

Examining the Linkage of Academic Performance and Attention by Uddin's Numeral Finding and Typo Revealing Tests: A Cross-Sectional Pilot Study in Undergraduate Students of Bangladesh

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Abstract: *Background:* Attention is the state of applying the concentration to something and it's strongly linked to academic performance. The drive of this study was to analyze the academic performance and attention of undergraduate students.

Methods: The study was implemented on 139 undergraduate students of Bangladesh selected from 9 universities from April to August 2018. In this study to investigate the attention of the students, the Uddin's Numeral Finding (NF) and Typo Revealing (TR) tests were used.

Results: In the NF test male students with last semester cumulative grade point average (CGPA) of 3.47 (highest) exerted the maximum 40% attention but female students exerted only 33.3% attention and their last semester CGPA was 3. Students with age > 22 years exerted maximum, 70.55%, and 35.2% attention in NF and TR tests respectively with last semester CGPA of 3.56 (maximum). In the NF and TR tests, highest, 89.73%, and 50.33% attention respectively were reported by 1st-year students with last semester CGPA of only 3.70. High-socioeconomic status students with last semester CGPA of 3.43 (lowest) exerted maximum 75.30% attention in NF test. There were no significant associations between variables.

Conclusion: Attention is a very rudimentary function that often is a forerunner to cognitive functions. Individual differences in academic performance have been linked to differences in attention and intelligence.

Keywords: Attention, Cognitive functions, Academic performance, Academic life, Numeral finding test, Typo revealing test.

INTRODUCTION

Attention is the complex cognitive course of especially giving concentration to a specific object, issue, or activity and discounting other stimuli [1]. Although, the brain obtains a number of stimuli from the surrounding it finally must select the appropriate stimuli to give emphasis on and reject the remaining [2]. Copious studies recommended that in the course of attention the brain is unable of multitasking [3]. For appropriate functions of numerous skills related to cognition, attention is vital. Studies suggested that human attention is not a discreet process, actually a set of copious subprocesses linked to attention [4,5]. The posterior part of the parietal lobe is accountable for attention [6]. The level of attention is variable based on time, and having difficult to give attention during mid-afternoon does not certainly indicate alteration of attention [5,7]. Numerous factors may affect the level of attention such as tiredness, drowsiness, high

temperatures, lethargy, in addition to consuming drugs or other substances [5,8].

Success in academic life and another aspect of life is strongly linked to attention. It is one of the utmost imperative features of studying [9]. The examination is the best way to analyze the levels of academic performances. But the best analysis process is still a mystery and there are no typical pacts as well as associated factors [10]. People diverge in academic achievement have been related to alterations in intelligence [11]. Students with superior mental aptitude as confirmed by intelligence quotient (IQ) tests in addition to those students who are greater in conscientiousness tend to succeed greatly in academic backgrounds [12,13]. The study suggested that mental interest has a vital impact on academic performance along with conscientiousness and intelligence [11,14].

The most important traits of cognitive abilities are to precisely process info (i.e., attention) and to retain info in a manageable state (i.e., working memory) [15]. The level of cognitive ability, prior education preparation, attainment, gender, level of self-efficiency, attitudes

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toward academic activities influence academic performance [16]. Researchers believe that mounting cognitive ability is accountable to expand student's intellectual act which increases self-academic efficacy [17]. Conversely, academic procrastination has a significant adverse effect on academic progress [18]. But youths of nowadays differ from past days. Studies stated that students of this century with a vision of academic achievement just need to focus not only on writing, reading, as well as arithmetic [19,20]. But they must be essentially motivated, goal concerned or communicatively skilled to balance social abilities and features related to academics [19,20]. However, the performance of student depends on many factors such as attention in courses, time distribution of studies, parents' income, as well as mother's age and education etc. Furthermore, socioeconomic, psychological, and environmental factors have also been associated [21].

In Bangladesh, there is no study available which focus on the relation between attention and academic performance at any stage of academic level. The aim of this study was focusing on the relationship between academic performance and attention of university undergraduates in Bangladesh.

MATERIALS AND METHODS

Study Site

This test was conducted in the undergraduate students of 9 universities such as Southeast University, University of Dhaka, Rajshahi University, Asian University, Uttara University, Tejgaon Government College, Tongi Government College, Government Titumir College and International University of Business Agriculture and Technology. This study was conducted from April 2018 to August 2018. In the course of study to detect the linkage of attention and academic performance, 139 students were selected.

Study Population

In this study from 180 students, finally 139 students were selected from 9 universities in Bangladesh based on the interest of the students. The demographic info of the students is given in Table 1.

Study Design

This was a cross-sectional pilot study conducted amid 139 university undergraduate students. A predesigned questionnaires' was used to detect the

linkage of various factors like sex, age, year of study, social status, and academic results with attention.

Table 1: The Demographic Profile of the Students (n = 139)

Parameter	n	%
Sex		
Male	85	61.15
Female	54	38.85
Age (years)		
18-20	26	18.71
20-21	79	56.83
> 22	34	24.46
Year of Study		
1 st year	18	12.95
2 nd year	36	25.90
3 rd year	57	41.01
4 th year	28	20.14
Social Status		
Low	6	4.32
Middle	104	74.82
High	29	20.86

Attention Tests

1. Numeral Finding Test

Numeral Finding (NF) test was executed as stated by the method of Uddin *et al.*, [22] to detect the attention of the students. In a print page, 100 numbers were distributed having double digits with repetition and given to students. The time occupied to detect the repeated numbers were regarded as numeral finding time (NFT) and the time of this test was 180 seconds. The stated equation was used to detect the percentage of attention of the students:

$$\text{Attention (\%)}: \text{TCn} \times 100/\text{TGn}$$

where, TCn = Total number of detected correct repetition and TGn = Total number of given numbers.

The percentage of increase in attention is considered as an increase in attention [22].

2. Typo Revealing Test

Typo Revealing (TR) test was executed as stated by the method of Uddin *et al.*, [22] to detect the attention of the students. In a print page, a passage

with 250 words having intentional typing mistake and given to students. The time occupied to detect the typographical errors was regarded as typo finding time (TFT) and the time of this test was 180 seconds. The stated equation was used to detect the percentage of attention of the students:

$$\text{Attention (\%)}: \text{TCte} \times 100/\text{TGte}$$

where, TCte = Total number of detected correct typographical errors and TGte = Total number of given typographical errors.

The percentage of increase in attention is considered as an increase in attention [22].

Ethical Considerations

The protocol of this study was accepted by the ethics committee of the Department of Pharmacy, Southeast University, Dhaka, Bangladesh. The study was conducted in consensus with the ethical standards laid down in the 1964 Declaration of Helsinki.

Statistical Analysis

The results of this study were expressed as mean \pm SEM. Multiple regression analysis was performed to check the linkage of variables by using GraphPad InStat 3 software.

RESULTS

In this study among the students, 61.15% were male and the remaining 38.85% were female. Highest 56.83% of students belong to the age group 20-21 years and maximum, 41.01% students were 3rd-year students. Most of the students, 74.82% belonged to a middle-socioeconomic status family (Table 1).

The outcomes of the academic performances of the students and its linkage with attention with respect to sex are represented in Table 2. In case of NF test, highest attention, 40% was reported for male and their CGPA in the last semester of university results was 3.47. Both male and female students exerted the same results, 46.6% in TR test but the CGPA of the female students were lower than male. No significant relations amid variables were reported.

Table 3, represents the linkage attention of the students with academic performances based on the age of the students. In NF test all age groups (i.e., 18 to > 22) exerted the highest attention than TR test and their CGPA in the last semester of university results ranges from 3.46 to 3.56. Students with > 22 years exerted the highest attention (i.e., 70.55%, 35.2%) in both NF and TR tests with CGPA of 3.56. There were no significant links between variables.

Table 2: The Linkage of Academic Performance and Attention with Respect to the Sex of the Students Using NF and TR Tests

Sex	Number of Students (n)	SSC Results	HSC Results	Last Semester Results of University	NF test	TR test
		GPA (Mean)		CGPA (Mean)	% of Attention (Mean \pm SEM)	
Male	85	3.33	3.62	3.47	40 \pm 2.33	46.6 \pm 1.80
Female	54	3.5	3.69	3	33.3 \pm 3.16	46.6 \pm 2.25

Values were expressed as mean \pm SEM.

Table 3: The Linkage of Academic Performance and Attention with Respect to the Age of the Students Using NF and TR Tests

Age	Number of Students (n)	SSC Results	HSC Results	Last Semester Results of University	NF test			TR test		
		GPA (Mean)		CGPA (Mean)	% of Attention (Mean \pm SEM)	95% CI	P-Value	% of Attention (Mean \pm SEM)	95% CI	P-Value
18-20	26	4.90	4.81	3.46	68.90 \pm 4.66	50.394–88.960	0.9857	35.1 \pm 3.88	30.019–43.975	0.1070
20-21	79	4.73	4.85	3.49	69.49 \pm 2.44			32.02 \pm 1.77		
> 22	34	4.85	4.88	3.56	70.55 \pm 7.79			35.2 \pm 2.82		

Values were expressed as mean \pm SEM.

Table 4: The Linkage of Academic Performance and Attention with Respect to the Year of Study of the Students Using NF and TR Tests

Year of Study	Number of Students (n)	SSC Results	HSC Results	Last Semester Results of University	NF test			TR test		
		GPA (Mean)		CGPA (Mean)	% of Attention (Mean±SEM)	95% CI	P-Value	% of Attention (Mean±SEM)	95% CI	P-Value
1	9	4.89	4.73	3.70	89.73±6.41	55.787 - 115.48	0.1974	50.33±7.46	13.638 - 76.585	0.3178
2	24	4.30	4.95	3.69	74.97±4.88			36.36±3.65		
3	73	4.94	5	3.50	66.17±2.51			32±1.91		
4	33	4.88	4.25	3.86	68.03±3.43			29.86±2.09		

Values were expressed as mean ± SEM.

Table 5: The Linkage of Academic Performance and Attention with Respect to the Social Status of the Students Using NF and TR Tests

Social Status	Number of Students (n)	SSC Results	HSC Results	Last Semester Results of University	NF test			TR test		
		GPA (Mean)		CGPA (Mean)	% of Attention (Mean±SEM)	95% CI	P-Value	% of Attention (Mean±SEM)	95% CI	P-Value
Low	6	4.87	4.49	3.62	67.91±9.41	9.23- 133.60	0.8477	26.65±3.44	- 62.880- 126.25	0.8867
Middle	104	4.77	4.80	3.51	68.39±2.17			32.33±1.63		
High	29	4.85	4.88	3.43	75.30±3.90			39.05±3.21		

Values were expressed as mean ± SEM.

Based on the year of the study, the influences of attention for academic performances of the students are given in Table 4. 1st-year students with last semester CGPA of university results were 3.7 exerted highest, 89.73% and 50.33% attention in NF and TR tests respectively. Lowest 66.17% attention was reported in 3rd-year students with last semester CGPA of 3.5 in the NF test. No significant relations were reported between variables.

The link of academic performances and attention of the students are mentioned in Table 5 based on social status. High-socioeconomic status students with last semester CGPA of in the university result of 3.43 exerted the highest attention, 75.30% and 39.05% in both NF and TR tests respectively. Low-socioeconomic status students exerted 67.91% and 26.65% attention in NF and TR tests respectively with last semester CGPA of 3.62.

DISCUSSION

The best assessment system of academic performance is arduous as there is no usual treaty.

Attention is strongly linked to academic achievement [23]. In this study, the linkage of academic performances and attention were analyzed using NF and TR tests.

In this study, among 139 students 61.15% were male and 38.85% were female. Highest 56.83% student belongs to 20-21 age groups and highest, 41.01% were 3rd-year students and most of the students, 74.82% were from middle-socioeconomic status family.

The differences in the anatomy of male and female are an enduring theme of foremost curiosity. Both male and female are different in terms of brain chemistry as well as behaviors and mental processes [24]. In this study, the grade point average (GPA) of the secondary school certificate (SSC) and higher secondary certificate (HSC) examination of female students were higher compared to male and last semester CGPA of the university results of male students were higher compared to male. In the NF test, male group exerted 40% attention and female group exerted 33.3%

attention. In the case of the TR test, both groups exerted the same results. Numerous studies examined the relationship between sex differences and cognition [25]. Studies suggested that there are larger total brain dimensions in men, with respect to rises in global as well as regional gray matter in women and a higher percentage of white matter in case of men. In a study by Haier *et al.*, [26] reported that more gray matter is linked with higher IQ.

Aging is strongly linked to attention [27-30]. Students with > 22 years exerted 70.55% and 35.2% attention in NF and TF tests respectively and their SSC, HSC GPA was 4.58 and 4.88 and last semester CGPA of the university results was 3.56. But students belong to 18-20 years with low GPA in HSC examinations as well as lowest CGPA in the university results exerted, 68.9% attention in NF test. In the case of TR test, students belong to 20-21 years exerted lowest 32.02% attention with HSC and SSC GPA of 4.73 and 4.85 as well as their last semester CGPA was 3.49. A longer period of attention was reported for mature children compared to younger [31]. Individual able to conduct job effortlessly exerted higher attention with respect to an individual with difficulty to complete the job. Numerous factors like noise, stress hunger, fatigue etc. lessen the period held on the job. In fact, for the freely selected job, usual estimations for continual attention range from 5 min in case of 2 years child and 20 min for orders [32].

Amid students, for the 3rd-year student's exerted highest results in both SSC and HSC examinations and for 4th-year students with highest last semester CGPA in the university, results were found. In the NF test, lowest 66.17% attention was reported for 3rd years students with last semester CGPA of 3.50 and highest 89.73% attention were reported by 1st-year students and their last semester CGPA was 3.70. First year student also exerted highest 50.33% attention in TR test. Students with high levels of attention are directly linked to the highest academic performance [33]. Conversely, a moderate level of attention is associated with average academic performance and students with poor attention are unsuccessful [33,34]. Numerous factors like financial and health problems, lack of interest, noise and home environment are responsible to confuse attention [33,35].

The socioeconomic status of the family, as well as neighborhood, greatly impact student's well-being [36]. In this study student with high social status has the highest GPA in HSC examination but lowest CGPA in

last semester of university results. On the other hand, students with low social status had the highest GPA in SSC and highest CGPA in last semester of university results. For NF and TR tests, lowest, 67.91% and 26.65% attention were reported respectively for students with low social status. Students with high social status in NF and TR tests exerted highest 75.30% and 39.05% attention respectively. Poverty hinders cognitive development, decision-making capacity, and attention [37-39]. The study reported that children belong to poor family backgrounds obtained average lower marks on intelligence tests compared to children with high social status [40-42]. Furthermore, over time, their performance has been proposed to deteriorate, even though their previous backgrounds were well [40-42].

CONCLUSION

All intellectual doings necessitate proper attention. In the NF test, male students with high CGPA in the last semester of university results exerted the highest attention. Elder students having high CGPA in the last semester exerted maximum attention compared to the young student except for age group 20-21 in TR test. 1st-year students with a poor CGPA exerted the highest attention in NF and TR tests. High-socioeconomic status students with a low CGPA exerted the highest attention. Most brain deeds entail a lot of attention and it's intensely related to academic achievement.

LIMITATION

The present study was conducted in 9 universities in Bangladesh. It would be best if we could accomplish this study in numerous universities all over the country.

ABBREVIATIONS

SSC	=	Secondary school certificate
HSC	=	Higher secondary certificate
GPA	=	Grade point average
CGPA	=	Cumulative grade point average
IQ	=	Intelligence quotient
CI	=	Confidence interval

AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between all authors. All the authors read and approved the final manuscript.

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ETHICAL APPROVAL

The study protocol was approved by the ethics committee of the Department of Pharmacy, Southeast University, Dhaka, Bangladesh. The study was conducted in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

CONFLICT OF INTERESTS

The authors proclaim no conflict of interest.

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REFERENCES

- [1] Anderson JR. Cognitive Psychology and Its Implications. Worth Publishers, New York 2004.
- [2] Denckla MB. Biological Correlates of Learning and Attention: What Is Relevant to Learning Disability and Attention-Deficit Hyperactivity Disorder? *Journal of Developmental & Behavioral Pediatrics* 1996; 17: 114-119. <https://doi.org/10.1097/00004703-199604000-00011>
- [3] Uddin MS, Asaduzzaman M. Innovation and Validation of Neuropsychopharmacological Testing Methods for the Assessment of Memory, Attention and Cognition in Human Participants. *Neuroscience and Medicine* 2016; 7(3): 83-84. <https://doi.org/10.4236/nm.2016.73010>
- [4] Bachmann T. Attention as a Process of Selection, Perception as a Process of Representation, and Phenomenal Experience as the Resulting Process of Perception Being Modulated by a Dedicated Consciousness Mechanism. *Frontiers in Psychology* 2011; 2: 387. <https://doi.org/10.3389/fpsyg.2011.00387>
- [5] CogniFit. Attention: One of Our Cognitive Domains. Available: <https://www.cognifit.com/attention>
- [6] Guyton AC, Hall JE. Textbook of Medical Physiology. China: Elsevier Saunders 2006.
- [7] Wilson K, James HK. Attention During Lectures: Beyond Ten Minutes. *Teaching of Psychology* 2007; 34(2): 85-89. <https://doi.org/10.1177/009862830703400202>
- [8] Wang W. Factors Affecting Learners' Attention to Teacher Talk in Nine ESL Classrooms. *Electronic Journal for English as a Second Language* 2015; 19(1): 1-20.
- [9] Archer L. Younger Academics' Constructions of 'Authenticity', 'Success' and Professional Identity. *Studies in Higher Education* 2008; 33(4): 385-403. <https://doi.org/10.1080/03075070802211729>
- [10] Ward A, Stoker HW, Murray-Ward M. Achievement and ability tests-Definition of the domain. *Educational Measurement* 1996; 2: 2-5.
- [11] Von Stumm S, Hell B, Chamorro-Premuzic T. The hungry mind: Intellectual curiosity is the third pillar of academic performance. *Perspectives on Psychological Science* 2011; 6(6): 574-88. <https://doi.org/10.1177/1745691611421204>
- [12] Zimmerman BJ. Self-regulated learning and academic achievement: An Overview. *Educational Psychologist* 1990; 25(1): 3-17. https://doi.org/10.1207/s15326985ep2501_2
- [13] Shaw P, Greenstein D, Lerch J, Clasen L, Lenroot R, Gogtay NE, Evans A, Rapoport J, Giedd J. Intellectual Ability and Cortical Development in Children and Adolescents. *Nature* 2006; 440(7084): 676-9. <https://doi.org/10.1038/nature04513>
- [14] Holmes A, Silvestri R. Rates of Mental Illness and Associated Academic Impacts in Ontario's college students. *Canadian Journal of School Psychology* 2016; 31(1): 27-46. <https://doi.org/10.1177/0829573515601396>
- [15] Johansen NB. *New Research on Short-term Memory Book*. New York: Nova Science Publishers 2008.
- [16] Furnham A, Chamorro-Premuzic T, McDougall F. Personality, Cognitive Ability, and Beliefs about Intelligence as Predictors of Academic Performance. *Learning and Individual Differences* 2003; 14(1): 47-64. <https://doi.org/10.1016/j.lindif.2003.08.002>
- [17] Lent RW, Brown SD, Gore Jr PA. Discriminant and Predictive Validity of Academic Self-Concept, Academic Self-Efficacy, and Mathematics-Specific Self-Efficacy. *Journal of Counseling Psychology* 1997; 44(3): 307. <https://doi.org/10.1037/0022-0167.44.3.307>
- [18] Janssen J. Academic Procrastination: Prevalence among High School and Undergraduate Students and Relationship to Academic Achievement. Available: https://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1115&context=epse_dis_s
- [19] Brockman MS, Russell ST. Academic Success. Building Partnership for Youth National 4H Council and the University Of Arizona. Available: http://calscf.calsnet.arizona.edu/fcs/bpy/content.cfm?content=academic_success
- [20] Mahmud MM. Communication aptitude and academic success. *Procedia-Social and Behavioral Sciences* 2014; 134: 125-33. <https://doi.org/10.1016/j.sbspro.2014.04.230>
- [21] Hijazi ST, Naqvi SM. Factors Affecting Students' Performance. *Bangladesh e-Journal of Sociology* 2006; 3(1): 1-10.
- [22] Uddin MS, Mamun AA, Asaduzzaman M. Innovation of Neuropsychopharmacological Experimental Methods to Investigate Attention in Human Participants and Its Validation by Randomized Double Blind Placebo Controlled Clinical Trial. *Journal of Behavioral and Brain Science* 2016; 6(7): 280-293. <https://doi.org/10.4236/jbbs.2016.67028>
- [23] Rivkin SG, Hanushek EA, Kain JF. Teachers, schools, and academic achievement. *Econometrica* 2005; 73(2): 417-58. <https://doi.org/10.1111/j.1468-0262.2005.00584.x>
- [24] Uddin MS. Brain Chemistry and Sex Differences: Are Male and Female Brains Really Varied? *Neurochemistry & Neuropharmacology* 2018; 4(1): 1-3.
- [25] Merritt P, Hirshman E, Wharton W, Stangl B, Devlin J, Lenz A. Evidence for gender differences in visual selective attention. *Personality and Individual Differences* 2007; 43(3): 597-609. <https://doi.org/10.1016/j.paid.2007.01.016>
- [26] Haier RJ, Jung RE, Yeo RA, Head K, Alkire MT. Structural Brain Variation and General Intelligence. *Neuroimage* 2004; 23(1): 425-33. <https://doi.org/10.1016/j.neuroimage.2004.04.025>
- [27] Madden DJ. Aging and Visual Attention. *Current Directions in Psychological Science* 2007; 16(2): 70-74. <https://doi.org/10.1111/j.1467-8721.2007.00478.x>

- [28] Bialystok E, Craik MIF. *Lifespan Cognition: Mechanisms of Change*. UK: Oxford University Press 2006.
<https://doi.org/10.1093/acprof:oso/9780195169539.001.0001>
- [29] Charles S, Carstensen LL. Social and Emotional Aging. *Annual Review of Psychology* 2010; 61: 383-409.
<https://doi.org/10.1146/annurev.psych.093008.100448>
- [30] O'halloran AM, Finucane C, Savva GM, Robertson IH, Kenny RA. Sustained Attention and Frailty in the Older Adult Population. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 2013; 69(2): 147-56.
<https://doi.org/10.1093/geronb/gbt009>
- [31] Ruff HA, Lawson KR. Development of Sustained, Focused Attention in Young Children During Free Play. *Developmental Psychology* 1990; 26(1): 85-93.
<https://doi.org/10.1037/0012-1649.26.1.85>
- [32] David Cornish M, Dukette D. *The essential 20: Twenty Components of an Excellent Health Care Team*. United States: Dorrance Publishing 2009.
- [33] Shah SM, Saleem S. Level of Attention of Secondary School Students and Its Relationship with their Academic Achievement. *Journal of Arts and Humanities* 2015; 4(5): 92-106.
- [34] Nicholls JG. Achievement Motivation: Conceptions of Ability, Subjective Experience, Task Choice, and Performance. *Psychological Review* 1984; 91(3): 328-346.
<https://doi.org/10.1037/0033-295X.91.3.328>
- [35] Breslau J. Poor Attention In Kindergarten Predicts Lower High School Test Scores. *Medical Journal Pediatrics* 2009; 44(3): 210-214.
- [36] Bradley RH, Corwyn RF. Socioeconomic Status and Child Development. *Annual Review of Psychology* 2002; 53(1): 371-99.
<https://doi.org/10.1146/annurev.psych.53.100901.135233>
- [37] Engle PL, Black MM. The Effect of Poverty on Child Development and Educational Outcomes. *Annals of the New York Academy of Sciences* 2008; 1136(1): 243-56.
<https://doi.org/10.1196/annals.1425.023>
- [38] Hair NL, Hanson JL, Wolfe BL, Pollak SD. Association of Child Poverty, Brain Development, and Academic Achievement. *JAMA Pediatrics* 2015; 169(9): 822-829.
<https://doi.org/10.1001/jamapediatrics.2015.1475>
- [39] Duncan GJ, Magnuson K, Kalil A, Ziol-Guest K. The Importance of Early Childhood Poverty. *Social Indicators Research* 2012; 108(1): 87-98.
<https://doi.org/10.1007/s11205-011-9867-9>
- [40] Bradley RH, Corwyn RF. Socioeconomic Status & Child Development. *Annual Review of Psychology* 2002; 53: 371-399.
<https://doi.org/10.1146/annurev.psych.53.100901.135233>
- [41] Schoon I, Jones E, Cheng H, Maughan B. Family Hardship, Family Instability, and Cognitive Development. *Journal of Epidemiology and Community Health* 2012; 66: 716-722.
<https://doi.org/10.1136/jech.2010.121228>
- [42] Strenze T. Intelligence and Socioeconomic Success: A Meta-Analytic Review of Longitudinal Research. *Intelligence* 2007; 35: 401-426.
<https://doi.org/10.1016/j.intell.2006.09.004>

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