Predicting Achievement in the Early Years: How Influential is Personal, Social and Emotional Development?

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Abstract

The personal, social and emotional development (PSED) of young children is perceived to be an important aspect of child development and is included in the statutory early-years curriculum and assessment in England. Although widely valued, how strong is the relationship between PSED and cognitive development, and does this relationship change with age? This paper analyses large data sets collected from children aged 4, 5 and 7 years. The CEM Centre at Durham University has developed computer-delivered assessments of PSED, early reading and early maths, which are used on a large scale in England with children aged 4 and 5 years. Data from these assessments, collected on an annual basis, are analysed to explore the strength of the relationship between PSED and cognitive development at these ages, and further analyses of longitudinal data investigate how important PSED is in the prediction of later achievement at age 7 years.

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Introduction

The Early Years Foundation Stage (EYES), launched in March 2007 (DCSF, 2008) for use in England from September 2008 onwards, emphasises the importance of personal, social and emotional development (PSED) in the education and care of the 'whole child' from birth through to the end of the first (Reception) year at school age 5. The statutory assessment of the Early Learning Goals, that form the backbone of the framework, aims to measure progress in areas including disposition and attitude, social development and emotional development. The rationale behind this is to promote a positive sense of self, a positive disposition to learn and emotional well-being to know themselves and what they can do. The development of socio-emotional skills is clearly essential for children, but to what extent is this related to cognitive development? If there is a relationship, does this change with age? If a relationship is found, this will add weight to the importance of assessing PSED within schools and also support further research into causality and possible remediation or intervention.

There is a growing body of evidence to support a relationship between socio-emotional skill and cognitive function. Kohn & Rosman (1973) used instruments of social-emotional function to predict cognitive functioning using a two factor model: Interest-Participation versus Apathy-Withdrawal and Cooperation-Compliance versus Anger-Defiance. They found an association between high ratings on Apathy-Withdrawal and poor cognitive functioning in pre-school children. In a later study, (1974) they found that the same socio-emotional factors measured in pre-school explained 16%-22% of the variance in achievement in word-knowledge, reading and arithmetic at the age of 7. Miles and Stipek (2006) found significant associations between social skills (aggression and prosocial behaviour) and literacy in children from low-income backgrounds at particular risk of negative outcomes. This association was consistent with children aged 6, 8 and 10. Although they point out that their study was limited to a particular set of social skills and only related to literacy, it suggests the importance of schools in developing the social aspects of the child alongside academic achievement.
Not all recent studies have produced consistent findings. Lemelin et al (2006) conducted a study that investigated the contribution of socio-emotional factors (level of activity, pleasure, social fearfulness, anger proneness and interest/persistence) to individual differences in cognitive development. They found only activity level to be related to performance on a mental development scale.

In a comprehensive review, Blair addressed the functional role of social and emotional skills in cognition from a neurobiological perspective (2002). His work converged on their being a significant contribution from emotion in organising and directing cognition. For example deficits in strategic thinking have been associated with poor attributions of the self as a learner.

With studies from child development, educational psychology and neurobiology providing some interesting results, further research from a different angle has the potential to add to the existing body of knowledge and suggest further work. This study

investigated the relationship between PSED at the start of primary school with early reading and mathematics attainment on a large school-based cohort of children. The participants were then followed up to age 7 to explore longer-term relationships.

Method

Data for this study came from schools that participated in the PIPS (Performance Indicators in Primary Schools) monitoring system run by the CEM Centre, Durham University, UK (for more information see www.cemcentre.org). This is a large-scale system, which several thousand primary schools currently choose to subscribe to. The CEM Centre provides assessments for every year group throughout the primary school, collects and analyses pupil-level data, and provides standardised feedback for schools. As a result of this service, it holds large longitudinal datasets, of which one cohort has been analysed for this study.

Measures and Procedures

Assessments from three time-points were analysed. The first assessment was administered at the start of the first year of primary school (known as the Reception year in England, when the children are aged 4 years), the end of the first year at school (age 5 years in England) and in the January of the third year at school (age 7 years in England).

Children were assessed in the first few weeks of the first year of primary school with the PIPS On-Entry Baseline Assessment. This individually-administered, computer-adaptive assessment included the following measures:

1. Handwriting – the child is asked to write his/her own name.
2. Vocabulary – the child is asked to identify objects embedded within a series of pictures.
3. Ideas about reading – assesses concepts about print.
4. Repeats – child hears and repeats words in this measure of phonological awareness.
5. Rhyme detection – child hears a words and selects one that rhymes with it from a choice of three.
6. Letter identification – a fixed order of mixed upper and lower case letters.
7. Word recognition and reading (sentences and then comprehension).
8. Ideas about mathematics – assessment of understanding of mathematical concepts.
9. Counting and numerosity.
10. Sums – addition and subtraction problems presented without symbols.
11. Shape identification.
12. Digit identification.
13. Maths problems – including sums with symbols.

The internal (Cronbach's Alpha) and test/re-test reliabilities of the PIPS On-Entry Baseline Assessment were 0.94 and 0.98 respectively. For more detail about the content and psychometric properties of the PIPS On-Entry Baseline Assessment, see Tymms

(1999). The teacher works with individual pupils and the whole assessment takes approximately 20 minutes per child. The computer program presents the child with questions (orally) and, depending on the type of question, the child responds either by pointing to the answer from the choice of options on the screen or by saying the answer. The teacher records the child's response on-screen and the program selects the next question. The above sections of the assessment were originally created in 1994 for use in schools in England with the intention of providing a fixed point from which progress in reading and mathematics could be measured. As such, its content was designed after examining the results of longitudinal studies that had monitored the progress of children from the ages of 3-5 to the end of primary education and beyond.

The PIPS On-Entry Baseline Assessment was repeated at the end of the first year of school when the children were aged 5 years.

In addition to the areas of assessment described above, the PIPS On-Entry Baseline Assessment includes an optional assessment of personal, social and emotional development (PSED). This was carried out within the first few weeks of pupils starting school and repeated at the end of the year. The teacher observes pupils' behaviour in the school setting and then completes an observation record which covers 11 different areas of development:

1. Adjustment – Comfortable (how comfortable the child is at being left in the school setting).
2. Adjustment – Independence (how independent the child is, for example able to change for physical education unaided).
3. Personal – Confidence.
4. Concentration – Teacher directed activities.
5. Concentration – Self directed activities.
6. Personal – Actions (the extent to which the child considers the consequences of his/her actions).
7. Social – Relationship to peers.
8. Social – Relationship to adults.
9. Social – Rules (adherence to rules in social situations).
10. Social – Cultural awareness.
11. Social – Communication (ability to communicate non-verbally and verbally).

Each area has a 5-point scale and each point on the scale is accompanied by a descriptor. The teacher selects the descriptor that best fits the pupil's behaviour at that time. The scores are then manually entered into the PIPS Assessment program.

The PSED assessment was developed on the basis of practitioners' experience and developmental profiles (Allen and Maraotz, 1999). During the development phase, to measure the inter-rater reliability, class teachers and classroom assistants assessed the same sample of 769 children. The correlation between the two sets of results was 0.75 (significant at the 0.01 level). The distribution of scores at the start of the year was close to normal and the scale was reliable (Cronbach's alpha = 0.92). At the end of the year,

the scale did not discriminate at the top end of the distribution and so those scores were not analysed further in this study.

Half way through the third year of school, when the children were aged 7, assessments of reading and mathematics were administered. These assessments were developed exclusively for the PIPS project and the reading and mathematics sections were based on the English national curriculum. Each section had high internal reliability and validity (CEM Centre, 2008, Tymms, 1999).

Participants

Participation in the PIPS assessment systems is purely voluntary and schools pay to be involved. Schools subscribe to the system which allows them to assess pupils in any year group from ages 4 to 11. Each year the whole sample is checked to make sure it is nationally representative. The PIPS scores are normalized to produce scores for reading, maths and total which have a mean of 50 and standard deviation of 10. The 'total' score is made up of a standardized average of the reading and maths scores combined.

From the whole sample, pupils from schools that completed the optional PSED section in addition to the reading and maths sections at the start of the 2005/06 academic year were selected for this study. This consisted of 16,023 pupils in 758 schools at the start of the year. The sample of schools which chose to re-assess their pupils at the end of that year was smaller: 14,782 pupils in 704 schools. By the time the pupils had reached the third year of schooling in the 2007/08 academic year, aged 7 years, the sample had declined further to 3,561 pupils in 216 schools. Comparing the PIPS normalized scores against the national sample mean of 50 and standard deviation of 10, the means and standard deviations for reading and mathematics for each time-point are shown in Table 1.

Table 1: Mean scores and standard deviations for sample in reading and mathematics at each time point

	Reading		**Mathematics**	
	Mean	**SD**	**Mean**	**SD**
On-entry to school, aged 4 years	50.31	10.55	49.87	9.71
End of first year, aged 5 years	49.72	9.94	49.41	9.84
Third year, aged 7 years	49.89	9.87	50.43	9.81

These are very close to the national sample. The reasons for the decline in numbers over time were firstly due to families moving away from the schools' catchment areas and secondly because schools choose and pay to use PIPS assessments and some of these schools will have chosen not to assess their pupils in the later years.

Results

The raw scores for reading and mathematics attainment (and the total scores for the start and end of the first year of school) and for PSED were normalized with a mean of 50 and standard deviation of 10.

There were differences between boys and girls, and the mean scores, standard deviations and effect sizes of the differences are shown in Table 2.

Table 2: Mean scores, standard deviations and differences between boys and girls in the sample for reading and mathematics at each time point

	Sex	Number of pupils	Mean	Standard Deviation	Effect Size
PSED	M	8123	47.99	9.74	0.42
	F	7879	52.08	9.79	
Age 4 reading	M	8123	48.83	10.40	0.29
	F	7879	51.83	10.49	
Age 4 maths	M	8123	49.20	10.02	0.14
	F	7879	50.56	9.33	
Age 5 reading	M	7466	48.43	10.02	0.26
	F	7299	51.04	9.68	
Age 5 maths	M	7466	49.14	10.31	0.06
	F	7299	49.69	9.33	
Age 7 reading	M	1747	48.37	9.67	0.30
	F	1814	51.34	9.85	
Age 7 maths	M	1746	50.57	10.24	0.03
	F	1814	50.29	9.37	

Girls scored significantly (at the 0.01 level) higher than boys on all variables except Age 7 maths. The difference between girls and boys was largest for PSED, with an effect size of 0.42.

Correlations between PSED, reading and maths at each time-point are shown in Table 3.

Table 3: Correlations between PSED and reading and maths at each time point

	PSED
Reading age 4	0.50
Maths age 4	0.49
Reading age 5	0.40
Maths age 5	0.39
Reading age 7	0.37
Maths age 7	0.41

All correlations were statistically significant at the 0.01 level. The strongest correlations were between PSED and reading and maths at the start of school when the children were aged 4 years.

How important was PSED at the start of school for children's reading and maths at the later ages? This was explored using multilevel models in which pupils were nested in schools. The outcomes were reading and maths at ages 4, 5 and 7. At age 4, the controls were sex and PSED at the start of school. At age 5, the controls were reading and maths at age 4, sex, PSED at the start of school. At age 7, the controls were reading and maths at ages 4 and 5, sex and PSED at the start of school.

The results for reading are shown in the tables below:

Table 4: Outcome: Reading at age 4 (start of school)

	Null model	Controls excl. PSED	Full
Cons	50.678(0.223)	46.320(0.311)	21.916(0.425)
Sex		2.930(0.146)	0.587(0.127)
PSED age 4			0.564(0.007)
Variance			
School	27.616(1.837)	27.407(1.814)	29.681(1.862)
Pupil	83.873(0.958)	81.737(0.934)	58.342(0.667)

Table 5: Outcome: Reading at age 5 (end of first year at school)

	Null model	Controls Excl. PSED	Full
Cons	49.979 (0.213)	7.273(0.325)	6.141 (0.342)
Reading age 4		0.453(0.007)	0.434(0.007)

Maths age 4		0.371(0.007)	0.351(0.008)
Sex		0.806(0.089)	0.611(0.091)
PSED age 4			0.067(0.006)
Variance			
School	23.259(1.618)	15.058(0.962)	15.656(1.001)
Pupil	76.049(0.904)	27.278(0.325)	27.015(0.322)

Table 6: Outcome: Reading at age 7 (third year at school)

	Null model	**Controls Excl. PSED**	**Full**
Cons	49.600(0.360)	5.030(0.726)	4.678(0.766)
Reading age 4		-0.003(0.019)	-0.007(0.019)
Maths age 4		0.144(0.020)	0.140(0.020)
Reading age 5		0.545(0.021)	0.545(0.021)
Maths age 5		0.143(0.019)	0.140(0.020)
Sex		1.356(0.204)	1.300(0.207)
PSED age 4			0.020(0.014)
Variance			
School	19.016(2.557)	10.029(1.295)	10.003(1.292)
Pupil	77.721(1.894)	32.472(0.796)	32.456(0.795)

At the start of school, age 4, without any controls for attainment, PSED was very significant. Including it in the model reduced the variance between pupils but not schools. At the end of the first year of school at age 5, after controlling for prior attainment, which is the most significant control, PSED was still a statistically significant control. At age 7 it was no longer significant after taking prior attainment into account.

The maths results were similar to those of reading, as shown in Tables 7, 8 and 9 however they differed at age 7 when PSED was still statistically significant as a control.

Table 7: Outcome: Maths at age 4 (start of school)

	Null model	**Controls excl. PSED**	**Full**
Cons	50.091(0.176)	48.131(0.276)	24.296(0.398)
Sex		1.315(0.143)	-0.964(0.124)
PSED age 4			0.549(0.007)
Variance			
School	15.475(1.123)	15.440(1.125)	18.596(1.233)
Pupil	79.039(0.902)	78.523(0.901)	55.882(0.639)

Table 8: Outcome: Maths at age 5 (end of first year at school)

	Null model	**Controls Excl. PSED**	**Full**
Cons	49.710(0.199)	9.764(0.342)	7.873(0.358)
Reading age 4		0.203(0.008)	0.173(0.008)
Maths age 4		0.617(0.008)	0.584(0.008)
Sex		-0.817(0.094)	-1.144(0.095)
PSED age 4			0.112(0.007)
Variance			
School	19.562(1.405)	16.540(1.071)	17.660(1.121)
Pupil	78.172(0.929)	30.157(0.359)	29.464(0.351)

Table 9: Outcome: Maths at age 7 (third year at school)

	Null model	**Controls Excl. PSED**	**Full**
Cons	50.36(0.355)	8.772(0.729)	7.032(0.765)
Reading age 4		0.030(0.019)	0.011(0.019)
Maths age 4		0.249(0.020)	0.229(0.020)
Reading age 5		0.157(0.021)	0.155(0.021)
Maths age 5		0.411(0.020)	0.399(0.020)
Sex		-1.167(0.205)	-1.449(0.207)
PSED age 4			0.100(0.014)
Variance			
School	18.296(2.484)	9.827(1.272)	9.787(1.262)
Pupil	78.228(1.906)	32.908(0.807)	32.42(0.795)

Discussion

This study found PSED to be statistically significant in the prediction of achievement in reading and maths when the children in the sample were aged 4 years. This relationship was found to continue for maths until children reached the age of 7. However, PSED was found to no longer be a significant variable for the prediction of reading at the age of 7. These trends were similar to findings of the study by Miles and Stipek which reported that children with better social skills had better literacy achievement in the early years but the relationship when the children were tested in third-grade (aged 7) it was no longer significant. The current study adds weight to their findings for a number of reasons. Their sample was limited to 400 children and the range of social skills covered was limited to teacher rating on only two subscales: aggression and prosocial behaviour. This study also extends their work by including maths attainment as an outcome and raises the interesting question of why PSED continues to predict maths to a later age.

The findings indicate a relationship between PSED and cognitive function which has clear implications for practitioners. However, further work is needed to investigate the direction of causality. Using data from the US National Institute of Child Health and Human Development Study, Mann et al. (2007) found a significant relationship between lower prosocial scores and referral to remedial or special educational programmes. Direction of causality is not addressed, but it provides further evidence to suggest more work be done in this area with the potential for an intervention study. Miles and Stipek also addressed the issue of causation. Overall, some studies have previously found that poor academic skills predict later anti-social behaviour and others have found the reverse pattern.

Further potential research might take the form of an intervention study to improve certain aspects of PSED with the aim of investigating the benefit on attainment outcomes.

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