Factors associated with poor academic achievement among urban primary school children in Malaysia

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ABSTRACT

Introduction: The aim of this study was to identify factors associated with poor academic achievement during the early school years.

Methods: This was a cross-sectional study of urban Primary Two children. Sociodemographic and medical data were obtained from questionnaires and interviews. Achievement was based on marks obtained in the core subjects of the Primary One examination. All students underwent the Raven's Standard Progressive Matrices test as a general measure of cognitive ability, audiometry and visual tests, and standardised measurements of weight and height.

Results: Out of 1,470 eligible children, 206 (14 percent) had poor academic achievement. Of the 919 children who participated in the study, 111 (12.1 percent) had poor achievement compared with 95 (17.2 percent) of the 551 non-participants. Using logistic regression analysis, the factors that were found to be independently associated with poor academic achievement were lower mean Raven scores (p-value is less than 0.001), lower mean socioeconomic status scores (p-value is less than 0.001), larger sibship size (p-value is 0.031), male gender (odds ratio [OR] 1.7; 95 percent confidence interval [CI] 1.1–2.65) and a history of prematurity (OR 14; 95 percent CI 2–97.8).

Conclusion: Cognitive ability, gender, prematurity and social factors contribute to poor academic achievement during the early school years. The higher proportion of poor achievers among non-participants warrants further attention.

Keywords: academic achievement, cognitive ability, gender, prematurity, socioeconomic status

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INTRODUCTION

Poor academic achievement in school may be the result of an interplay between child factors and the environmental milieu. Studies have shown that the effects of poor academic achievement during the early school years often carry over to the adolescent years, with a higher proportion of school dropouts, behavioural problems and even delinquency among this population.[1] It is important not only to identify children who are coping poorly in the early years of school, but also to look at factors that have an impact on school achievement.

While earlier studies have looked at the child's medical and cognitive problems, and socioeconomic background,[2-8] more recent studies have emphasised the importance of family involvement and the child's intrinsic motivation.[9-11] A local study on early primary school children showed a weak but significant association between poor nutritional intake and academic achievement;[12] however, these children were from low socioeconomic areas and of a single ethnic origin. Another study examined recurrent abdominal pain and academic performance in children who had already completed six years of education.[13] A cross-sectional study was then undertaken in 2001 to identify low academic achievers among primary school children attending urban national-type primary schools in Malaysia and to determine the cognitive, sociodemographic, medical and nutritional factors that contribute to poor achievement.

METHODS

All Primary Two students from seven schools that were randomly selected from the Ministry of Education's list of schools in Kuala Lumpur, Malaysia, were recruited into the study. Their scores in two core subjects (Mathematics and the Malay Language) from the Primary One examination records were used to determine their academic performance, as these represented the essential academic components and the Malay Language was the medium of instruction for all subjects. Another core subject, English Language, was not included in the selection criteria as it was a second language for most students. A student was considered to be a poor academic achiever if he or she

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failed both subjects, i.e. obtained a score of less than 50% in the subjects. Children who did not sit for the Primary One examination or had moved to another school were excluded from the study.

Written information regarding the study and consent forms were distributed to eligible students. Parents who consented to participate were then required to complete a questionnaire that obtained details regarding their socioeconomic background, and the child's health and development. Attempts were made to maximise participation by redistributing forms at least thrice to students who did not return them previously and by using trained research assistants to contact families outside of school hours. Information on ethnicity, citizenship status and paternal occupation was obtained from the school register.

Raven's Standard Progressive Matrices test was used as a screening test of cognitive ability.[14] This test is designed to measure a person's ability to form perceptual relations and to reason by analogy independent of language and formal schooling, and may be used with persons ranging from six years old to adulthood. The candidate is provided with multiple choices to identify the missing segment required to complete a larger pattern in each test item. In this study, the test was administered in groups under the supervision of trained research assistants, and the raw scores were converted to percentile scores for analysis. This test was selected as it eliminates the bias of language. Furthermore, there was an ongoing study on visual-related problems among this cohort, and the Raven test results were used to correlate visual-motor and visual-perception test scores.

The socioeconomic status was determined by the same method used by Boey et al, with graded scores from 1 to 5 given for parental occupation and scores from 1 to 4 for educational attainment.[13] These scores were summated for both parents (range 4–18), with a higher score indicating a higher socioeconomic status.

Weight was measured using a digital weighing scale (Model 880, Seca, Hamburg, Germany) calibrated to the nearest 0.1 kg. Height was measured using a portable measuring unit (Seca Bodymeter Model 208, Seca, Hamburg, Germany) calibrated to the nearest 0.1 cm. Height-for-age was used as an indicator of past nutrition, while weight-for-height was used as an indicator of present nutrition.[15] The z-scores of weight-for-age, height-for-age and weight-for-height were calculated using a standardised program software (ANTHRO version 1.01, World Health Organization [WHO], Geneva, Switzerland).[16] Students were classified as underweight, stunted or wasted if their weight-for-age, height-for-age and weight-for-height scores were below –2 standard deviations (SD) of the WHO standards.[17] The body mass index was also calculated, with the students categorised as overweight or obese according to age and gender-specific values.[18]

Hearing was assessed using a diagnostic audiometer (Madsen Midi-mate 622, GN Otometrics, Taastrup, Denmark) in an empty classroom, where the noise environment level was monitored with a sound level meter (Quest 2800, Quest Technologies, Oconomowoc, WI, USA). Visual acuity was measured at 4 m using an LEA number chart (M & S Technologies Inc, Skokie, IL, USA) and performed in the classroom with a level of illumination of at least 300 lux. The study was approved by the university research and ethics committee and the Malaysian Ministry of Education.

Univariate analysis was carried out using the chi-square test (or Fisher's exact test for cell values < 5) and student's *t*-test of unpaired means. Logistic regression analysis, using the Statistical Package for the Social Sciences version 12.0 for Windows (SPSS Inc, Chicago, IL, USA), was employed to determine the variables associated with poor academic achievement. In order to avoid overfitting, the number of variables entered into the regression equation was reduced by including only those that were statistically significant on univariate analysis. A p-value < 0.05 was considered to be statistically significant.

RESULTS

There were 1,481 randomly selected children, out of which 11 were excluded, as they had either not taken the end of year examination or had changed schools. Of the 1,470 eligible children, 117 (8%) children's parents refused consent and 251 (17%) did not respond despite repeated attempts to obtain the consent forms back from the students. Out of the 1,102 children whose parents consented to participate, only 919 (83.3%) subsequently returned the completed questionnaires for analysis.

Based on the Primary One examination results of the 1,470 eligible children, 206 (14%) fulfilled the selection criteria of low academic achievement. There was no significant difference in the proportion of low achievers among the seven schools (chi-square 4.23, degree of freedom 6, p = 0.065). There was a significantly higher proportion of students with low academic achievement who did not participate in the study compared to those who did. There were no significant differences between the participant and non-participant students in terms of gender, ethnicity, citizenship status and paternal occupation (Table I).

Table I. Comparison of demographic profile of participants and non-participants in the study.

Demographic	No (%)		p-value
	Participants (n = 919)	Non-participants (n = 551)	
Male gender	465 (50.6)	295 (53.5)	0.414
Ethnicity			
Malay	863 (93.9)	511 (92.7)	0.420
Chinese	7 (0.8)	8 (1.4)	
Indian	46 (5.0)	31 (5.6)	
Others	3 (0.3)	1 (0.2)	
Migrant family	31 (3.4)	24 (4.4)	0.258
Paternal occupation			
Unemployed	42 (4.6)	23 (4.2)	0.767
Unskilled	311 (33.8)	186 (33.8)	
Skilled	313 (34.1)	165 (29.9)	
Professional	253 (27.5)	177 (32.1)	
Poor academic achievement	111 (12.1)	95 (17.2)	0.005
Failed ML only	155 (16.8)	115 (20.9)	0.039
Failed Maths only	213 (23.2)	186 (33.8)	< 0.001

ML: Malay Language

A total of 919 students had sufficient data for analysis. There was an equal proportion of male to female students (465 and 454, respectively). The ethnic groups comprised 863 (93.9%) Malays, seven (0.8%) Chinese, 46 (5.0%) Indians and three (0.3%) of mixed parentage. A total of 31 (3.4%) children came from migrant families.

The mean paternal and maternal education was 11.5 (standard deviation [SD] 2.91) and 11.2 (SD 2.57) years, respectively. Only 350 (38.1%) fathers and 165 (18%) mothers had attained college or university education. 224 (24.4%) fathers and 231 (25.1%) mothers had completed less than nine years of education. 253 (27.5%) fathers were professionals, 313 (34.1%) were skilled and 311 (33.8%) were unskilled workers. 42 (4.6%) of the fathers were unemployed. Half of the mothers (489 or 53.2%) were housewives, 63 (6.8%) were unskilled, 231 (25.2%) were skilled workers and 136 (14.8%) were professionals. The mean socioeconomic status score was 11.2 (SD 2.91).

Only 30 (3.3%) children were from single parent families. About half of the households (457 or 49.7%) had a family member who was a smoker, with a mean of 6.6 cigarettes smoked per day. The mean number of children in the family was 3.8 (SD 1.61). A total of 38 (4.1%) families had only one child, 641 (69.8%) had between two and four children and 240 (26.1 %) had five or more children. The main language spoken at home was Malay (93.5%), reflecting the ethnic makeup of our study population.

None of the patients had significant visual or auditory problems that could potentially interfere with their academic performance. There were very few children with prior medical problems. Only 14 (1.5%) mothers reported problems in pregnancy and 72 (7.8%) reported problems during delivery. 16 (1.7%) children were born with low birth weight (less than 2.2 kg) and seven (0.8%) were premature. Eight (0.9%) children had had seizures, 123 (13.4%) had a medical problem that required repeated visits to the doctor or hospital and 14 (1.5%) had had previous surgery. 78 (8.5%) students were classified as underweight, 83 (9%) were stunted and 28 (3.1%) were wasted. 157 (17.1%) students were classified as overweight and 55 (6%) as obese.

870 children (94.7%) had attended preschool before entering primary school. Of the 111 children identified as low achievers in this study, only 50 (45%) of the parents reported learning difficulties in the first year of school. The mean Raven percentile score achieved was 41.6 (SD 32.49), with 199 (21.7%) students achieving scores that were equivalent to the fifth percentile or less.

Table II shows the factors associated with poor academic achievement on univariate analysis. When these factors were subjected to logistic regression analysis, only low Raven scores, male gender, a lower socioeconomic status score, a larger number of siblings and a history of prematurity remained as independent factors (Table III).

DISCUSSION

This cross-sectional study of an urban population in Malaysia reveals that 14% of children had poor academic achievement after one year in primary school. Zalilah et al reported 31.3% in their urban study population, but had selected schools in low income areas and also included English Language test scores to determine academic achievement.[12] We had opted not to include English Language test scores, as only half of Zalilah et al's study population had passed the English Language test. Boey et al's study on urban Primary Six children reported that 40% of the children had below average scores based on the results of a standardised national examination.[13] The figures are not directly comparable, as there was an underrepresentation of students of Chinese ethnicity in this study. It is possible that other ethnic groups, especially the Chinese, had enrolled their children into vernacular or private schools, thus limiting the generalisability of our findings. A limitation of Zalilah et al's study [12] and ours was the lack of a standardised test of academic achievement nationwide for Primary One students. Although all schools had a standard syllabus and textbooks, bias could have arisen

Table II. Sociodemographic, cognitive and child health characteristics associated with poor academic achievement in Primary One school children.

Factor	Academic achievement, No.(%)		p-value
	Normal (n = 808)	Poor (n = 111)	
Male gender	397 (49.1)	68 (61.3)	0.017
Race			
Malay	762 (94.3)	101 (91.0)	0.394*
Chinese	6 (0.7)	1 (0.9)	
Indian	37 (4.6)	9 (8.1)	
Others	3 (0.4)	0 (0.0)	
Migrant family	27 (3.3)	4 (3.6)	0.782
Mean SES score ± SD	11.4 ± 2.81	9.3 ± 2.96	< 0.001
Mean no. of children ± SD	3.7 ± 1.48	4.6 ± 2.06	< 0.001
> 5 in family	193 (23.9)	47 (42.3)	< 0.001
Single-parent family	27 (3.3)	4 (3.6)	0.913
Birth order	2.5 (1.41)	3.1 (1.76)	0.001
Attended preschool	771 (95.4)	99 (89.2)	0.006
Passive exposure to household smoking	400 (48.5)	65 (58.6)	0.157
Mean no. of cigarettes exposed to per day ± SD	6.5 ± 6.95	7.0 ± 7.43	0.415
Health-related problems			
Pregnancy-related	11 (1.4)	3 (2.7)	0.234
Delivery-related	59 (7.3)	13 (11.7)	0.105
Low birth weight	13 (1.6)	3 (2.7)	0.428
Prematurity	3 (0.4)	4 (3.6)	0.005
Seizures	5 (0.6)	3 (2.7)	0.061
Previous surgery	11 (1.4)	3 (2.7)	0.234
Recurrent medical illnesses	106 (13.1)	17 (15.3)	0.524
Mean Raven scores ± SD	44 ± 31.7	24 ± 24.2	< 0.001
< 5th percentile	154 (19.0)	45 (40.5)	< 0.001
Nutritional status			
Mean weight for age z-score ± SD	−0.6 ± 1.49	−0.3 ± 1.47	0.259
Mean height for age z-score ± SD	−0.6 ± 1.00	−0.8 ± 1.09	0.100
Mean weight for height z-score ± SD	0.2 ± 1.52	0.2 ± 1.73	0.955
Mean body mass index ± SD	16.4 ± 3.24	16.3 ± 3.45	0.950
Overweight	137 (17.0)	20 (18.0)	0.842
Obese	49 (6.1)	6 (5.4)	0.536

* P-value is based on (x-1) degree of freedom.
SD: standard deviation

from each school setting its own examination. However, our study showed that there was no significant difference in the proportion of low achievers between the schools.

As only 62.5% of the total eligible population participated in the study, attempts were made to determine if this was representative of the population at large, by comparing data available from school records, such as race, gender, school grades and paternal occupation. Information on other factors that might result in selection bias was not available, as the majority of the non-participants were non-responders who could not be contacted. The fact that a larger proportion of non-participants had children who were low achievers than participants highlights the problem of limited access to families that most need help. Another limitation of this study was the inability to determine the reasons for non-response. Clearly, an outreach community programme is required for remedial measures rather than attempting to address the issue within the classroom alone.

As expected, academic achievement was related to cognitive performance,[5,11,19] as measured by the Raven scores in this study. However, this was modified by environmental factors, notably, low socioeconomic status. Previous studies, both locally and elsewhere, have shown the consistent influence of the child's socioeconomic background on school achievement.[2,3,5-8,12,13] Having a larger family size was also associated with lower academic achievement. This could be due to the dilution of resources, as pointed out by others.[9,20] Boys tend to do less well in school compared to girls, a phenomenon that has been noted since the 1980s.[3,6,12,13,21] This has been attributed to boys displaying a higher level of activity as well as having a different approach to academic achievement and a lack of concern with pleasing parents and teachers.[21]

In this study, prematurity was the only "medical"

Table III. Logistic regression analysis of factors associated with low academic achievement.

Factor	Beta coefficient ± SE	Odds ratio, 95% CI	p-value
Raven percentile score	−0.21 ± 0.005	-	< 0.001
Socioeconomic status score	−0.18 ± 0.043	-	< 0.001
No. of children in family	0.18 ± 0.082	-	0.031
Male gender	0.54 ± 0.223	1.7, 1.10–2.65	0.015
Prematurity	2.64 ± 0.991	14.0, 2.01–97.82	0.008

SE: standard error; CI: confidence interval

factor that was significantly associated with academic achievement. Prematurity and low birth weight has been shown in a local study on four-year-olds to be associated with lower IQ scores, clumsiness and behavioural problems.[22] The effects of prematurity carry over into school age, as evidenced in this and other studies that report a higher incidence of school-related problems among this population.[2-4,10] However, most studies have demonstrated that the effects of social disadvantage far outweigh those of prematurity or low birth weight.[2,3,10,22]

A history of having attended preschool was significant on univariate analysis in this study. A Cochrane Database System Review on day care for disadvantaged preschool children in the USA showed that day care has beneficial effects on cognitive development and school achievement.[23] Boey et al have pointed out that children who had attended more than one year of preschool education tended to perform better academically at 12 years of age.[13] The quality and duration of day care programmes in our study were not looked into, and might have resulted in this factor being excluded in the regression analysis.

Unlike the study by Zalilah et al,[12] this study did not find an association between poor nutrition and school achievement. The difference could be due to a larger study population, the different criteria used to define poor academic achievement, a smaller proportion of children who were malnourished and the inclusion of other more important factors in this study. A review of published studies investigating obesity and school performance found detrimental school performance among children who were obese.[24] However, we did not find such an association; the cause and effect of this association has not yet been established through research, and obesity may be a marker, rather than a causal factor, for low test scores.[25] Other studies found an association between academic achievement and coming from a single parent family.[3,6,10,13] This was not observed in our study as it is possible that other factors, such as the home environment and family educational resources, had diminished the impact of single parenthood.[7,9,11,20]

Some studies have suggested that other factors, such as parental involvement and the child's self esteem and motivation, could be even more important,[5,7,9-11] although there are others who disagree.[8,19] School-level factors (such as a viable curriculum, monitoring and high expectations, a conducive learning environment, and strong administrative leadership) have been shown to mediate academic performance.[26] A limitation of our study was that these potentially important issues were not addressed, as it is likely that a combination of school and subject-level factors serve to determine academic outcomes.

In conclusion, poor academic achievement was found to be prevalent in 14% of children at the end of their first year in primary school. Cognitive ability (Raven scores), child health (prematurity) and social factors (socioeconomic status, presence of a large number of children in the family, male gender) individually and collectively contribute to poor academic achievement during the early school years. Longitudinal studies are required to determine if these children with poor academic achievement in the first year of school are at risk for continuing educational failure. This study also highlighted the problem of accessing families of children who are most in need of remedial education. It implies that educational failure in the urban Malaysian setting is as much a "social" as an "educational" issue, and resources may need to focus on the family rather than on the child in the school environment alone.

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