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# Cognitive ability, levels of parent's education, gender-based differences and academic achievement among students of elementary school in Semarang, Central Java

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## ABSTRACT

The current research aimed at tapping correlations between cognitive ability, levels of parents' educational background, gender-based differences and academic achievement among students of elementary schools in Semarang. Participants were 114 students from three elementary state schools in Semarang, 56 (49.1%) were girls, and 58 (50.9%) were boys. Cognitive ability were assessed using a standardized intelligence testing, CFIT, levels of parents' educational background were derived based on a self-report demographic inventory, and academic achievement were based on the academic report derived from academic records of each school. We used *product moment correlations*, *t-test analysis* and *variance analysis* to analyse the data of the current study. Results of the data analysis showed that cognitive ability was positively and significantly related with academic achievement ( $r = .34, p < .01$ ), with no difference between girls and boys on cognitive ability ( $t(112) = -1.045; p > .05$ ). Albeit the result showing that there was no gender-based difference on cognitive ability ( $t(112) = -1.045; p > .05$ ), however, we found an interesting finding in which girls ( $M = 79,37; SD = 5.84$ ) outperformed boys ( $M = 73,32; SD = 4,49$ ) on academic achievement. Moreover, results based on variance analysis showing that levels of fathers' education correlated nearly significant (or significant at  $p < .10$ ) to academic achievement among these students ( $F = 2.246, p = .56 / p < .10$ ). Discussion and implications of the study were discussed.

**Keywords:** cognitive ability, levels of parents education, gender-based difference academic achievement, elementary school students, Semarang

## 1. Introduction

Academic achievement has been widely associated with intelligence (Deary, Strand, Smith, & Fernandes, 2007; Kuncel, Hezlett, & Ones, 2001).<sup>1</sup> In their impressive 5-year longitudinal study of over 70,000 British school children, Deary et al. obtained correlations of .69 between a standardised cognitive abilities test (CAT) and total grade GCSE (General Certificate of Secondary Education), and .72 between CAT scores and students' "Best 8" exam scores. Cognitive ability tests, especially intelligence quotient (IQ), have been shown to predict a number of students' outcomes, such as academic performance and grades (Leeson, Ciarrochi, & Heaven, 2008; Woolfolk, 2004).

Cognitive ability tests were intended, initially, to develop a method of identifying those students unlikely to benefit from regular school instruction and therefore in need of special educational services (Floyd, 2010; Woolfolk, 2004). Cognitive ability tests also allowed school psychologist to make normative and developmental comparisons<sup>3</sup> by situating a child's total score within the distribution of those expected based on age

In the Indonesian context, cognitive ability testing is, mostly, a privilege of rich private schools or some very good, favorite state-owned schools. The government doesn't see the importance of cognitive testings, therefore, psychological testings, include cognitive ability testings, have not yet the primary policy to be conducted in the educational settings. In fact, many primary school students coming from underprivileged or low socioeconomic background went to

state-owned schools with poor facilities/resources in Semarang City. Therefore, these schools could not afford to undertake cognitive ability testings.

Research has shown that socioeconomic status which includes family income, parents' educational background, and occupation is associated with some aspects of children's life, including cognitive outcomes (Bradley & Corwyn, 2002). Furthermore, research has shown that children with underprivileged background are at higher risk of having some developmental problems due to lack of resources, i.e. health care. Turkheimer, Haley, Waldron, D'Onofrio, and Gottesman's (2003) study revealed an intriguing finding in which they found that 60% of the variance in an IQ score was effected by the shared environment suggesting that socioeconomic status of children's parent strongly predicted children's IQ.

It is, therefore, important to assess the impact of cognitive factor on academic performance among students coming from underprivileged background. Secondary purpose of the current study was to assess the impact of the educational background of the parents because educational attainment may serve a proxy of cognitive ability (Berry, Gruys, & Sackett, 2006). Demographic variable that appears to discriminate students' academic achievement is gender. There is an increasing evidence that female consistently tend to outperform its male counterparts on academic achievement (Leeson et al., 2008; Sulastri, Handoko, & Janssens, 2015).

## 2. Method

*Sample.* Participants were 114 students from three elementary state-owned schools in Semarang, 56 (49.1%) were girls, and 58 (50.9%) were boys.

*Cognitive ability.* A standardized cognitive ability testing were conducted to assess the cognitive ability of these students. The standardized test was CFIT (Culture Fair Intelligence Test). We chose CFIT to retain the fairness of the IQ scores considering the underprivileged background of the students.

*Academic performance.* Data about the students' academic performance provided by each school's administrative staff, comprising of students' academic reports.

*Demographic variables.* Parents of these students filled out a self-report demographic questionnaire after giving consent to participate in the current study.

## 3. Results

*Preliminary results.* Significant gender differences were found in which girls ( $M = 79,37$ ;  $SD = 5.84$ ) outperformed boys ( $M = 73,32$ ;  $SD = 4,49$ ) on academic achievement. Fathers' educational attainment comprised of post-graduates were 7 people (6%), bachelor were 7 (6%), diploma were 6 (5%), high-school graduates /SMA were 64 (56%), junior high-school graduates/SMP were 16(14%), elementary school graduates were 13 (11%). Mothers' educational attainment comprised of post-graduates were 1 people (1%), bachelor were 9 (8%), diploma were 5 (4%), high-school graduates /SMA were 55 (48%), junior high-

school graduates/SMP were 22 (19%), elementary school graduates were 21 (18%).

*Data analyses.* We used *product moment correlations*, *t-test analysis* and *variance analysis* to analyse the data of the current study.

Cognitive ability was positively and significantly related with academic achievement ( $r = .34, p < .01$ ), with no difference between girls and boys on cognitive ability ( $t(112) = -1.045; p > .05$ ). Albeit the result of *t-test analysis* showed that there was no gender-based difference on cognitive ability ( $t(112) = -1.045; p > .05$ ), however, we found an interesting finding in which girls ( $M = 79, 37; SD = 5.84$ ) outperformed boys ( $M = 73,32; SD = 4,49$ ) on academic achievement. Moreover, results based on *variance analysis* showing that levels of fathers' education correlated nearly significant (or significant at  $p < .10$ ) to academic achievement among these students ( $F = 2.246, p = .56 / p < .10$ ).

#### **4. Discussion**

Results of the current study showing that cognitive ability correlated positively and significantly to academic achievement add to previous studies confirming that intelligence is central of academic achievement (Deary et al., 2007; Sheard, 2009). The current study highlights the importance of psychological testings, particularly a standardized cognitive testing, as research has shown that cognitive ability is of central on the prediction of students' academic achievement.

Secondly, with regard to gender-based differences in academic achievement, result of the current study is consistent with previous studies

(Furnham, Chamorro-Premuzic, & McDougall, 2003; Leeson et al., 2008; Sulastri et al., 2015) confirming that girls tend to outperform boys in grades obtained.

Environment also plays an important role on predicting academic achievement. The current research showed that fathers with a higher educational background predicts their children's academic performance indicating that their roles on educational setting. This result support previous study confirming that environment, i.e. higher higher parental educational background (Bradley & Corwyn, 2002), may positively and significantly interact with educational outcomes of the children.

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