0.05	0.004
HOME		
Learning environment	0.12	0.0001
Regular bed time	0.04	0.050
CHILDCARE HISTORY		
Relative care	0.05	0.004
Time in target centre	0.04	0.050

The variable of co-operation/conformity was derived from the Principal Components Analysis of ASBI items, and was highly correlated ($r=0.87$) with the compliance scale, which is discussed in Appendix 2. .

Parent

Socio-economic status was significantly related to co-operation/conformity. The professional group had children rated higher on co-operation/conformity than all other socio-economic groups.

Family

Children whose first language was not English were rated by pre-school staff as lower on co-operation/conformity than children whose first language was English. Children with one or two siblings were rated higher on co-operation/conformity than only children, while where there were three or more siblings the child was rated similarly to an only child. It appears that co-operation/conformity shows an inverted-U function with number of siblings.

Child

Several child variables were related to co-operation/conformity. Girls were rated significantly higher than boys, and older children were also rated higher on co-operation/conformity. Previous developmental problems, previous behaviour problems and early health problems (during first 2 months) were all related to lower co-operation/conformity scores.

Home

Two home variables were positively related to co-operation/conformity scores. The home learning environment had the strongest effect of any variable and also homes with a regular bed time (which might be regarded as a proxy variable for degree of structure in the home) were associated with higher co-operation/conformity scores.

Childcare history

Some aspects of previous childcare experience had significant effects. Those children who had been cared for more by a relative (usually grandmother) had higher co-operation/conformity scores. Also more time at the target pre-school centre was linked with higher co-operation/conformity scores.

The childcare history variable, time at target pre-school centre, exhibited marked variation between the four pre-school centre groups in the study. The time at the target centre for the private day nursery and LA centre children was around fifteen times that for nursery class children and nine times that for playgroup children (Melhuish *et al.* 1999). Such large variations mean that it is likely that the impact of this variable may differ substantially for the four pre-school groups. Hence it may well be that the private day nursery and LA centre groups essentially carry the effect of this variable. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable was no longer statistically significant. This result indicates that the effect of the variable time in target centre is carried by the effect within the private day nursery and LA centre groups, and that for the other groups this variable is non-significant. This reflects the fact that while children in private day nurseries and LA centres often start at the centre much younger than 3 years of age, children start other types of centre either near 3 years of age or older. As children were recruited to the study at 3 years of age or when they started at a target centre, there is little variation in the variable time in target centre except for children attending a private day nursery or LA centre (and some children in combined centres).

Final regression model of predictors for peer sociability

R = 0.33

R² = 0.11

Adjusted R² = 0.11

F (16,2755) = 21.39, significance p < 0.0001

Variable	Standardized β	Significance
PARENTS		
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	n.s.	
Sibs = 2	n.s.	
Sibs = 3+	-0.11	0.0001
English 1 st language	-0.13	0.0001
CHILD		
<i>Gender – girls vs. boys</i>	0.10	0.0001
<i>Age</i>	0.08	0.0001
<i>Previous developmental problems – comparison to none</i>		
Low	-0.05	0.012
Moderate–high	-0.11	0.0001
<i>Previous behaviour problems – comparison to none</i>		
Low	n.s.	
Moderate–high	-0.07	0.0001
HOME		
Learning environment	0.09	0.0001
<i>Peer play out of home – comparison to none</i>		
1 day per week	0.04	0.039
2 days per week	n.s.	
3 days per week	n.s.	
4 or more days per week	0.07	0.001
CHILDCARE HISTORY		
Time in target centre	0.15	0.0001

Parent

None of the parental variables, for example socio-economic status, parental qualifications, or age, were significantly related to peer sociability.

Family

The family variables of whether English was a first language and number of siblings were significantly related to peer sociability. Children whose first language was not English were rated by pre-school staff as lower on peer sociability than children whose first language was English. Children with three or more siblings were rated lower on peer sociability than all other children.

Child

Several child variables were related to peer sociability. Girls were rated significantly higher than boys and older children were also rated higher on peer sociability. Previous developmental problems and previous behaviour problems were related to lower peer sociability scores.

Home

Two home variables were positively related to peer sociability. The home learning environment had a strong effect, with higher HLE scores being associated with higher peer sociability. The other significant home variable was peer play outside of the home, with children having more peer play being rated higher on peer sociability.

Childcare history

Of the childcare variables, only time at the target pre-school centre had a significant effect. This effect was strong and children with more time at the target pre-school centre were rated higher on peer sociability.

As described earlier it is likely that the effect of this variable is due to the private day nursery and LA centre groups. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable no longer had a statistically significant effect. This result indicates that the private day nursery and LA centre groups carry the effect of the variable time in target centre, and that for the other groups this variable is non-significant.

Final regression model of predictors for confidence

R = 0.30

R² = 0.09

Adjusted R² = 0.08

F (22,2748) = 12.11, significance p<0.0001

Variable	Standardized β	Significance
PARENTS		
<i>S.E.S – comparison to professional</i>		
Intermediate	-0.6	0.046
Skilled non-manual	-0.7	0.030
Skilled manual	-0.8	0.004
Semi-skilled	-0.12	0.0001
Unskilled	-0.04	0.030
Not in employment category	n.s.	
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	n.s.	
Sibs = 2	n.s.	
Sibs = 3+	-0.06	0.009
English 1 st language	-0.10	0.0001
CHILD		
Gender	0.06	0.002
<i>Previous developmental problems – comparison to none</i>		
Low	n.s.	
Moderate–high	-0.08	0.0001
<i>Previous behaviour problems – comparison to none</i>		
Low	n.s.	
Moderate–high	-0.04	0.049
HOME		
Learning environment	0.10	0.0001
<i>Peer play out of home – comparison to none</i>		
1 day per week	0.08	0.0001
2 days per week	0.07	0.001
3 days per week	0.05	0.007
4 or more days per week	0.08	0.0001
CHILDCARE HISTORY		
Time in target centre	0.10	0.0001
Group care	0.04	0.029

Parent

Of the parental variables only socio-economic status was significantly related to confidence. Those children in the professional group scored higher on confidence than children in all other groups, except for children whose parents were not in an employed category.

Family

The family variables of whether English was a first language and number of siblings were significantly related to confidence. Children whose first language was not English were rated by pre-school staff as lower on confidence than children whose first language was English. Children with three or more siblings were rated lower on confidence than other children.

Child

Gender was related to confidence, with girls being rated significantly higher than boys. Moderate to high levels of previous developmental problems and previous behaviour problems were associated with lower confidence.

Home

Two home variables were positively related to confidence scores. The home learning environment had a strong effect with higher HLE scores being associated with higher confidence. The other significant home variable was peer play outside of the home with children having more peer play being rated higher on confidence.

Childcare history

Two childcare history variables were related to significant effects on confidence. The time at the target pre-school centre had a strong effect and children with more time at the target pre-school centre were rated higher on confidence. Also, children with more previous group care (e.g. day nursery, playgroup) were rated higher on confidence.

It is likely that the effect of this variable is due to the private day nursery and LA centre groups as these groups have most variation on this variable. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable no longer had a statistically significant effect. This result indicates that the private day nursery and LA centre groups carry the effect of the variable time in target centre, and that for the other groups this variable is non-significant.

Final regression model of predictors for antisocial behaviour

R = 0.24
R² = 0.06
Adjusted R² = 0.05
F (18, 2749) = 8.97, Significance p<0.0001

Variable	Standardized β	Significance
PARENTS		
<i>Mother's age – comparison to under 21</i>		
21 +	-.04	0.046
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	-0.07	0.005
Sibs = 2	-0.09	0.0001
Sibs = 3+	-0.09	0.0001
CHILD		
<i>Previous behaviour problems – comparison to none</i>		
Low	0.06	0.003
Moderate – high	0.06	0.002
HOME		
Learning environment	-0.06	0.001
CHILDCARE HISTORY		
Time in target centre	0.11	0.0001
Relative care	-0.06	0.002
Group care	0.05	0.013
ETHNIC GROUP		
White European	n.s.	
Black Caribbean	0.10	0.0001
Black African	0.06	0.001
Indian	n.s.	
Pakistani	n.s.	
Other	n.s.	
Mixed Heritage	0.04	0.019

The factor of antisocial behaviour was derived from the factor analysis of ASBI items, and is equivalent to a sub-scale of disruptive behaviour. This factor produces a weak regression model that only accounts for 5 per cent of the variance.

Parent

Of the parent variables only mother's age has any significant effect. This weak effect indicates that where the mother was 21 or younger at the start of the study (i.e. 18 or younger at child's birth) then the child was more likely to be rated higher on antisocial behaviour by pre-school staff.

Family

Of the family variables, number of siblings had a significant effect. Children with siblings were rated as showing less antisocial behaviour than only children.

Child

Of the child variables only previous behaviour problems and ethnic group had a significant effect. Previous behaviour problems were associated with higher scores for antisocial behaviour. There were also some effects related to ethnic group. Children of Black Caribbean, Black African and Mixed heritage were more likely to be rated by pre-school staff as exhibiting antisocial behaviour.

Home

The home learning environment had a significant effect, with higher HLE scores being associated with less antisocial behaviour.

Childcare history

Three aspects of previous childcare experience had significant effects. Those children who had been cared for more by a relative (usually grandmother) had lower antisocial scores, while children with more group care (e.g., day nursery, playgroup) had higher antisocial scores. Also more time at the target pre-school centre was linked with higher antisocial scores.

As described earlier it is likely that the effect of this variable is due to the private day nursery and LA centre groups. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable no longer had a statistically significant effect. This result indicates that the private day nursery and LA centre groups carry the effect of the variable time in target centre, and that for the other groups this variable is non-significant.

Regression model for worried/upset behaviour

The results for this regression are reported in order to complete the reporting the analyses for social/behavioural development. The strength of the regression model is too slight for any confident conclusions. The results of the regression for worried/upset behaviour are shown in Appendix 3.

SUMMARY OF SECTION C REGRESSION ANALYSES FOR SOCIAL/BEHAVIOURAL DEVELOPMENT

The regression models accounted for a relatively small part of the total variance of the children's scores on the social/behavioural measures in the first stage of the study. Nonetheless there are a range of variables which do show significant effects. Some of the significant effects are quite strong and others are relatively weak. It is a characteristic of studies with very large samples that weak effects can still prove to be statistically significant upon social/behavioural development. The effects for the various categories of independent variables, i.e. parent, family, child, home, and childcare, are summarized here.

Parent

The parental variables had few effects. The variables of socio-economic status, mother's qualifications, mother's age, father's age, mother's part/full-time employment, father's part/full-time employment were all used in the regressions. Socio-economic status was significantly related to both co-operation/conformity and confidence. For both of these social/behavioural variables the children of professional parents were rated more highly than other children in the study. Only mother's age had a significant effect upon the amount of antisocial behaviour. Children with the youngest group of mothers (18 years or younger at the birth) scored higher for antisocial behaviour than the children with mothers on the older age groups, when all the other variables are taken into account.

Family

Family variables had rather more influence on the measures of social/behavioural development. Whether English is the first language is a significant predictor of co-operation/conformity, peer sociability and confidence. For these aspects of social development children whose first language is not English scored lower. This variable obviously relates to children from ethnic minorities, yet no specific ethnic group differences were found for co-operation/conformity, peer sociability or confidence.

Another family variable with significant effects was number of siblings. The effects were varied. Children with one or two siblings scored higher on co-operation/conformity. Children with three or more siblings scored lower on peer sociability and confidence. Only children were rated higher on antisocial behaviour than children with siblings. For social/behavioural development most advantage accrues to those children with one or two siblings.

Child

The child variables had effects on all measures of social/behavioural development. Gender and age had significant effects on co-operation/conformity, peer sociability and confidence, with girls and older children scoring higher. There were no gender or age effects on antisocial or worried/upset behaviour when all the other variables had been accounted for.

The child's level of previous behaviour problems reported by the parent had a significant effect on every measure of social/behavioural development. Those children with higher levels of previous behaviour problems scored lower on co-operation/conformity, peer sociability and confidence and scored higher on antisocial behaviour, indicating that early behaviour problems observed at home are continuing in their effect into the pre-school environment.

Those children with higher level of previous developmental problems scored lower on co-operation/conformity, peer sociability and confidence, possibly reflecting a general developmental effect. Those children with more perinatal health problems (during the first two months) had lower scores on co-operation/conformity.

For antisocial and worried/upset behaviour there were some ethnic group effects, Black Caribbean, Black African and Mixed heritage children being rated higher for antisocial behaviour, while Black Caribbean were also rated higher for worried/upset behaviour, and White European

children were rated lower for worried/upset behaviour. These ethnic group effects were present in weak regression models and should be interpreted with caution.

Home

Variables deriving from the home environment had significant effects on four measures of social/behavioural development. The home learning environment produced significant effects on all dependent variables except worried/upset behaviour, which had a very weak regression model. The higher the home learning environment, the higher the scores for the child on co-operation/conformity, peer sociability and confidence and the lower the scores for antisocial behaviour. Peer sociability and confidence were influenced by children's experience of playing with friends elsewhere having a positive effect. This effect was strongest for confidence.

The variable whether the child had a regular bed time was one of several variables aimed at tapping the degree of structure in the child's home life, and this variable had a significant effect on co-operation/conformity, with children with a regular bed time scoring higher.

Childcare history

Variables related to the child's childcare experience had significant effects on all measures of social/behavioural development. Considering childcare before starting at the target centre, the amount of childcare by relatives had effects on co-operation/conformity and antisocial behaviour. More relative care was associated with higher co-operation/conformity and lower levels of antisocial behaviour. However, more group care was associated with higher levels of antisocial behaviour. The time the child had spent at the target centre was related to co-operation/conformity, peer sociability, confidence, antisocial, and worried/upset behaviour. Those children who had spent more time at the target centre scored higher on co-operation/conformity, peer sociability and confidence and higher on antisocial, worried/upset (and disruptive) behaviour. Similar effects have been reported in studies of children in group day care (e.g. Clarke-Stewart *et al.* 1980; Haskins 1985). It appears that those children with more time at the target centre are rated as showing more of all kinds of socially oriented behaviours.

In this study the effects of the variable time in target centre (before entering the study) was removed if children from the private day nursery and LA centre groups were omitted from the analysis. This indicates that the effect of this variable is carried by these two pre-school groups.

SECTION D COGNITIVE DEVELOPMENT

The children in the study were all assessed for their level of cognitive attainment at the start of the study. The assessment used were four sub-scales of the British Ability Scales (BAS). These sub-scales (block building, picture similarities, verbal comprehension and picture naming) were summed to produce an overall assessment of cognitive attainment. In addition two of the sub-scales, block building and picture similarities, were combined as a score of non-verbal cognitive attainment. This non-verbal aspect of cognitive development was not directly tapping abilities likely to be affected by language. Hence the non-verbal measure is useful for considering cases where limited language experience or restricted language development may be adversely affecting the child's overall score for cognitive development. In this section the overall level of cognitive development is analysed using the procedure outlined earlier. The final regression model including only significant predictor variables is presented and subsequently the same regression model is fitted to the dependent variable of non-verbal cognitive attainment. Comparison of these two regression models can be used to reveal situations where language factors may be having an effect on the predictive power of independent variables.

Final regression model for overall cognitive scores

R = 0.68

R² = 0.46

Adjusted R² = 0.46

F (32,2714) = 72.64, significance p<0.0001

	Standardized β	Significance
PARENTS		
<i>SES – comparison to professional</i>		
Intermediate	-0.06	0.025
Skilled non-manual	-0.12	0.0001
Skilled manual	-0.07	0.0001
Semi-skilled	-0.15	0.0001
Unskilled	-0.08	0.0001
Unemployed/student	-0.07	0.0001
<i>Mother's qualifications. – comparison to none</i>		
16 vocational	<i>n.s.</i>	
16 academic	0.08	0.0001
18 vocational	0.06	0.003
18 academic	0.08	0.0001
Degree/postgraduate	0.18	0.0001
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	<i>n.s.</i>	
Sibs = 2	<i>n.s.</i>	
Sibs = 3+	-0.08	0.0001
English 2nd language	-0.20	0.0001
CHILD		
Gender – girls vs. boys	0.06	0.0001
Age	0.42	0.0001
Birth weight	0.06	0.0001
<i>Developmental problems – comparison to none</i>		
Low	-0.04	0.004
Moderate–high	-0.10	0.0001
HOME		
Learning environment	0.17	0.0001
Regular bed time	0.04	0.005
CHILDCARE HISTORY		
Time in target centre	0.05	0.009
Total group care	0.06	0.0001
ETHNIC GROUP		
<i>Comparison to White UK</i>		
White European	-0.09	0.0001
Black Caribbean	<i>n.s.</i>	
Black African	-0.05	0.001
Indian	<i>n.s.</i>	
Pakistani	-0.07	0.0001
Bangladeshi	-0.07	0.0001
Other	-0.03	0.002
Mixed Heritage	-0.05	0.028

Final regression model for nonverbal cognitive scores

R = 0.55

R² = 0.30

Adjusted R² = 0.29

F (32,2712) = 36.21, significance p<0.0001

	Standardized β	Significance
PARENTS		
<i>SES – comparison to professional</i>		
Intermediate	-0.07	0.018
Skilled non-manual	-0.09	0.004
Skilled manual	-0.10	0.0001
Semi-skilled	-0.12	0.0001
Unskilled	-0.07	0.0001
Unemployed/student	-0.07	0.0001
<i>Mother's qualification – comparison to none</i>		
16 vocational	n.s.	
16 academic	0.07	0.0001
18 vocational	n.s.	
18 academic	0.07	0.001
Degree/postgraduate	0.13	0.0001
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	n.s.	
Sibs = 2	n.s.	
Sibs = 3+	-0.06	0.005
English 2nd language	n.s.	
CHILD		
Gender – girls vs. boys	0.06	0.001
Age	0.45	0.0001
Birth weight	0.07	0.0001
<i>Developmental problems – comparison to none</i>		
Low	-0.05	0.004
Moderate – high	-0.08	0.0001
HOME		
Learning environment	0.11	0.0001
Regular bed time	0.04	0.010
CHILDCARE HISTORY		
Time in target centre	n.s.	
Total group care	0.04	0.023
ETHNIC GROUP		
<i>Comparison to White UK</i>		
White European	n.s.	
Black Caribbean	n.s.	
Black African	n.s.	
Indian	n.s.	
Pakistani	n.s.	
Bangladeshi	-0.04	0.027
Other	n.s.	
Mixed Heritage	n.s.	

The regression model for overall cognitive development was very strong accounting for more than 46 per cent of the variance. As expected, overwhelmingly the strongest variable was age at assessment. The next strongest effects were for the variables: whether English was a first language, home learning environment, socio-economic status, mother's education and previous developmental problems, and the childcare variables of time at target centre, and group care. This group of variables all showed strong effects of the same order of magnitude. Other significant effects were due to gender (girls higher than boys), birth weight, regular bed time, and ethnic group variables. Several ethnic groups showed lower scores than the White UK group, these were White European, Black African, Pakistani, Bangladeshi, Other and Mixed Heritage. The ethnic groups of Black Caribbean and Indian did not differ significantly from the White UK group. The regression analysis was repeated using only non-verbal scores as an outcome. The analysis of non-verbal scores showed no effects for whether English was a first language and all ethnic group effects except one disappeared. Those children of Bangladeshi heritage had lower non-verbal scores than children of White UK heritage, but the effect size was considerably reduced. This indicates that ethnic group effects on cognitive development are primarily mediated by language.

The time at the target pre-school centre for the private day nursery and LA centre children is around fifteen times that for nursery class children and nine times that for playgroup children (Melhuish *et al.* 1999). Such large variations mean that it is likely that the impact of this variable may differ substantially between pre-school groups. Hence it may well be that the private day nursery and LA centre groups essentially carry the effect of this variable. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable no longer had a statistically significant effect, and some ethnic group comparisons are no longer significant as the numbers in the ethnic subgroups are reduced. This result implies that the private day nursery and LA centre groups carry the time in target centre effect. As discussed earlier (p.19) the other pre-school groups show little variation on the variable time in target centre, hence within these groups there is little opportunity for the variable to exert an effect.

SUMMARY OF SECTION D: REGRESSION ANALYSES FOR COGNITIVE DEVELOPMENT

The regression model accounts for 46 per cent of the variance. This is high in relation to most studies of cognitive development in the early years. There are many variables that show significant effects upon cognitive development at the start of the study. Some of these effects are powerful and others are relatively weak. The effects for the various categories of parental, family, child, home and childcare variables are summarized below.

Parents

In the final regression model, two parent variables were significant; socio-economic status and mother's qualifications. For socio-economic status, the professional group scored significantly higher than all other groups. Mother's qualifications were also significant. Where the mother had no qualifications or a 16-years-of-age vocational qualification, the children's BAS scores were similar. However, for all other levels of mother's qualifications, the child scored higher than when the mother had no qualifications. The effect became greater the higher the mother's qualification.

Family

Of the family variables, number of siblings and whether English was the first language were significant variables in predicting children's cognitive scores. Where there were three or more siblings cognitive scores decreased significantly.

Where English was not the first language, the child scored lower on overall cognitive development, but this effect disappears when nonverbal cognitive development is considered.

Child

Amongst the child variables gender (girls scored higher than boys) age, and birth weight were all significant predictors of cognitive scores. In addition, where there were previous developmental problems (e.g. speech problems, late to walk) then children scored lower than if there had been no previous developmental problems.

The ethnic group comparisons were added as a block after all the other variables had been dealt with. The reason was to allow the tests for ethnic group differences to occur having taken account of all other significant variables. The BAS scores for ethnic groups were compared against those of the White UK group. Several comparisons were statistically significant. The White European, Black African, Pakistani, Bangladeshi, Mixed Heritage and Other groups all scored lower than the White UK group after all the other significant variables had been taken into account. There were no significant differences for the other ethnic group comparisons. The regression analysis was repeated using only nonverbal scores as an outcome. The analysis of nonverbal scores showed no effects for whether English was a first language and all ethnic group effects except one disappeared. Those children of Bangladeshi heritage had lower nonverbal scores than children of White UK heritage, and this effect was smaller than when verbal scores were included. This indicates that ethnic group effects on cognitive development are primarily mediated by language.

Home

Of the variables related to home environment, the variable home learning environment had a powerful effect. If the variables relating to (i) home learning environment, (ii) mother's qualifications, and (iii) socio-economic status are deleted from the regression model one at a time, the relative strength of effects for these three factors can be compared. The home learning environment is the variable that produces the greatest decrease in the variance accounted for in the model. Hence the strongest effect is for home learning environment. While age and whether English is a first language show the strongest effects on BAS scores, the next most powerful effect is for the learning environment of the home. Its effect is stronger than that of either socio-economic status or mother's qualifications, which have often been found to be among the strongest predictors of children's developmental outcomes in other studies (e.g. Davie, Butler and Goldstein 1972). In homes with a regular bedtime (which might be regarded as a proxy variable for degree of structure in the home) children also scored higher on cognitive development.

Childcare history

Amongst the childcare history variables, time in target centre, and previous group care experience show significant effects. For both independent variables increases are associated with higher BAS scores. The variables time at the target centre, and group care before the target centre are significant for the total sample. However the effect of the variable time in target centre is carried by the private day nursery and LA centre children only.

SUMMARY AND DISCUSSION

The final regression models accounted for a small part of the variation amongst children for social/behavioural development, but a large part of the variation for cognitive development. Hence the explanatory value of the models is much stronger for cognitive development.

Parents

The parental variables had few effects upon social/behavioural development, while having stronger predictive power for cognitive development. Socio-economic status, mother's qualifications, mother's age, father's age, mother's part/full-time employment, father's part/full-time employment were all used in the regressions. Socio-economic status was significantly related to both co-operation/conformity and confidence. For both of these social/behavioural variables the children of professional parents were related more highly than other children in the study. Additionally mother's age had a significant effect upon the amount of antisocial behaviour. Children with very young mothers scored higher for antisocial behaviour than children with older mothers. For cognitive development two parent variables were significant: socio-economic status and mother's qualifications showed powerful effects. For socio-economic status, the professional group scored significant higher than all other groups. Mother's qualifications were also significant. However, for all levels of mother's qualifications above age 16 vocational, the child scored higher than when the mother had no qualifications. The effect was greater the higher the mother's qualification. The results relating to parent variables are similar to findings in other studies (e.g. Davie, Butler and Goldstein 1972). They reflect the greater resources (personal and material) that are often more available to parents of higher SES and qualifications for providing a nurturing environment for their children.

Family

There are some significant effects for family variables. If English was not the child's first language, this was associated with lower co-operation/conformity, and lower cognitive development scores. The number of siblings had varied effects. Children with one or two siblings scored higher on co-operation/conformity. Children with three or more siblings scored lower on peer sociability and confidence. Only children were rated higher on antisocial behaviour than children with siblings. For social behavioural development having one or two siblings but not more was most advantageous. Children with three or more siblings scored lower on cognitive development. Larger families may result in less parental attention being available for any individual child. This decreased individual attention from parents may be the reason for the effects on cognitive development.

Child

The child variables included gender, age, aspects of previous health, previous developmental problems and previous behaviour problems.

Gender had several significant effects. Girls showed more co-operation/conformity, peer sociability and confidence. Girls also had higher cognitive development scores. These results suggest that pre-school gender differences are precursors of later gender differences found in schools.

Age was an important variable, being associated with increased co-operation/conformity, peer sociability and confidence, and higher cognitive development scores, reflecting general developmental trends.

Aspects of health had some slight effects in that children with more perinatal health problems (first two months) had lower co-operation/conformity. Also children with lower birth weights had lower cognitive development scores. Where children had previous developmental problems (e.g. speech problems, late to walk), they were more likely to have lower cognitive development scores. They also had lower co-operation/conformity, peer sociability and confidence. These may reflect a general developmental effect for health related problems.

Where children had previous behaviour problems reported by the parent, they had lower co-operation/conformity, peer sociability and confidence, and increased antisocial behaviour. This indicates that early behaviour problems observed at home continue into the pre-school environment.

When all other significant variables were taken into account, there were no specific ethnic group differences found for the social/behavioural development variables of co-operation/conformity, peer sociability or confidence. There were some ethnic group differences associated with antisocial and worried/upset behaviour. Black Caribbean, Black African and Mixed Heritage children were reported as showing more antisocial behaviour than White UK children. Black Caribbean children were rated as showing more worried/upset behaviours and White European children as showing less than White UK children. However these ethnic group effects were present in weak regression models and should be interpreted with caution.

With regard to cognitive development, there were some specific ethnic group effects. Several ethnic groups showed lower cognitive scores than the White UK group, these were White European, Black African, Pakistani, Bangladeshi, Other and Mixed Heritage. These effects persisted after all available parental, family, child, home and childcare variables had been taken into account. However, an analysis of nonverbal scores showed no effects for whether English was a first language and all ethnic group effects except one disappeared. Those children of Bangladeshi heritage had lower nonverbal scores than children of White UK heritage, but the size of this effect was considerably smaller than when verbal scores were included. This indicates that ethnic group effects on cognitive development are primarily mediated by language. Similar results were reported in a multi-level analysis of EPPE data by Sammons *et al.* (1999). This indicates that the ethnic group effects on cognitive development are almost entirely mediated by language.

While it is probable that ethnic group effects on cognitive development are mediated by language, it is unclear whether social/behavioural differences are mediated by language. This is possible in that social/behavioural outcomes derive from ratings made by pre-school staff. To the extent that incompatibility of communicative skills between staff and children affect staff-child interactions, staff impressions of children's behaviour may be affected, with consequent effects on their ratings of children.

Home

Several aspects of the home environment were recorded from the parent interview, including the home learning environment, play with friends in different settings, television watching and household rules. Several of these variables had isolated effects. Those children who had more experience of playing with friends outside of the home showed higher peer sociability and confidence. The variable, whether the child had a regular bedtime, could be regarded as a marker for the degree of structure in the child's home life. This variable was associated with increased co-operation/conformity and higher cognitive development scores.

From questions to the parent regarding learning and play activities, a variable called the home learning environment was constructed. This variable proved to have several powerful effects involving all child development variables. Higher home learning environment score were associated with increased co-operation/conformity, peer sociability and confidence, and lower

antisocial and worried/upset behaviour and higher cognitive development scores. The effect on cognitive development was particularly pronounced. After age, it was the variable with strongest effect on cognitive development. Its effect was stronger than either social class or parental education, which have often been found to be amongst the strongest predictors of children's cognitive development in previous studies.

The variable home learning environment produced the strongest effect on the cognitive scores after age. The correlation between learning environment and total BAS scores was 0.38 which indicates the strength of association, which is greater than that between BAS scores and demographic variables such as socio-economic status and parental education that have often been found to be amongst the strongest predictors of children's cognitive development (e.g. Davie, Butler and Goldstein 1972). The importance of the home learning environment indicates that what parents do is more important than who parents are.

It is rare for a large-scale study, longitudinal or not, to include process variables indicative of family interaction processes or patterns of experience in the home other than the standard structural demographic variables such as social class or parental education. The strength of the effect of this variable could well be informative to projects targeted on improving the home environment of children with regard to reducing social exclusion, for example Sure Start. The components of the variable learning environment in the home provide a starting point for consideration of which aspects of family life may be involved in efforts to produce measurable beneficial effects upon children's development.

It is quite possible that the strong relationship between home learning environment and cognitive scores is mediated by some intervening unmeasured factor. Those parents who answer the questions concerned with learning environment in a way leading to a high score may well have other characteristics, which lead their children to have higher cognitive scores. This question would require a detailed study of home experiences contributing to cognitive development, and may ultimately be unanswerable. At this stage, the home learning environment would appear to be a good starting point for a project concerned with improving children's development. One possible way forward would be a randomized control trial or other systematic study of an intervention e.g. a parent support programme, targeted on the components of the home learning environment.

Childcare history

The effects of childcare history were pervasive across social/behavioural development and cognitive development. The childcare history variables considered were relative care (e.g. grandmother), individual care (e.g. childminders), group care (e.g. day nurseries, playgroups) and time at the target centre (i.e. centre the child attended upon entering the study). These variables were all measured in terms of total time before entering the study.

All of these variables, except individual care, had associations with child development at the start of the study (i.e. when the child was aged 3–4). Relative care before entering the study showed modest effects but was associated with higher co-operation/conformity and less antisocial behaviour. Group care before entering the study was slightly associated with increased antisocial behaviour and had a slight significant association with higher cognitive development scores. The time that the children had spent in the target centre before entering the study had most and strongest effects.

More time in the target centre was associated with not only increased co-operation/conformity, peer sociability and confidence, but also increased antisocial and worried/upset behaviour and increased cognitive development scores. The children attending private day nursery or LA centres carry the effects for this variable almost entirely. These are the children who usually started at the centre at younger ages and had much more time in the target centre. The children with more time at the target centre were rated as showing more of all types of social behaviour,

both positive and negative. Similar results have been found in American studies of group care (e.g. Clarke-Stewart *et al.* 1980).

It was noteworthy that the effect on cognitive development is carried almost entirely by the powerful effect within the private day nursery group. There is no significant effect of this variable on cognitive development for children attending LA centres. The variable, time at target centre, had similar distributions for both groups. This suggests that there is some characteristic associated with time in target centre for private day nurseries which is not present for LA centres and that this characteristic is important for cognitive development. It is possible that this characteristic is related to differences in children's experiences in private day nurseries as opposed to LA centres. Alternatively, it might be some parental or some family characteristic associated with greater time in the target centre for private day nurseries but not for LA centres. Such a characteristic may be the effect of regular peer interaction with children from relatively advantaged backgrounds. Such children are likely to have considerable cognitive and social skills and continued interaction in such surroundings will lead to children learning from each other (via imitation and observational learning) and transferring such skills from peer to peer. In particular, where peers are more skilled this would lead to increased social and cognitive skills for children with such experience (e.g., children in private day nurseries). Such peer learning could operate for social/behavioural or cognitive skills.

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APPENDIX 1 ADAPTIVE SOCIAL BEHAVIOR INVENTORY

Name of child Name of Centre

Date of BirthName of administrator.....

Date of administration **R or NSAA**

1. Understands others' feelings, like when they are happy, sad or mad123
2. Is helpful to other children123
3. Is obedient and compliant123
4. When you give him/her an idea for playing, he/she frowns, shrugs shoulders, pouts or stamps foot123
5. Follows rules in games123
6. Gets upset when you don't pay enough attention123
7. Is sympathetic toward other children's distress, tries to comfort others when they are upset123
8. Waits his/her turn in games or other activities123
9. Is open and direct about what he/she wants123
10. Cooperates with your requests123
11. Can easily get other children to pay attention to him/her123
12. Says nice or friendly things to others, or is friendly towards others123
13. Will join a group of children playing123
14. In social activities, tends to just watch other123
15. Follows household or pre-school centre rules123
16. Says 'please' and 'thank you' when reminded123
17. Asks or wants to go play with other children123
18. Is calm and easy-going123
19. Plays games and talks with other children123
20. Shares toys or possessions123
21. Teases other children, calls them names123
22. Is confident with other people123
23. Prevents other children from carrying out routines123
24. Tends to be proud of things she/he does123
25. Accepts changes without fighting against them or becoming upset123
26. Bullies other children123
27. Is interested in many and different things123
28. Is worried about not getting enough
(where enough might include attention, access to toys, food/drink etc.)123
29. Is bossy, needs to have his/her way123
30. Enjoys talking with you123

R or N – Rarely or Never S – Sometimes AA – Almost Always

APPENDIX 2: THE THREE-SCALE RESOLUTION OF ASBI ITEMS

In this appendix the ASBI items have been scored as originally described by Hogan *et al.* (1992). This produces a three-scale resolution to the ASBI items. Analyses were then performed on the three-scale resolution as described before in the main results section.

In developing the inventory, Hogan *et al.* conducted a factor analysis of data from 545 3-year-old American children. The factor analysis strategy was chosen to maximize the independence of the factors and an orthogonal rotation procedure was selected. This procedure produces uncorrelated factors. Another criterion was to produce similar factor solutions for boys and girls. The factor analysis led to the selection of 30 items that comprised three scales: Social Competence (Express), Comply and Disrupt.

The **social competence** scale contains items such as:

- ◆ 'understands others' feelings, like when they are happy, sad or mad';
- ◆ 'is open and direct about what he/she wants'.

Note: Hogan *et al.* (1992) named this scale Express. In this paper the more transparent term Social Competence will be used.

◆ The **comply** scale contains items such as:

- ◆ 'is helpful to other children';
- ◆ 'shares toys or possessions'.

Sample items from the **Disrupt** scale are:

- ◆ 'gets upset when you don't pay enough attention';
- ◆ 'is bossy, needs to have his/her way'.

Three-scale resolution for ASBI

The 30 items of the ASBI were used to compute the social competence, comply and disrupt scales as described by Hogan *et al.* (1992). Scores on the social competence, comply and disrupt scales were produced by computing the average of the items scores for the items contributing to each of the scales. The interrelationships between the three scales can be seen in Table 4.

Table 4 Correlations between social competence, comply and disrupt

	Social competence	Comply
Comply	0.52**	
Disrupt	0.02	-0.51**

** significant at the 0.01 level (2 – tailed)

Social competence shows a positive association with comply but almost no association with disrupt. There is a negative association between social competence and disrupt. This indicates that children high on social competence are also likely to be rated as compliant; and children rated as highly compliant are unlikely to be rated as disruptive.

Relationship of the five-factor and three-scale resolutions

The five factors produced by the factor analysis in the main results section were then correlated with the three scales produced by the Hogan *et al.* method of combining items. The resulting correlations can be seen in Table 5.

Table 5 Correlations of three-factor and five-factor solutions to ASBI data

	Social competence	Comply	Disrupt
Co-operation/ Conformity	0.25**	0.87**	-0.37**
Peer Sociability	0.77**	0.31**	-0.02
Confidence	0.58**	0.16**	0.15**
Antisocial	0.02	-0.21**	0.69**
Worried/upset	0.01	-0.20**	0.57**

** significant at the 0.01 level (2 – tailed)

It would appear from these correlations that co-operation/conformity and comply are extremely similar ($r = 0.87$) antisocial and worried/upset are strongly correlated with disrupt ($r = 0.69$ and 0.57) while peer sociability and confidence are both highly related to social competence ($r = 0.77$ and $r = 0.58$).

Inspection of the items contributing to co-operation/conformity and comply confirms almost complete overlap and that they can be regarded as functionally equivalent.

Inspection of the items contributing to antisocial, worried/upset and disrupt shows that the disrupt scale is a combination of the antisocial and worried/upset items.

The items which make up social competence are almost the same as the list of items which is made by adding those loading most heavily on peer sociability with those loading most heavily on confidence. Hence it would appear that the five-factor solution has split the items of the social competence scale into two separate contributing factors. To summarize:

- ◆ Social competence is separated into factors of peer sociability (factor 2) and confidence (factor 3).
- ◆ Comply is equivalent to compliance/conformity (factor 1).
- ◆ Disrupt is separated into antisocial (factor 4) and worried/upset (factor 5) behaviours.

Three social/behavioural scales and cognitive development

The three ASBI scales developed by Hogan *et al.* were correlated with the four BAS sub-scales and total score of the BAS as shown in Table 6.

Table 6 Correlations between BAS and ASBI three-scale resolution

	Block building	Picture similarities	Verbal comprehension	Picture naming	Total Score
Social competence	0.12**	0.16**	0.27**	0.26**	0.30**
Comply	0.18**	0.20**	0.25**	0.23**	0.30**
Disrupt	-0.06	-0.06	-0.05	-0.03	-0.07

** significant at the 0.01 level (2 – tailed)

All the BAS scores show a similar pattern of significant low to moderate levels of association with the social competence and comply dimensions, but almost no association with the disrupt dimension.

This pattern is congruent with the conclusions reached earlier about the nature of the equivalence between the three- and five-factor resolutions to the ASBI data.

ANALYSES OF THE THREE-SCALE RESOLUTION OF ASBI DATA

Following Hogan *et al.* (1992) three scales of social competence, compliance and disruptive behaviour were constructed. These scales are closely related to the five factors analysed in Section C of the main results. These three scales were used in regression analyses using the method described in Section C.

The social competence scale was analysed by using it as the dependent variable in a multiple linear regression model with the parental, family, child, home, and childcare variables as predictor variables. The final regression model is shown below.

Final regression model of predictors for social competence (Social Competence)

R = 0.34

R² = 0.12

Adjusted R² = 0.11

F (17,2753) = 21.07, significance p<0.0001

Variable	Standardized β	Significance
PARENTS		
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1		n.s.
Sibs = 2		n.s.
Sibs = 3+	-0.10	0.0001
English 1 st language	-0.14	0.0001
CHILD		
Gender	0.08	0.0001
Age	0.07	0.001
<i>Previous developmental problems – comparison to none</i>		
Low	-0.05	0.005
Moderate–high	-0.11	0.0001
<i>Previous behaviour problems – comparison to none</i>		
Low		n.s.
Moderate–high	-0.05	0.005
HOME		
Learning environment	0.11	0.0001
<i>Peer play out of home – comparison to none</i>		
1 day per week	0.07	0.001
2 days per week	0.05	0.014
3 days per week	0.04	0.025
4 or more days per week	0.07	0.0001
CHILDCARE HISTORY		
Time in target centre	0.15	0.0001
Group care	0.04	0.042

Social competence is equivalent to a combination of the peer sociability and confidence factors discussed earlier. The regression model for social competence accounts for 11 per cent of the variance. The strongest effects are due to the variables time in the target centre, previous developmental problems, the number of siblings, whether English is a first language and the home learning environment (HLE). There are a number of other variables that exert a significant effect on social competence. These are gender, age, previous behaviour problems, frequency of playing with friends out of home, and amount of group care. These are the same variables exerting an effect for peer sociability, and apart from age, also for confidence.

Parent

None of the parental variables e.g., socio-economic status, parental qualifications, or age, were significantly related to social competence.

Family

However, the family variables of whether English was a first language, and number of siblings were significantly related to social competence. Children whose first language was not English were rated by pre-school staff as lower on social competence than children whose first language was English. Children with three or more siblings were rated lower on social competence than all other children.

Child

Several child variables were related to social competence. Girls were rated significantly higher than boys and older children were also rated higher on social competence. Previous developmental problems and previous behaviour problems were related to lower social competence scores.

Home

Two home variables were positively related to social competence. The home learning environment had a strong effect with higher HLE scores being associated with higher social competence. The other significant home variable was peer play outside of the home with children having more peer play being rated higher on social competence.

Childcare history

Of the childcare variables only time at the target pre-school centre had a significant effect. This effect was strong and children with more time at the target pre-school centre were rated higher on social competence.

The time at the target centre for the private day nursery and LA centre children is around fifteen times that for nursery class children and nine times that for playgroup children, Melhuish *et al.* (1999). Such large variations mean that it is likely that the impact of this variable may differ substantially between pre-school groups. Hence it may well be that the effect of this variable is due to the private day nursery and LA centre groups. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable no longer had a statistically significant effect. This result indicates that the effect of the variable time in target centre is carried by the private day nursery and LA centre groups, and that for the other groups this variable is non-significant.

Compliance

The same regression analysis method was used with compliance as the dependent variable. The results of this analysis are shown below.

Final regression model of predictors for compliance

R = 0.33
 R² = 0.11
 Adjusted R² = 0.11
 F (14, 2758) = 24.75, significance p < 0.0001

Variable	Standardized β	Significance
PARENTS		
<i>S.E.S. – comparison to professional</i>		
Intermediate	n.s.	
Skilled non-manual	-0.06	0.047
Skilled manual	-0.07	0.008
Semi-skilled	-0.07	0.006
Unskilled	n.s.	
Not in employment category	-0.05	0.031
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	0.08	0.001
Sibs = 2	0.05	0.023
Sibs = 3+	n.s.	
English 1 st language	-0.12	0.0001
CHILD		
<i>Previous developmental problems – comparison to none</i>		
Low	-0.05	0.0012
Moderate–high	-0.09	0.0001
<i>Previous behaviour problems – comparison to none</i>		
Low	-0.06	0.001
Moderate–high	-0.09	0.0001
<i>Perinatal health problems</i>	-0.05	0.009
HOME		
Learning environment	0.12	0.0001
Regular bedtime	0.04	0.019
CHILDCARE HISTORY		
Relative care	0.05	0.009

The compliance scale is essentially equivalent to the co-operation/conformity factor considered earlier. The regression model for compliance accounted for 10% of the variance observed in this sample. The strongest effect were due to the variables gender (girls showing more compliance than boys), previous developmental problems, previous behaviour problems, whether English is the first language, and the home learning environment (HLE) which all show similar levels of significant effects. Other variables showing smaller but significant effects are age, perinatal

health problems, whether there is a regular bed time, and the amount of childcare by relatives (e.g. grandmother) before starting at the target centre. These are the same predictor variables that exert significant effects for co-operation, with the exception that time in target centre also exerts a significant effect for co-operation/conformity.

Parent

None of the parental variables e.g., socio-economic status, parental qualifications, or age, were significantly related to compliance.

Family

However, the family variables of whether English was a first language, and number of siblings were significantly related to compliance. Children whose first language was not English were rated by pre-school staff as lower on compliance than children whose first language was English. Children with siblings were rated higher on compliance than only children.

Child

Several child variables were related to compliance. Girls were rated significantly higher than boys and older children were also rated higher on compliance. Previous developmental problems, previous behaviour problems and early health problems (during first 2 months) were all related to lower compliance scores.

Home

Two home variables were positively related to compliance scores. The home learning environment had the strongest effect of any variable and also homes with a regular bedtime (which might be regarded as a proxy variable for degree of structure in the home) were associated with higher compliance scores.

Childcare history

Some aspects of previous childcare experience had significant effects. Those children who had been cared for more by a relative (usually grandmother) had higher compliance scores.

Disruptive behaviour

The same analysis method was used as previously. The results are shown below.

Final regression model of predictors for disruptive behaviour

R = 0.26

R² = 0.07

Adjusted R² = 0.06

F (18, 2751) = 11.77, Significance p<0.0001

Variable	Standardized β	Significance
PARENTS		
<i>Mother's age – comparison to under 21</i>		
21+	-0.04	0.036
FAMILY		
<i>Number of siblings – comparison to none</i>		
Sibs = 1	-0.07	0.006
Sibs = 2	-0.07	0.003
Sibs = 3+	-0.07	0.004
CHILD		
<i>Previous behaviour problems – comparison to none</i>		
Low	0.07	0.0001
Moderate–high	0.08	0.0001
HOME		
Learning environment	-0.05	0.016
CHILDCARE HISTORY		
Time in target centre	0.12	0.0001
Relative care	-0.05	0.007
Group care	0.06	0.001
ETHNIC GROUP		
White European	n.s.	
Black Caribbean	0.09	0.0001
Black African	0.05	0.010
Indian	n.s.	
Pakistani	n.s.	
Bangladeshi	n.s.	
Other	n.s.	
Mixed Heritage	0.04	0.037

The disrupt scale is equivalent to a combination of the antisocial behaviour and worried/upset behaviour factors considered earlier. The regression model for the disrupt scale accounts for only 6 per cent of the variance in the sample. The strongest effect is the time at the target centre. There is a range of variables showing smaller significant effects. These are previous behaviour problems, the amount of group care (before target centre), the amount of childcare by relatives (before target centre), number of siblings, the home learning environment, mother's age, and some ethnic group effects. Black Caribbean, Black African and Mixed Heritage children are reported by pre-school staff as showing more disruptive behaviour than White UK children. This list of variables is exactly the same as those exerting significant effects for antisocial behaviour.

Parent

Of the parent variables only mother's age has any significant effect. This weak effect indicates that where the mother was 21 or younger at the start of the study (i.e. 18 or younger at child's birth) then the child was more likely to be rated higher on disruptive behaviour by pre-school staff.

Family

Of the family variables, number of siblings had a significant effect. Children with siblings were rated as showing less disruptive behaviour than only children.

Child

Of the child variables only previous behaviour problems had a significant effect. Previous behaviour problems were associated with higher scores for disruptive behaviour.

Home

The home learning environment had a significant effect, with higher HLE scores being associated with less disruptive behaviour.

Childcare history

Three aspects of previous childcare experience had significant effects. Those children who had been cared for more by a relative (usually grandmother) had lower disruptive scores, while children with more group care (e.g. day nursery, playgroup) had higher disruptive scores. Also more time at the target pre-school centre was linked with higher disruptive scores.

As described in Section C it is likely that the effect of this variable is due to the private day nursery and LA centre groups. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable no longer had a statistically significant effect. This result indicates that the private day nursery and LA centre groups carry the effect of the variable time in target centre, and that for the other groups this variable is non-significant.

APPENDIX 3: REGRESSION MODEL FOR WORRIED/UPSET BEHAVIOUR

Final regression model of predictors for worried/upset behaviour

R = 0.14
R² = 0.02
Adjusted R² = 0.02
F (12, 2758) = 4.63, Significance p<0.0001

Variable	Standardized β	Significance
PARENTS		
FAMILY		
CHILD		
<i>Previous behaviour problems – comparison to none</i>		
Low	n.s.	
Moderate–high	0.06	0.003
HOME		
CHILDCARE HISTORY		
Time in target centre	0.06	0.002
Group care	0.07	0.0001
ETHNIC GROUP		
White European	-0.05	0.044
Black Caribbean	0.08	0.001
Black African	n.s.	
Indian	n.s.	
Pakistani	n.s.	
Bangladeshi	n.s.	
Other	n.s.	
Mixed Heritage	n.s.	

The worried/upset factor produces a very weak regression model, accounting for only 2 per cent of the variance. The predictor variables showing a significant effect are previous behaviour problems, amount of group care, time in target centre, and the ethnic group variables, White European and Black Caribbean. All other variables are non-significant.

Moderate to high levels of previous behaviour problems are associated with increased worried/upset behaviour. Greater group care and time in the target centre are associated with increased worried/upset behaviour. There was less worried/upset behaviour for children of White European heritage and more worried/upset behaviour for children of Black Caribbean heritage as compared with children of White UK heritage.

More group care and more time at the target centre were associated with increased levels of worried/upset behaviour. As described earlier (p.19) it is likely that the effect of this variable is due to the private day nursery and LA centre groups. In order to check this proposition the analysis was rerun with the private day nursery and LA centre groups omitted. The resulting regression model produced essentially the same results with the exception that the time in target centre variable no longer had a statistically significant effect. This result indicates that the private day nursery and LA centre groups carry the effect of the variable time in target centre, and that for the other groups this variable is non-significant.

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