



ORIGINAL ARTICLE

# Academic performance in childhood and the risk of attempting suicide as an adult



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## KEYWORDS

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## Abstract

**Background and objectives:** Previous studies have identified education as an important indicator of future psychological outcomes through the lens of parental education level. Here, we seek to understand how education affects suicide through the perspective of the child's education.

**Methods:** The current study follows a cohort from the Providence National Collaborative Perinatal Project from birth to adulthood with a follow-up at age 7. Through measures of reading, writing, and IQ administered at follow up, we examine the effects of early childhood education on adult mental health status and suicide attempt.

**Results:** We found that among males, those scoring below 88 on the Wide Range Achievement Test (WRAT) had a suicide attempt rate of 14.4% while those whose scores were above 106 had a suicide attempt rate of 8.8%. In females, the suicide attempt rates for those with WRAT scores below 88 and above 106 were 18.6% and 9.5%, respectively. We also found that females scoring below 89 on measures of Full-Scale IQ had much higher suicide attempt rates (16.6%) than those with higher scores.

**Conclusions:** Our findings suggest that reading and writing, and thus educational attainment at age 7, were predictive risk for suicide attempt in adulthood. Educators, parents, and mental health professionals should be aware of this association and monitor students who perform poorly academically for signs of depression and suicidal ideation, offering the appropriate support when necessary.

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**Abbreviations:** WRAT, Wide Range Achievement Test; CPP, Collaborative Perinatal Project.

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### What's known on this subject

- The relationship between education and mental health has been examined. However, in the United States, little research has been done to understand the relationship between childhood educational attainment and the later development of depression and suicidal ideation in adulthood.

### What this study adds

- Using a longitudinal birth cohort with a greater than twenty-year follow-up, this study suggests that poor academic performance (in reading, arithmetic, and spelling), but not low intelligence, in childhood is a risk factor for attempting suicide as an adult.

Suicide has long been recognized as a serious mental health issue around the world in both developing and developed countries. In 2012, the World Health Organization estimates that every year more than 800,000 people die from suicide and a global mortality rate is 1.4% of death from all causes, accounting as the 15th leading cause of death. Suicide worldwide is estimated to represent 1.8% of the total global burden of disease, and is expected to expand to 2.4% in countries with market and former socialist economies by 2020.<sup>1</sup> The United States is not an exception. In 2004, suicide was the third leading cause of death in persons under the age of 34.<sup>2</sup> In 2012, it has become the 2nd common cause of death in adolescent from 15 to 29 years old. Further, the quoted suicide rate is an immense underestimation of the scope of the problem. The National Institute for Mental Health estimates that for every successful suicide attempt, between twelve and 25 unsuccessful attempts are made.<sup>3</sup>

Suicide has been shown to be significantly associated with certain mental disorders, including major depressive disorder.<sup>4</sup> Lesage et al. showed that depression was a factor in 60% of suicide attempts.<sup>5,6</sup> Alves et al. indicated socioeconomic status (unemployment, poor condition, family disruption, a loss of parent(s) or other relatives or friends) and other mental illness (schizophrenia, anxiety, substance abuse) contribute to suicide attempts or real suicide.<sup>7</sup> Furthermore, childhood neglect or abuse may also play an important role for suicide attempts (OR = 4, 95% CI, 2.4–6.6).<sup>8</sup>

### The role of education in suicide

The relationship between education and mental health has drawn considerable interest and has been examined from a number of different perspectives. Socioeconomic status is frequently operationally defined as level of education and/or level of education of family members. Lower levels of maternal education have been identified by a number of studies to significantly increase the risk of suicide, suicidal ideation, and depression.<sup>9</sup> Another study, by Ferguson and Woodward (2002), revealed that educational underachievement was significantly correlated with major depression.<sup>10</sup> Poor reading ability in youths has been shown to be associated with increased school drop-out rates,

even after controlling for sociodemographic and psychiatric confounders.<sup>11</sup> The same study also showed that those youths with poor reading skills experienced significantly higher levels of suicidal ideation. Further, perception of poor academic performance has been shown to be an even greater risk factor for suicide than even low self-esteem in three studies performed outside of the United States.<sup>12–14</sup> These studies performed on adolescents of Korean, Hong Kong, and Australia. For example, in the Australian study, 2603, 2485, and 2246 school students aged 13, 14, and 15, respectively participated in the repeated measures longitudinal study demonstrate that even the perception of poor academic performance (and not necessarily poor academic performance itself) can increase the likelihood that a youth will attempt suicide later. The study concluded that perceived academic performance, over and above self-esteem and locus of control, in some instances, is a good long-term predictor of suicidality<sup>14</sup>.

All of these previous studies made useful and relevant conclusions but left important areas open for consideration. There remains a dearth of research in the United States that examines the relationship between childhood educational attainment and the later development of depression and suicidal ideation in adulthood. Further, the existing studies that scrutinize this relationship tend to have short-term follow-up times. A long-term follow-up study is needed to determine the detrimental effects of poor educational attainment as a child on adult mental health. The current study seeks to explore such a relationship using a longitudinal birth cohort with a longer than twenty-year follow-up.

The purpose of this study is therefore to determine whether or not a relationship exists between educational attainment (through Wide Range Achievement Test – WRAT) and intelligence (based on the child's estimated Full Scale IQ – FSIQ) in childhood and attempting suicide as an adult. Further we wish to determine if such a relationship exclusively exists in males, females, or both.

## Method

### Study sample and adult follow-up procedures

Subjects were offspring of participants in the Providence, Rhode Island, cohort of the National Collaborative Perinatal Project (NCP), a multisite study that enrolled more than 50,000 pregnancies nationally from twelve university hospitals and followed the offspring prospectively through the first 7 years of life. Obstetrical intake occurred between 1959 and 1966. In Providence, a total of 4,140 pregnancies were enrolled.<sup>15</sup>

From the 4140 Providence Collaborative Perinatal Project births, 1780 individuals were selected for follow-up and assessment in adulthood. Selection occurred in two distinct phases. In each, a stratified random sample was drawn from the entire cohort to investigate the association between several early life factors and adult psychiatric disorders. During phase one, initiated in 1984, 995 eligible subjects 18–27 years old with and without maternal pregnancy/delivery complications were selected.<sup>15</sup> In the second phase, initiated in 1996, 1056 subjects 30–39 years old with and without learning disabilities were selected.<sup>16</sup> There was a small

overlap ( $N=271$ ) between the first- and second-phase samples. For participants included in both phases, phase-two interviews were used. Written informed consent was obtained from all subjects.

The Internal Review Board of Brown University has approved this study.

### Study measures

Terms definition (CDC – Centers for Disease Control and Prevention).

Suicide attempt: a non-fatal, self-directed, potentially injurious behavior with intent to die as a result of the behavior; might not result in injury.

### Suicide attempt

During the interview process, information was collected concerning prior suicide attempts. The subjects were asked, ‘‘Did you ever try to end your own life (whether or not you thought about it ahead of time)?’’ (Have you ever tried to kill yourself or attempt suicide?) Possible answers included ‘‘yes’’ and ‘‘no.’’

### Cognitive testing at age 7 years

Children enrolled in the CPP were evaluated throughout the first seven years of life on a number of neurological, cognitive, developmental, and behavioral measures. Cognitive performance at age 7 was assessed using the Wechsler intelligence scale for children. The Wechsler Intelligence Scale tests a wide range of cognitive abilities, as well as providing an estimate of each child’s Full Scale IQ (FSIQ).<sup>17</sup> The mean FSIQ in this sample was 99.0 with a standard deviation (SD) of 12.2. The reason the US NCPP protocol set age 7 was based on biologically oriented theories such as the neurodevelopment theory, as well as in the socially oriented theories involving diverse precipitants and stressors at various life stages. Data deriving from studies of neurodevelopmental cognitive and social organizations suggest that there is a discontinuity at 7 years that corresponds to a second biodevelopmental shift. The brain attains its adult format and reaches its asymptote of its maximum weight at 7 years. Moreover, it is after 7 years begin to understand

their feelings, intuitions, and thoughts may be of interest to others.<sup>18</sup>

### Socioeconomic status

Maternal socioeconomic data was collected both at birth and when the child was 7 years old. Two socioeconomic variables were used, maternal education and socioeconomic index. Maternal education was determined by whether or not the child’s mother had graduated from high school. Socioeconomic index was a composite of maternal education, salary, and occupational prestige.

### Wide Range Achievement Test

In addition to the Wechsler achievement test, the Wide Range Achievement Test (WRAT) was administered. The WRAT was developed as a simple and efficient measure of academic ability. The first version was created by Joseph Jastak in 1946. The WRAT itself contains three sections, with each section testing a different skill: reading, arithmetic, and spelling.<sup>19</sup>

### Statistical analysis

We first calculated the total percent of subjects that reported a prior suicide attempt. We then examined the rate of prior suicide attempt with respect to certain socioeconomic and demographic factors. The student’s *t*-test and chi square test were used to examine for an association between reading, math, and spelling WRAT scores and suicide attempt as well as between IQ score and suicide attempt. Finally, we used regression analysis to control for the effects of potentially confounding factors, including gender and socioeconomic status. All statistical analyses were performed with SPSS.

## Results

### Risk for suicide attempt

Table 1 shows that out of a sample population of 1253, there were 148 subjects who had attempted suicide (11.8%) and 1105 subjects who did not report a suicide attempt. Of those who did not report a suicide attempt 52.9% were

**Table 1** Sample characteristics.

	Overall sample		Suicide attempt		No suicide attempt		<i>p</i> -Value
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	
<b>Sex</b>							0.15
Male	658	52.5	69	46.4	585	52.9	
Female	595	47.5	79	53.4	520	47.1	
<b>Race</b>							0.82
White	952	76.0	114	77.1	843	76.3	
Non-white	301	24.0	34	22.9	262	23.7	
<b>Maternal education</b>							1.00
High school graduate	393	31.4	37	25.3	356	32.2	
Non-high school graduate	860	68.6	111	74.7	749	67.8	

male, 76.3% were white, and 32.2% had high school educated mothers. Of those who reported a suicide attempt, 46.4% were male, 77.1% were white, and 25.3% had high school educated mothers. Our examination did not reveal any significant correlation between race or gender with suicide attempt in adulthood.

We further analyzed the association between suicide attempt in adulthood and socioeconomic status at age 0 and 7. Lower levels of maternal education and lower socioeconomic index, both at age 0 and 7, were significantly correlated (all  $p < 0.00$ ) with suicide attempt.

### Cognition and gender differences

No significant association was found between measured childhood IQ and suicide attempt later in life. However, subjects who had attempted suicide as an adult were significantly more likely to have had lower reading, mathematics, and spelling scores as a child (Table 2).

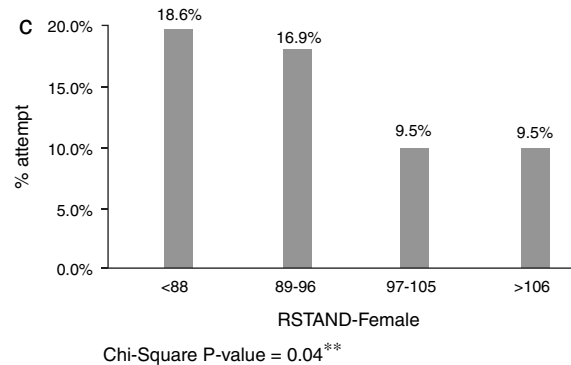
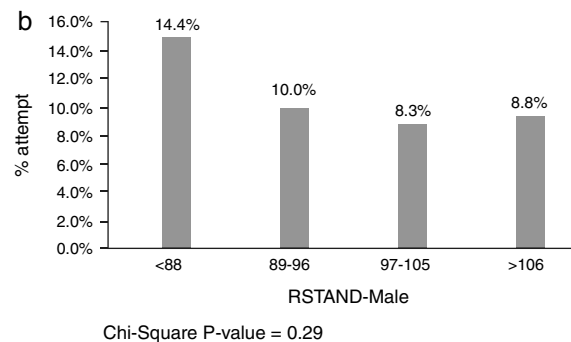
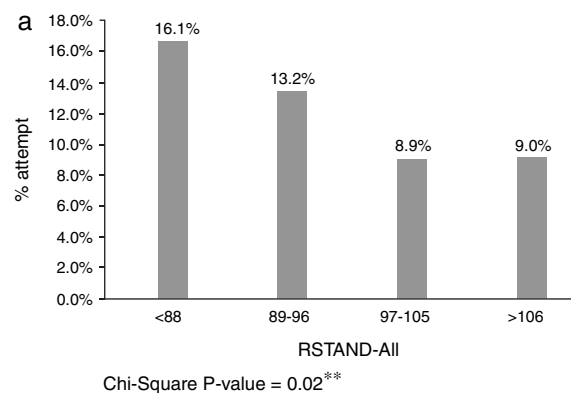
Of those who had attempted suicide, almost 17% had an FSIQ below 85, while of those who had never attempted suicide, 14.7% had an FSIQ below 85. Although those who had attempted suicide were more likely to have an FSIQ below 85, this difference was not statistically significant at  $\alpha = 0.05$ . There were similarly no statistically significant differences in FSIQ, VIQ, and PIQ between those who had attempted suicide and those who had not attempted suicide.

In terms of the WRAT measures, those who had attempted suicide had significantly lower reading, math, and spelling scores than those who had not attempted suicide. The average reading score for those who had attempted suicide was 95.64, while the average reading score for those who had not attempted suicide was 98.98 ( $p = 0.01$ ). The average math score for those who had attempted suicide was 93.94, while the average math score for those who had not attempted suicide was 96.49 ( $p = 0.01$ ). Finally, the average spelling score for those who had attempted suicide was 92.19, while the average spelling score for those who had not attempted suicide was 95.03 ( $p = 0.01$ ).

Further males and females differed in terms of the specific WRAT scores that predicted suicidal behavior. Males who had attempted suicide as an adult had significantly lower standardized math scores as a child ( $p = 0.02$ ). There was no statistically significant difference between the reading

**Table 2** Risks for suicide attempt ( $2 \times 2$  Chi-square).

	Attempted suicide
<b>Sex</b>	
Male	10.5%
Female	13.3%
<b>Race</b>	
White	12.0%
Non-white	11.3%
<b>Maternal education</b>	
High school graduate	9.4%
Non-high school graduate	12.9%



**Figure 1** The association between standardized reading assessment at age 7 and suicide attempt as an adult: (a) all, (b) male, and (c) female.

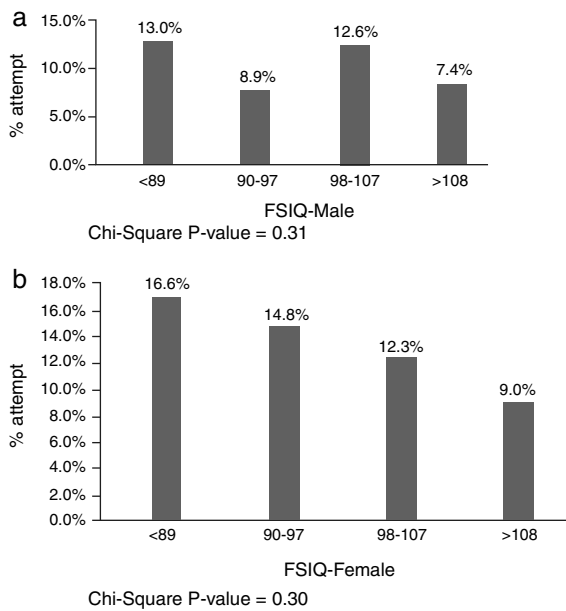
scores of those males who had attempted suicide as an adult and those males who had not attempted suicide as an adult.

Meanwhile, females who had attempted suicide as an adult had significantly lower reading ( $p = 0.01$ ) and spelling scores ( $p = 0.01$ ).

### Standardized reading

For those that scored less than 88, the bottom quartile, on the WRAT's standardized reading assessment, the overall suicide attempt rate was 16.1% (both male and female). Among individuals who scored higher than 106, the top quartile, the suicide attempt rate was 9.0% (Fig. 1).

The linear trend exhibited between lower standardized reading test score and higher suicide attempt rate persisted when we examined males and females separately. Males



**Figure 2** The association between FSIQ at age 7 and suicide attempt as an adult: (a) male and (b) female.

**Table 3** The association between cognitive development at age 7 and suicide attempt as an adult.

	Suicide attempt		p-Value
	No = 1105 Mean (SD)	Yes = 148 Mean (SD)	
FSIQ	98.07 (12.98)	96.21 (12.1)	0.11
VIQ	95.31 (13.23)	93.70 (11.5)	0.13
PIQ	101.70 (13.9)	99.67 (13.5)	0.10
%FSIQ < 85	14.7%	16.9%	0.48
WRAT – Reading	98.98 (14.79)	95.64 (12.5)	0.01**
WRAT – Arithmetic	96.49 (10.41)	93.94 (10.0)	0.01**
WRAT – Spelling	95.03 (12.31)	92.19 (10.1)	0.01**

\*\* statistically significant.

scoring lower than 88 had a suicide attempt rate of 14.4%, while males scoring higher than 106 had a suicide attempt rate of 8.8%. Females scoring below 88 had a suicide attempt rate of 18.6%, while females that scored above 106 had a suicide attempt rate of 9.5%.

**Full-scale IQ**

Male FSIQ data did not demonstrate any discernible pattern. However, female FSIQ data showed a linear trend with females with lower FSIQ scores having higher rates of attempted suicide (Fig. 2). Females scoring below 89 on the FSIQ had a suicide attempt rate of 16.6%. Those with a score between 90 and 97 had a suicide attempt rate of 14.8%. Those scoring between 98 and 107 had a suicide attempt rate of 12.3%. Finally, those females who scored higher than 108 had a suicide attempt rate of only 9.0% (Table 3, Fig. 2).

**Discussion**

Our data showed an inverse linear relationship between WRAT standardized reading test score and suicide attempt rate. Not only was this trend exhibited overall, but it persisted when each gender was examined separately. This data offers convincing evidence that low standardized reading test score at age 7 is a significant risk factor for suicide attempt later in life. Further, those who attempted suicide during adulthood had significantly lower WRAT subscores in all three categories tested: reading, spelling, and arithmetic. There are several other big studies that have also shown the relationship between academic performance and suicide risks. In two large national cohorts follow-up study in Sweden, with data from more than 200,000 Swedish males and females, the authors have demonstrated the inversed association between the academic performance in school with suicide risk. What is significantly identified in this study is the gender difference with male found to have four times of risk than female.<sup>20</sup> Likewise, Kyriaki Kosidou et al. conducted a population based study in adult aged 18 to 29 years in 2002 and 2006. The result after adjusting for socioeconomic status and psychiatric history have indicated that school failure is strongly associated with suicide attempt risks amongst young adults, i.e. low school performance may increase the risk for dead thoughts and suicidal behavior.<sup>21</sup>

Additionally, our findings conclude that there is no significant relationship between FSIQ score as a child and suicide attempt later in life. The findings that WRAT scores, but not FSIQ score, were significantly associated with suicide attempt later in life need not be contradictory. Although, FSIQ may be considered as a measure of academic performance to some extent, it is more generally regarded as a measure of pure intelligence. Conversely, WRAT scores are more representative of academic performance rather than simply measures of intelligence. Thus our data suggest that it is children who perform poorly academically and not children with low intelligence who are at a particularly elevated risk for attempting suicide later in life.

A number of limitations to our study should be considered. First, the Providence, Rhode Island, Collaborative Perinatal Project sample was not designed to be representative of the general U.S. population nor of Providence, Rhode Island.<sup>22</sup> The sample was predominantly white, and participants largely resided in a relatively affluent area. These issues limit the overall generalizability of our work. Further research must be done to examine whether or not our findings are consistent across cultures, regions, and ethnicities. Additionally, although the assessment of past suicide attempt was based on questions, it relied on retrospective recall at the time of the interview. As a result, our findings are subject to recall bias. Further, lack of verification of prior suicide attempt from medical records and/or clinic notes reduces the internal validity of the main outcome measure. Obtaining records of suicide attempts from inpatient care registries, as other studies have done<sup>23</sup>, would have limited such bias as well as improved the internal validity of the results. Depending on the availability and detail of the records,

obtaining them may have also offered us an opportunity to explore the circumstances surrounding the suicide attempt.

While in this study we have laid out the risks associated with low educational attainment and mental health as an adult, specifically as it relates to attempting suicide, certainly there are a number of mediating factors that, if present during one's youth, may complicate the relationship between educational attainment and later mental health. While some of these mediating factors, such as socioeconomic status, we have considered and included in our regression analyses, other factors including but not limited to attention deficit hyperactivity disorder (ADHD), depression, and ethnicity may confound the relationship between educational attainment and suicide risk. For example, a depressed child is at risk to perform poorly in school but is also at risk to become a depressed and/or suicidal adult. A child of a different ethnicity may, via certain cultural barriers, perform more poorly in school than his/her peers. Unfortunately, the dataset used to complete this study does not allow us to examine the role of these mediating variables, though they certainly should not be ignored, and future research should pay adequate credence to their potential role.

## Implications and contribution

The relationship between education and mental health has already been examined. However, in the United States, there remains a dearth of research aimed at understanding the relationship between childhood educational attainment and the later development of depression and suicidal ideation in adulthood.

Using a longitudinal birth cohort with a greater than twenty-year follow-up, this study suggests that poor academic performance (in reading, arithmetic, and spelling), but not low intelligence, in childhood is a risk factor for attempting suicide as an adult.

Educators, parents, and mental health professionals should be aware of this association and monitor students who perform poorly academically for signs of depression and suicidal ideation, offering the appropriate support when necessary.

## Author contributions

All authors listed on the manuscript have contributed sufficiently to the project to be included as authors. In addition, each author has read and approved this manuscript.

## Conflict of interest

The authors have no conflicts of interest relevant to this article to disclose.

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