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Personality and the Education-Health Gradient

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Non-technical summary

A large and persistent association between education and health has been documented in many countries and time-periods for a variety of health measures. More educated individuals enjoy better health, engage in healthier behaviors, and live longer. However, the mechanisms underlying this observed association are complex and difficult to identify. Education may improve health through stress reduction, better decision-making and information acquisition, greater resources, access to jobs with safer work environments, healthier behaviors, better neighborhoods and peers, and more. Additionally, the fact that more educated individuals are healthier may simply be a reflection of family background: children of educated parents may have been healthier as children, or been endowed with traits which contributed both to their educational attainment and health. Uncovering the mechanisms driving the association between education and health is crucial if we want to understand whether educational policy can be viewed as health policy.

This paper explores the role of traits (measured in childhood) distinct from cognition in explaining the education-health gradient in adults, using data from the National Child Development Study. We revisit the conclusions of Cutler and Lleras-Muney (2010) where the authors explore the education-health gradient. They find that cognitive ability is of central importance in explaining differences in health behaviors by education, while personality traits play a relatively small role. In this paper, we test the robustness of their conclusions by using the same methodology but including measures of child personality overlooked in the original analysis. We show that child personality contributes to the education-health gradient to an extent nearly as large as that of cognition.

More research is needed to understand the role played by traits of the child apart from cognition in contributing to adult disparities in health by education. Does the relationship we find hold true in other datasets outside of the United Kingdom? At what ages in childhood do these other traits matter the most, and which traits specifically? The answers to these questions will shed new light on the role of early life conditions in shaping late-life disparities, and on the importance of childhood in ensuring well-being across the lifecourse.

PERSONALITY AND THE EDUCATION-HEALTH GRADIENT
A Note on "Understanding Differences in Health Behaviors by Education"

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Abstract

We test the robustness of the results of Cutler and Lleras-Muney (2010) on the role of personality in explaining the education-health gradient by using alternative measures of child personality available in the National Child Development Study. We show that, alternatively to the authors conclusions, personality contributes to the education-health gradient to an extent nearly as large as that of cognition.

Keywords: health, education, cognitive ability, personality.
JEL numbers: I12, I21.

1 Introduction

In Cutler and Lleras-Muney (2010) (henceforth CLM), the authors explore the relationship between health behaviors and educational attainment, often referred to as the education-health gradient. While they analyze a number of potential explanations for the gradient, a central finding of their work is the importance of cognitive ability in explaining differences in health behaviors. In this respect, their work adds to a large body of research documenting the significance of cognitive ability in explaining economic (Cawley et al., 2000) and health outcomes (Gottfredson and Deary, 2004). However, a number of recent studies have demonstrated the importance of other traits distinct from intelligence, often called personality traits or noncognitive skills, in explaining a variety of outcomes (Chiteji, 2010; Conti et al., 2010a,b; Kaestner and Callison, 2011). In line with this more recent literature, CLM include a number of different measures of personality in their analysis, but - somewhat surprisingly - find that they play little role in explaining the education-health gradient.

In this note, we investigate the sensitivity of their results to the inclusion of alternative measures of personality. While CLM use a number of data sets in their analysis, we focus on one dataset in particular, the National Child Development Study (NCDS). This data-set is attractive both due to the significance of cognitive ability in explaining the education-health gradient in these data, and because of the availability of measures of noncognitive skills administered in childhood. By using CLM methodology, we first replicate their results, and then show that alternative measures of noncognitive skills account for a non-trivial share of the education-health gradient, potentially rivaling that of cognitive skills.

This note is structured as follows: Section 2 lays out the personality traits analyzed by CLM, and details the additional measures that we use, Section 3 presents the results, and Section 4 concludes.

2 Personality Measures

CLM include measures of personality in their model with the aim of analyzing whether and to what extent the education-health gradient could be due to differential "psychological abilities to make behavioral changes". For this purpose, they include measures meant to capture the ability to translate intentions into actions, such as depression, anxiety, stress, self-esteem, self-efficacy, and self-control. Although these personality measures are actually responsible for reasonably large portions of the gradient for certain individual outcomes (e.g. personality explains 35% of the gradient in "Regular doctor visits last year", 24% of "Current drinker", and 21% of "Light exercise" in the NLSY[1]) the authors conclusions are that they play a relatively small role overall.

[1]Interestingly, the NLSY is also the dataset - among all those used by the authors - where the personality scales have been measured at an earlier age.

In the case of the NCDS, CLM include indicators of self-efficacy (whether the respondent gets what he wants out of life, how much control they have over their lives, and whether they can run their lives how they want) and measures of mental health and stress, as measured by the Malaise index and the General Health Questionnaire (GHQ12). They find these measures to have a negligible impact on the education-health gradient.

We argue that the CLM approach is problematic for the following reasons. First, CLM use measures of cognitive ability and personality traits collected at vastly different times, the former during childhood (at ages 7, 11 and 16), and the latter during adulthood. While they acknowledge that their approach does not allow them to make causal claims about the relationship between education and health, they still compare the explanatory power of measures collected at different points across the lifecycle. However, given the nature of the outcomes being studied (addictive behaviors like smoking and drug use, persistent issues such as obesity), it is unsurprising that early-life traits would be better predictors of education and late-life outcomes than late-life traits, which could have been themselves an outcome of educational attainment and/or health behaviors (see Conti et al. (2010a) for the importance of early-life endowments in explaining the education-health gradient). Second, it is now being increasingly accepted in economics that performance on cognitive tests (especially those administered in a low-stake environment such as a survey context) is highly dependent on noncognitive traits, so that conditioning on them is required to ensure that the cognitive tests are not proxying for traits other than intelligence.

In our re-analysis, we try to improve upon the CLM choice of personality traits by including two additional sets of measurements: the Rutter Behavior Scale (Rutter, 1967; Rutter et al., 1970) and a number of syndrome scores from the British Social Adjustment Guide (BSAG, Stott (1963)). The Rutter Scale measures behavior difficulties in the child, and was administered at ages 7 and 11 (to the parents) and at age 16 (both to the parents and to the teacher). The *parental questionnaire, or Child Scale A* (Rutter et al., 1970), consists of descriptions of behavior (14 at ages 7 and 11, 18 at age 16) against which the parent (as part of the home interview, usually completed by the mother) was asked to indicate whether each description applies "never" (0), "sometimes" (1) or "frequently" (2)[2] (at ages 7 and 11), or "does not apply" (0), "applies somewhat" (1) or "certainly applies" (2) to the child (at age 16). The *teachers' questionnaire, or Child Scale B* (Rutter, 1967) consists of 26 descriptions of behavior against which the teacher was asked to indicate whether the description "does not apply" (0), "applies somewhat" (1) or "certainly applies" (2) to the child. The scale is constructed by summing the responses to all individual items, with a higher score indicating behavioral adjustment problems. A detailed list of the questions asked at each age is reported in Table A.1 in the Appendix. The British Social Adjustment Guides (BSAG) were designed to describe the child's behavior in particular settings, and were administered at ages 7 and 11. Teachers were presented with a number of 'phrases', and asked to underline 'items

[2]Numbers in parentheses represent the score assigned to each response.

of behavior' they thought described the child's behavior or attitudes. These underlined phrases were transformed into 12 'Syndromes' representing different aspects of social maladjustment[3]. A detailed list of the single items constituting each of the syndromes in reported in the appendix. Both sets of measures have been used extensively in previous work. For example, Carneiro et al. (2007) examine the relationship between the BSAG and a variety of outcomes later in life, including schooling and labor market outcomes. Other work in economics where the BSAG has been used as a measure of noncognitive skills include Blanden et al. (2007), Siles (2010) and Jones et al. (2011), while the Rutter scale has been used in Buchanan et al. (2002), Butler and Bynner (2001) and Power and Matthews (1997), among others.

Summary statistics for the measures used are presented in Table 1. A comparison with the original table in CLM (Table A3) reveals that we are able to almost perfectly match both means and sample sizes.

3 Results

In order to test the robustness of the CLM results to alternative measures of personality, we first attempt to replicate them (Table 8 in the original paper). The results are presented in Table 2. First, we notice that (see column 2) the means of all but two variables match those in CLM.[4] Unfortunately, restricting the sample according to what specified in the original paper (all individuals with nonmissing cognitive tests at all ages) leads to the inclusion of almost three hundred observations more than in CLM. Despite this, and some potential uncertainty in the exact specifications of background variables and economic controls, the replicated results are remarkably similar to the original ones: in particular, cognitive ability and social integration represent large portions of the gradient, while current and future satisfaction and personality (as defined in CLM) matter very little.

We next compare these results with those obtained using our alternative measures of child personality (BSAG and Rutter). First, we notice that these new measures explain, on average, 16% of the gradient, a portion that is at least comparable (although slightly less) to that of cognitive ability. In fact, the reduction on the education coefficient after including the BSAG and Rutter scores is of a sizeable magnitude for the majority of the outcomes, and it is greater than the reduction due to cognitive ability for diet, being overweight and number of drinks. Second, when we include our personality measures together with cognitive ability, we see a percentage reduction in the coefficient on education which is comparable to the one obtained upon the inclusion of cognitive ability alone. Given that we also observe a reduction in the education coefficient with

[3]Unforthcomingness, Withdrawal, Depression, Anxiety, Hostility towards adults, Writing off adults & standards, Anxiety for acceptance by kids, Hostility towards children, Restlessness, Inconsequential behavior, Miscellaneous symptoms, Miscellaneous nervous symptoms.

[4]The exceptions are "heavy drinker" and "number of drinks per week", which are not precisely defined in CLM.

Table 1: Summary Statistics

Variable	Did not pass A levels		Passed A levels		Min	Max
	N	Mean	N	Mean		
Cognitve Measures						
Age 7						
Math (arithmetic)	7128	4.78	2975	6.39	0	10
Drawing (Draw-a-man test)	7015	23.15	2915	26.29	0	53
Age 11						
Reading Comprehension	6893	14.59	2910	20.90	0	35
Math	6893	14.28	2908	25.20	0	40
Verbal	6894	20.46	2909	28.91	0	40
Non-verbal	6894	19.68	2909	26.28	0	40
Drawing (Copying designs)	6882	8.23	2902	8.83	0	12
Age 16						
Reading comprehension	5964	23.87	2640	30.53	0	35
Math	5931	10.73	2637	19.00	0	31
Life Satisfaction						
Current (0=min; 10=max)	7925	7.23	3339	7.43	0	10
In ten years (0=min; 10=max)	7904	8.03	3334	8.11	0	10
Personality Scales						
Efficacy 1 (never get what I want out of life=1)	7902	0.26	3330	0.15	0	1
Efficacy 2 (usually have control over my life=1)	7914	0.87	3336	0.94	0	1
Efficacy 3 (can run my life how I want=1)	7914	0.94	3333	0.96	0	1
Malaise index (1=healthy; 24=unhealthy)	7931	3.86	3342	2.96	0	24
GHQ12 (1=low stress; 12=high stress)	7933	1.83	3342	1.88	0	12
Socialization						
Mother is alive (percent)	7690	0.76	3282	0.82	0	1
Frequency sees mother (0=every day, 4=never)	6167	1.84	2757	2.19	1	5
Father is alive (percent)	7754	0.57	3306	0.64	0	1
Frequency sees father (0=every day, 4=never)	4577	1.98	2141	2.30	1	5
Frequency eat together as a family (1=daily, 5=never)	5087	2.18	2199	2.12	1	5
Frequency go out together as a family (1=daily, 5=never)	5123	2.65	2256	2.17	1	5
Frequency visit relatives as a family (1=daily, 5=never)	5174	2.11	2276	2.14	1	5
Frequency go on holiday as a family (1=daily, 5=never)	5103	3.83	2262	3.50	1	5
Frequency go out alone or with friends (1=weekly, 4=never)	6325	2.24	2721	2.17	1	4
Frequency attends religious services (1=weekly, 4=never)	6898	3.54	2581	3.04	1	4
BSAG						
Depression (age 7)	7148	1.08	2980	0.56	0	14
Depression (age 11)	6888	1.15	2903	0.53	0	10
Anxiety (age 7)	7149	0.93	2980	0.82	0	12
Anxiety for acceptance by kids (age 7)	7148	0.31	2980	0.24	0	8
Anxiety for acceptance by kids (age 11)	6888	0.35	2903	0.22	0	8
Anxiety for acceptance by adults (age 11)	6888	0.59	2903	0.44	0	11
Hostility towards children (age 7)	7148	0.28	2980	0.16	0	9
Hostility towards children (age 11)	6888	0.30	2903	0.14	0	10
Hostility towards adults (age 7)	7148	0.80	2980	0.45	0	16
Hostility towards adults (age 11)	6888	0.93	2903	0.49	0	18
Unforthcomingness (age 7)	7149	1.86	2980	1.35	0	15
Unforthcomingness (age 11)	6888	1.69	2902	1.15	0	12
Withdrawal (age 7)	7148	0.34	2980	0.21	0	10
Withdrawal (age 11)	6888	0.36	2902	0.21	0	8
Writing off adults and standards (age 7)	7148	0.98	2980	0.48	0	16
Writing off adults and standards (age 11)	6888	1.09	2903	0.54	0	16
Restlessness (age 7)	7148	0.29	2980	0.13	0	4
Restlessness (age 11)	6888	0.25	2903	0.09	0	4
Inconsequential behavior (age 7)	7148	1.51	2980	0.80	0	11
Inconsequential behavior (age 11)	6888	1.55	2903	0.74	0	12
Miscellaneous symptoms (age 7)	7148	0.63	2980	0.38	0	7
Miscellaneous symptoms (age 11)	6888	0.65	2903	0.38	0	7
Miscellaneous nervous symptoms (age 7)	7148	0.15	2980	0.10	0	4
Miscellaneous nervous symptoms (age 11)	6888	0.12	2903	0.07	0	4
Rutter						
Parent rating (age 7)	6587	6.34	2764	5.75	0	24
Parent rating (age 11)	6115	5.94	2672	5.32	0	23
Parent rating (age 16)	5757	4.37	2481	3.25	0	30
Teacher rating (age 16)	5709	4.84	2561	1.99	0	43

the inclusion of the BSAG and of the Rutter Scales alone, this would suggest a significant degree of correlation among the two sets of measurements – and indeed, to give one example, the correlation between the teacher-rated Rutter Scale and the reading and math tests at age 16 is > 0.35.[5]

However, although both the BSAG and the Rutter scales are widely used, they capture behavioral problems in general, and do not reflect particular personality traits. Hence, we also include an additional set of results using measures intended to capture specific personality traits, in particular we examine the importance of motivation, and depression and anxiety. Our inclusion of motivation is based on recent work in psychology which has stressed its importance in predicting achievement (Duckworth et al., 2007). We use a series of self-rated measures[6] as well as a teacher-rated measure (ranking the student from 1 "lazy" to 5 "hardworking") of academic motivation, both taken at age 16. The Cronbach's alpha reliability coefficient for the scale constituted of these item is a satisfactory 0.77. Notice also that, although depression and anxiety are stressed by CLM as key personality traits potentially influencing health behaviors, they do not directly test their importance in explaining the education-health gradient using the NCDS. We try to do so by using a subset of the BSAG syndromes (all related to depression and anxiety).[7] The results reported in Table 3 show that the both traits play substantial roles in explaining the gradient (especially motivation), on a scope rivaling that of cognition. For example, motivation accounts for the same reduction in the gradient - 48% - as cognitive ability for the probability of being a current smoker, and for a bigger reduction - 29% *versus* 17% - in the number of cigarettes smoked; we also confirm its bigger role, as compared to cognition, in explaining the gradient in diet, being overweight and number of drinks. While the use of more well-established measures like the BSAG and the Rutter scales is important to verify these results, both motivation and - although to a lesser extent - depression and anxiety appear to be key traits.

4 Conclusions

In this note we have tested the robustness of CLM results on the role of personality in explaining the education-health gradient by using alternative measures of child personality available in the NCDS. We have shown that, while cognitive ability plays a significant role, the type of personality measures included and the age at which they are

[5] Conti et al. (2010a) report that the correlation between cognitive and noncognitive endowments is 0.54.

[6] The questions asked are: "I feel school is largely a waste of time", "I am quiet in the classroom and get on with my work", "I think homework is a bore", "I find it difficult to keep my mind on my work", "I never take work seriously", "I don't like school", "I think there is no point in planning for the future - you should take things as they come", and "I am always willing to help the teacher", ranked from 1 "very true" to 5 "not true at all".

[7] In particular: depression (ages 7 and 11), anxiety (age 7), anxiety for acceptance by kids (ages 7 and 11), and anxiety for acceptance by adults (age 11).

Table 2: Replicated and New Results

Behavior	Mean	N	Coefficient on passing A level										Economic controls	Addition to income and background controls							
			Demographics and background	Economic controls	Addition to income and background controls																
					Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	BSAG and Rutter	Cognitive, BSAG and Rutter	All Factors		Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	BSAG and Rutter	Cognitive, BSAG and Rutter	All factors
Smoking																					
Current smoker	29%	6752	-0.126***	-0.100***	-0.039***	-0.100***	-0.095***	-0.081***	-0.029**	-0.071***	-0.038**	-0.027*	21%	48%	0%	4%	15%	56%	23%	49%	58%
			(0.013)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.015)	(0.015)									
Former smoker	25%	6752	-0.02	-0.019	-0.014	-0.019	-0.019	-0.028**	-0.02	-0.017	-0.015	-0.021	5%	25%	0%	0%	-45%	-5%	10%	20%	-10%
			(0.012)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.015)	(0.015)									
Quit smoking (ever smoked only)	46%	3653	0.099***	0.077***	0.031	0.079***	0.075***	0.053**	0.018	0.060***	0.031	0.016	22%	46%	-2%	2%	24%	60%	17%	46%	62%
			(0.021)	(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.024)	(0.022)	(0.024)	(0.024)									
Number of cigarettes smoked	17	1673	-1.579***	-1.276**	-1.006	-1.477**	-1.275**	-0.957	-0.886	-1.314**	-1.201*	-1.044	19%	17%	-13%	0%	20%	25%	-2%	5%	15%
			(0.569)	(0.595)	(0.642)	(0.592)	(0.588)	(0.602)	(0.634)	(0.612)	(0.654)	(0.645)									
Diet/exercise																					
BMI	25.9	6588	-0.571***	-0.684***	-0.557***	-0.689***	-0.642***	-0.603***	-0.499***	-0.552***	-0.579***	-0.515***	-20%	22%	-1%	7%	14%	32%	23%	18%	30%
			(0.136)	(0.148)	(0.162)	(0.148)	(0.148)	(0.151)	(0.163)	(0.151)	(0.162)	(0.164)									
Underweight	1%	6588	0.007**	0.008**	0.009**	0.008**	0.008**	0.008**	0.008**	0.007**	0.008**	0.008**	-14%	-14%	0%	0%	0%	0%	14%	0%	0%
			(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)									
Overweight	52%	6588	-0.075***	-0.081***	-0.079***	-0.082***	-0.076***	-0.073***	-0.072***	-0.069***	-0.081***	-0.072***	-8%	3%	-1%	7%	11%	12%	16%	0%	12%
			(0.014)	(0.015)	(0.017)	(0.015)	(0.015)	(0.016)	(0.017)	(0.016)	(0.017)	(0.017)									
Obese	15%	6588	-0.039***	-0.039***	-0.028**	-0.040***	-0.036***	-0.033***	-0.025**	-0.030***	-0.030**	-0.027**	0%	28%	-3%	8%	15%	36%	23%	23%	31%
			(0.01)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)	(0.012)	(0.013)									
Exercise regularly	75%	6751	0.092***	0.069***	0.047***	0.070***	0.065***	0.056***	0.043***	0.055***	0.043***	0.039***	25%	24%	-1%	4%	14%	28%	15%	28%	33%
			(0.013)	(0.014)	(0.015)	(0.013)	(0.013)	(0.014)	(0.015)	(0.014)	(0.015)	(0.015)									
Eat fruit every day	53%	6751	0.107***	0.103***	0.090***	0.103***	0.098***	0.077***	0.074***	0.086***	0.086***	0.070***	4%	12%	0%	5%	24%	27%	16%	16%	31%
			(0.014)	(0.015)	(0.017)	(0.015)	(0.015)	(0.016)	(0.017)	(0.016)	(0.017)	(0.017)									
Eat vegetables every day	17%	6751	0.032***	0.018	0.040***	0.018	0.018	0.013	0.038***	0.014	0.039***	0.037***	44%	-69%	0%	0%	16%	-63%	13%	-66%	-59%
			(0.011)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.013)	(0.013)									
Drinking																					
Drinker	95%	6752	0.013**	0.008	-0.003	0.008	0.007	0.011	0.003	0.002	-0.002	0.003	38%	85%	0%	8%	-23%	38%	46%	77%	38%
			(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)									
Heavy drinker	20%	6752	0.053***	0.026**	-0.001	0.026**	0.028**	0.021*	0	0.016	-0.002	-0.001	51%	51%	0%	-4%	9%	49%	19%	53%	51%
			(0.011)	(0.012)	(0.014)	(0.012)	(0.012)	(0.013)	(0.014)	(0.013)	(0.014)	(0.014)									
Number of drinks in week	11.8	5585	-1.119***	-1.047**	-1.259***	-1.030**	-0.930**	-0.707	-0.920*	-0.903**	-1.160**	-0.804*	6%	-19%	2%	10%	30%	11%	13%	-10%	22%
			(0.399)	(0.434)	(0.477)	(0.434)	(0.434)	(0.44)	(0.476)	(0.446)	(0.481)	(0.481)									
Illegal drugs																					
Illegal drugs in last 12 months	8%	6707	0.004	0.008	0.008	0.008	0.009	0.004	0.004	0.013	0.009	0.005	-100%	0%	0%	-25%	100%	100%	-125%	-25%	75%
			(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.009)	(0.009)									
Ever tried illegal drugs	34%	6707	0.070***	0.069***	0.057***	0.070***	0.074***	0.056***	0.050***	0.082***	0.061***	0.055***	1%	17%	-1%	-7%	19%	27%	-19%	11%	20%
			(0.013)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)	(0.015)	(0.015)									
Unweighted Percentages (Significant Outcomes)													14%	18%	-1%	3%	14%	24%	16%	18%	24%
Unweighted Percentages (Original Significant Outcomes)													15%	21%	-1%	3%	10%	24%	15%	19%	24%

The sample includes all people with cogntive measures at all ages. The left side of the table presents the coefficient on a binary indicator for the passing the A-level, given each set of controls. The right side of the table presents the % reduction in this coefficient for each specification. Economic controls are compared to just demographics and background controls, while all other % reductions are the additional reduction beyond economic controls. Demographic controls include age, sex, race and ethnic dummies. Parental and background measures include height at age 16, birthweight, SES of dad at birth, age 7, age 11 and age 16, marital status and current SES. Three cognitive tests are included: at age 7 (math and drawing), age 11 (reading, math, verbal, non-verbal, and drawing), and age 16 (math and reading comprehension). Current life satisfaction is measured by a 10 point scale based on a question of how good life has turned out so far. Future life satisfaction is a 10 point scale based on where the subject expects themself to be in 10 years. Personality measures include 3 measures of efficacy based on answers to three questions, and the malaise score. Social integration measures include: parents alive, see parents, freqency eat together with family, frequency visit relatives with family, freqency go out together as family, freqency spend holidays togehter as family, frequency go out alone or with friends, frequency attends religious service. BSAG and Rutter are described in the text and the appendix. Missing variables were included as zeros, with dummies identifying missing data. Health outcomes are measured at wave 6.

Table 3: Results With Alternative Personality Measures

Behavior	Mean	N	Coefficient on passing A level										Economic controls	Addition to income and background controls							
			Demographics and background	Economic controls	Addition to income and background controls																
					Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	Motivation	Depression and Anxiety	All Factors		Cognitive ability	Current and future satisfaction	Personality	Social integration	All original factors	Motivation	Depression and Anxiety	All factors
Smoking																					
Current smoker	29%	6752	-0.126***	-0.100***	-0.039***	-0.100***	-0.095***	-0.081***	-0.029**	-0.039***	-0.088***	-0.007	21%	48%	0%	4%	15%	56%	48%	10%	74%
			(0.013)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)	(0.015)									
Former smoker	25%	6752	-0.020	-0.019	-0.014	-0.019	-0.019	-0.028**	-0.020	0.008	-0.021	-0.003	5%	25%	0%	0%	-45%	-5%	135%	-10%	80%
			(0.012)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)	(0.015)									
Quit smoking (ever smoked only)	46%	3653	0.099***	0.077***	0.031	0.079***	0.075***	0.053**	0.018	0.053**	0.068***	0.012	22%	46%	-2%	2%	24%	60%	24%	9%	66%
			(0.021)	(0.022)	(0.023)	(0.022)	(0.022)	(0.022)	(0.024)	(0.022)	(0.022)	(0.024)									
Number of cigarettes smoked	17.0	1673	-1.579***	-1.276**	-1.006	-1.477**	-1.275**	-0.957	-0.886	-0.823	-1.263**	-0.746	19%	17%	-13%	0%	20%	25%	29%	1%	34%
			(0.569)	(0.595)	(0.642)	(0.592)	(0.588)	(0.602)	(0.634)	(0.607)	(0.602)	(0.642)									
Diet/exercise																					
BMI	25.9	6588	-0.571***	-0.684***	-0.557***	-0.689***	-0.642***	-0.603***	-0.499***	-0.637***	-0.553***	-0.490***	-20%	22%	-1%	7%	14%	32%	8%	23%	34%
			(0.136)	(0.148)	(0.162)	(0.148)	(0.148)	(0.151)	(0.163)	(0.152)	(0.148)	(0.165)									
Underweight	1%	6588	0.007**	0.008**	0.009**	0.008**	0.008**	0.008**	0.008**	0.008**	0.008**	0.008**	-14%	-14%	0%	0%	0%	0%	0%	0%	0%
			(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)									
Overweight	52%	6588	-0.075***	-0.081***	-0.079***	-0.082***	-0.076***	-0.073***	-0.072***	-0.074***	-0.072***	-0.070***	-8%	3%	-1%	7%	11%	12%	9%	12%	15%
			(0.014)	(0.015)	(0.017)	(0.015)	(0.015)	(0.016)	(0.017)	(0.016)	(0.016)	(0.017)									
Obese	15%	6588	-0.039***	-0.039***	-0.028**	-0.040***	-0.036***	-0.033***	-0.025**	-0.036***	-0.030***	-0.026**	0%	28%	-3%	8%	15%	36%	8%	23%	33%
			(0.010)	(0.011)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)	(0.012)	(0.011)	(0.013)									
Exercise regularly	75%	6751	0.092***	0.069***	0.047***	0.070***	0.065***	0.056***	0.043***	0.056***	0.064***	0.038**	25%	24%	-1%	4%	14%	28%	14%	5%	34%
			(0.013)	(0.014)	(0.015)	(0.013)	(0.013)	(0.014)	(0.015)	(0.014)	(0.014)	(0.015)									
Eat fruit every day	53%	6751	0.107***	0.103***	0.090***	0.103***	0.098***	0.077***	0.074***	0.081***	0.098***	0.066***	4%	12%	0%	5%	24%	27%	21%	5%	35%
			(0.014)	(0.015)	(0.017)	(0.015)	(0.015)	(0.016)	(0.017)	(0.016)	(0.015)	(0.017)									
Eat vegetables every day	17%	6751	0.032***	0.018	0.040***	0.018	0.018	0.013	0.038***	0.014	0.016	0.034**	44%	-69%	0%	0%	16%	-63%	13%	6%	-50%
			(0.011)	(0.012)	(0.013)	(0.012)	(0.012)	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)									
Drinking																					
Drinker	95%	6752	0.013**	0.008	-0.003	0.008	0.007	0.011	0.003	0.005	0.004	0.002	38%	85%	0%	8%	-23%	38%	23%	31%	46%
			(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)									
Heavy drinker	20%	6752	0.053***	0.026**	-0.001	0.026**	0.028**	0.021*	-0.000	0.031**	0.021	0.003	51%	51%	0%	-4%	9%	49%	-9%	9%	43%
			(0.011)	(0.012)	(0.014)	(0.012)	(0.012)	(0.013)	(0.014)	(0.013)	(0.013)	(0.014)									
Number of drinks in week	11.8	5585	-1.119***	-1.047**	-1.259***	-1.030**	-0.930**	-0.707	-0.920*	-0.124	-1.078**	-0.500	6%	-19%	2%	10%	30%	11%	82%	-3%	49%
			(0.399)	(0.434)	(0.477)	(0.434)	(0.434)	(0.440)	(0.476)	(0.445)	(0.438)	(0.479)									
Illegal drugs																					
Illegal drugs in last 12 months	8%	6707	0.004	0.008	0.008	0.008	0.009	0.004	0.004	0.024***	0.009	0.012	-100%	0%	0%	-25%	100%	100%	-400%	-25%	-100%
			(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)									
Ever tried illegal drugs	34%	6707	0.070***	0.069***	0.057***	0.070***	0.074***	0.056***	0.050***	0.118***	0.073***	0.076***	1%	17%	-1%	-7%	19%	27%	-70%	-6%	-10%
			(0.013)	(0.014)	(0.015)	(0.014)	(0.014)	(0.014)	(0.015)	(0.014)	(0.014)	(0.015)									
Unweighted Percentages (Significant Outcomes)													14%	18%	-1%	3%	14%	24%	14%	9%	29%
Unweighted Percentages (Original Significant Outcomes)													15%	21%	-1%	3%	10%	24%	24%	8%	34%

The sample includes all people who took cognitive tests at all ages. The left side of the table presents the coefficient on a binary indicator for the passing the A-level, given each set of controls. The right side of the table presents the % reduction in this coefficient for each specification. Economic controls are compared to just demographics and background controls, while all other % reductions are relative to a specification that includes demographics and background controls and economic controls. Demographic controls include age, sex, race and ethnic dummies. Parental and background measures include height at age 16, birthweight, SES of dad at birth, age 7, age 11 and age 16, marital status and current SES. Three cognitive tests are included: at age 7 (math and drawing), age 11 (reading, math, verbal, non-verbal, and drawing), and age 16 (math and reading comprehension). Current life satisfaction is measured by a 10 point scale based on a question of how good life has turned out so far. Future life satisfaction is a 10 point scale based on where the subject expects themself to be in 10 years. Personality measures include 3 measures of efficacy based on answers to three questions, and the malaise score. Social integration measures include: parents alive, see parents, freqency eat together with family, frequency visit relatives with family, freqency go out together as family, freqency spend holidays togehter as family, frequency go out alone or with friends, frequency attends religious service. Motivation and depression and anxiety are described in the text and the appendix. Missing variables were included as zeros, with dummies identifying missing data. Health outcomes are measured at wave 6.

measured play a non-negligible role, and more attention should be paid to these issues in future research. Our analysis shows that personality contributes to the education-health gradient to an extent nearly as large as that of cognition.

A Appendix

Table A.1: Rutter Behaviour Scale Questions

Parent Rating (Ages 7 and 11)
Is squirmy or fidgety
Destroys own or others' belongings (e.g. tears or breaks).
Fights with other children
Worries about many things
Prefers to do things on his/her own rather than with others
Is irritable, quick to fly off the handle
Is miserable or tearful
Has twitches or mannerisms of the face, eyes or body
Sucks thumb or finger during the day
Bites nails
Is disobedient at home
Has difficulty in settling to anything for more than a few moments
Is upset by new situation, by things happening for first time
Is bullied by other children

Parent Rating (Age 16)
Very restless. Has difficulty staying seated for long
Squirmy, fidgety child
Often destroys own or others' property
Frequently fights or is extremely quarrelsome with other children
Not much liked by other children
Often worried, worries about many things
Tends to do things on his/her own – rather solitary
Irritable. Is quick to fly off the handle
Often appears miserable, unhappy, tearful or distressed
Has twitches, mannerisms or tics of the face or body
Frequently sucks thumb or finger
Frequently bites nails or fingers
Is often disobedient
Cannot settle to anything for more than a few moments
Tends to be fearful or afraid of new things or new situations
Fussy or over-particular
Often tells lies
Bullies other children

Teacher Rating (Age 16)
Very restless. Has difficulty staying seated for long
Squirmy, fidgety child
Often destroys or damages own or others' property
Frequently fights or is extremely quarrelsome with other children
Not much liked by other children
Often worries, worries about many things
Tends to do things on his/her own – rather solitary
Irritable, touchy, is quick to fly off the handle
Often appears miserable, unhappy, tearful or distressed
Has stolen things on one or more occasions in the last 12 months
Has twitches, mannerisms or tics of the face or body
Frequently sucks thumb or finger
Frequently bites nails or fingers
Is often disobedient
Cannot settle to anything for more than a few moments
Tends to be fearful or afraid of new things or new situations
Fussy or over-particular
Often tells lies
Bullies other children
Truants from school.
Tends to be absent from school for trivial reasons
Unresponsive, inert or apathetic
Often complains of aches or pains
Has had tears on arrival at school or has refused to come into the building in the past 12 months
Has a stutter or stammer
Resentful or aggressive when corrected

Anxiety for acceptance by kids

- Plays the hero (attitude to correction).
- Can't resist playing to the crowd (effect of correction).
- Inclined to fool around in team games.
- Over-brave (takes unnecessary risks) in team games.
- Over-anxious to be in with the gang (tries to curry favour, toadies, easily led) (companionship).
- Likes to be the centre of attention (companionship).
- Plays only or mainly with elder children (ways with other children).
- Strikes brave attitude but funks (physical prowess).
- Brags to other children (liking the limelight).
- Shows off (pulls silly faces, mimics, clowns) (liking the limelight).
- Spivish hair style (care for appearance).
- Damage to public property, etc (of school, fences, unoccupied houses) (nuisance).

Hostility towards kids

- In informal play disturbs others' games, teases, likes frightening.
- Sometimes nasty to those outside own set (ways with other children).
- Hurts by pushing about, hitting (ways with other children).
- Squabbles, makes insulting remarks (ways with other children).
- Tells tales, underhand (tries to get others into trouble) (ways with other children).
- Spoils or hides other children's things (nuisance).
- Mostly on bad terms with others (companionship).
- Spiteful to weaker children (ways with other children).
- Disliked, shunned (attitude to other children).
- Fights viciously (bites, kicks, scratches, uses dangerous objects as weapons) (physical prowess).

Hostility towards adults

- Ability at class jobs varies with mood.
- In answering questions eager except when in one of his moods.
- Persistence in manual tasks depends on his moods.
- In talking to teacher inclined to be moody.
- Offers to help teacher with jobs except when in a bad mood.
- In asking teacher's help sometimes very forward, sometimes sulky.
- In greeting teacher sometimes eager, sometimes definitely avoids.
- Response to greeting can be surly or suspicious.

- General manner with teacher is sometimes friendly, sometimes in a bad mood.
- Standard (manual) very variable (seems at times to do badly on purpose).
- Damage to personal property (cars, tradesmans belongings, etc) (nuisance).
- Bad language, vulgar stories, rhymes, drawings (nuisance).
- Suspicious (on the defensive) (liking for attention).
- Resentful mutterings or expression at times (attitude to correction).
- Sometimes a fluent liar (truthfulness).
- Has stolen money, sweets, valued objects once or twice (honesty).
- Bears a grudge, always regards punishment as unfair (effect of correction).
- Has a wild, hostile look in the eyes.
- Very naughty, difficult to discipline (class room behaviour).
- Aggressive defiance (screams, threats, violence) (attitude to correction).
- Associates mostly with unsettled types (attitude of other children).
- Has stolen money, sweets, valued objects frequently (honesty).
- Obscene behaviour (nuisance).

Writing off adults and adult standards

- Won't bother to learn (attentiveness).
- Only works when watched or compelled (persistence) (classwork).
- Only works when watched or compelled (persistence) (manual tasks).
- When answering questions not shy but unconcerned.
- Not shy but never comes for help willingly (asking teacher's help).
- Has no wish to volunteer help teacher with jobs.
- Unconcerned about approval or disapproval (liking for attention).
- Minimises contact with teacher but not backward with other children.
- Avoids talking to teacher but talks to other children.
- Copies from others (honesty).
- Takes books from others without permission (honest).
- Selfish, scheming, a spoilsport (ways with other children).
- Cunning, dishonest in individual games.
- Bad sportsman (plays for himself only, cheats, fouls) in team games.
- Can't look you in the face (eyes).
- Not open or friendly; sometimes seems to be watching you to see if you know (general manner with teacher).
- Can never keep a friend long (tries to pal up with newcomers) (companionship).

- Untrustworthy (ability at class jobs).
- Treats lenience as weakness (effect of correction).
- Plausible, sly; will abuse trust, hard to catch (classroom behaviour).
- Habitual slick liar; has no compunction about lying (truthfulness).

Withdrawal

- Absolutely never greets teacher.
- Does not answer when greeted.
- Makes no friendly or eager response (general manner with teacher).
- Avoids talking to teacher (distant, deep).
- Dreamy and distracted (lives in another world) (attentiveness).
- Distant and uninterested (persistence in manual tasks).
- Dreamy, uninterested in team games.
- Distant, shuns others' company.
- Keeps clear of adults even when hurt or wronged (liking for sympathy).
- Quite cut off from people, you can't get near him as a person (general with teacher).
- Unresponsive eyes.
- Speech is an incoherent rumbling chatter.
- In contacts with teacher, is like a suspicious animal.

Unforthcomingness

- Chats only when alone with teacher.
- Bursts into tears (attitude to correction).
- Never offers to help teacher with jobs by pleased when asked.
- Submissive, takes less wanted position, a ball fetcher (team games).
- Too timid to be naughty (class room behaviour).
- Lies from timidity (truthfulness).
- Likes sympathy but reluctant to ask.
- Never brings flowers, gifts, although classmates often do.
- Never brings objects he has found, drawings, models, etc, to show teacher although classmates often do.
- Associates only with one other child and mostly ignores the rest.
- Waits to be noticed before greeting teacher.
- Never makes first approach (talking to teacher).
- Too shy to ask teacher's help.
- When answering questions, gets nervous, blushes, cries when questioned.

- Shrinks from active play in informal play.
- Mumbles shyly, awkwardly in response to greeting.
- Can't get a word out of child (talking to teacher).
- Says very little when talking to teacher.

Depression

- Depends on how he feels (asking teacher's help).
- Varies noticeably from day to day (persistence in class work).
- Sometimes alert, sometimes lethargic in team games.
- In free activity sometimes lacks interest.
- Persistence in manual tasks varies greatly.
- Impatient, loses temper with job (persistence - manual tasks).
- Flies into a temper if provoked (physical prowess).
- Can work alone but has no energy (persistence in class work).
- Lacks physical energy (persistence manual tasks).
- Has no life in him (class room behaviour).
- Apathetic (just sits) (attentiveness).
- Shuffles restlessly (posture).
- In asking teacher's help too apathetic to bother.
- Dull listless eyes.
- Always sluggish, lethargic in team games.
- Sometimes wanders off alone (companionship).
- Speech is thick, mumbling, inaudible.
- Expression is miserable, depressed (under the weather) seldom smiles.

Anxiety for acceptance by adults

- Very anxious to do jobs (helping teacher with jobs).
- In greeting teacher, over-eager to greet.
- In talking to teacher, over-talkative (tires with constant chatter).
- Very anxious to bring flowers, gifts (contact with teacher).
- Very often brings objects he has found, drawings, models, etc, to show teacher (contact with teacher).
- Over-friendly (general manner with teacher).
- Talks excessively to teacher about own doings, family or possessions.
- Sidles up to or hangs around teacher (contact with teacher).
- Always finding excuses for engaging teacher (asking teachers help).

- Craves for sympathy (comes unnecessarily with minor scratches, bumps, etc, complains of being hurt by others (liking for sympathy).
- Tries to monopolise teacher (liking for attention).
- Tells fantastic yarns (truthfulness).
- Wants adult interest but can't put himself forward (liking for attention).
- Trades sympathy or interest (liking for sympathy).
- Put out if can't get attention (liking for attention).

Restlessness

- Gives up easily, persistence (manual tasks).
- Too restless in individual games.
- Feckless, scatterbrain (ability at class jobs).
- Too restless to work alone (persistence in class work).

Inconsequential behaviour

- Sometimes eager, sometimes doesn't bother (answering questions).
- Constantly needs petty correction (classroom behaviour).
- Too restless to remember for long (effect of correction).
- Cannot attend or concentrate for long (cannot sit still when read to or during broadcasts, plays with things under desk, etc) (attentiveness).
- Rough and ready, slapdash (standard) (manual).
- In informal play starts off others in scrapping and rough play.
- Does not know what to do with himself, can never stick at anything long (free activity).
- Misbehaves when teacher is out of room (liking the limelight).
- Careless, untidy, often loses or forgets books, pen (belongings).
- Gets very dirty during day (care for appearance).
- Slumps, lolls about (posture).
- Foolish pranks when with a gang (nuisance).
- Follower in mischief (nuisance).

Miscellaneous symptoms

- In informal play, plays childish games for his age.
- In team games eager to play but loses interest.
- Babyish (mispronounces simple words) (speech).
- Too immature to heed (effect of correction).
- Plays only or mainly with younger children (ways with other children).
- In team games, timid or poor spirited.

- Gets bullied (physical prowess).
- Has truanted once or twice, often suspected of truancy (attendance).
- Often late (punctuality).
- Has cut lessons (punctuality).
- Destructive, defaces with scribbling (belonging).
- On the fringe, somewhat of an outsider (attitude of other children).

Miscellaneous nervous symptoms

- Stutters, halts (can't get the words out) (speech).
- Jumbled speech.
- Blinking (eyes).
- Unwilled twitches, jerks, makes aimless movements with hands (fidgets, etc).
- Bites nails badly (fidgets, etc).
- Jumpy (fidgets, etc).
- Sucks fingers (over ten years) (fidgets, etc).

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