Research Article

Self-Discipline Outdoes IQ in Predicting Academic Performance of Adolescents

Angela L. Duckworth and Martin E.P. Seligman

Positive Psychology Center, University of Pennsylvania

ABSTRACT—*In a longitudinal study of 140 eighth-grade students, self-discipline measured by self-report, parent report, teacher report, and monetary choice questionnaires in the fall predicted final grades, school attendance, standardized achievement-test scores, and selection into a competitive high school program the following spring. In a replication with 164 eighth graders, a behavioral delay-of-gratification task, a questionnaire on study habits, and a group-administered IQ test were added. Self-discipline measured in the fall accounted for more than twice as much variance as IQ in final grades, high school selection, school attendance, hours spent doing homework, hours spent watching television (inversely), and the time of day students began their homework. The effect of self-discipline on final grades held even when controlling for first-marking-period grades, achievement-test scores, and measured IQ. These findings suggest a major reason for students falling short of their intellectual potential: their failure to exercise self-discipline.*

What distinguishes top students from others? Are they simply smarter? If so, what explains the wide range of performance among children of equal IQ?

Intellectual strengths (e.g., long-term memory, ability to think abstractly) and nonintellectual strengths (e.g., motivation, self-discipline) surely both contribute to a student's academic performance. Valid measures of IQ have been available since the early 1900s, making possible serious research into the correlates and consequences of intellectual ability. In contrast, nonintellectual strengths, including self-discipline, have lagged behind as objects of empirical investigation. For every article on academic achievement and self-discipline in the PsycInfo database, there are more than 10 articles on academic achievement and intelligence.

Address correspondence to Angela L. Duckworth, Positive Psychology Center, University of Pennsylvania, 3701 Market St., Suite 200, Philadelphia, PA 19104; e-mail: angela_duckworth@yahoo.com.

Reliable and stable measures of self-discipline for children and adolescents exist. However, reported correlations among different measures are moderate and often inconsistent in magnitude (e.g., White, Moffitt, Caspi, & Bartusch, 1994), suggesting that a valid measure of self-discipline for this age group requires a multimethod, multisource approach. In this investigation, we included self-report, parent report, teacher report, and both hypothetical and behavioral delay-of-gratification measures.

Studies exploring individual differences in self-discipline within nonclinical populations are rare and, unlike the current investigation, have focused on either college students or very young children. Most notably, Mischel and his colleagues showed that greater ability to delay gratification measured at age 4 predicted higher academic and social functioning more than a decade later (H.N. Mischel & Mischel, 1983; W. Mischel, Shoda, & Peake, 1988; Shoda, Mischel, & Peake, 1990). More recently, Wolfe and Johnson (1995) found self-discipline to be the only one among 32 measured personality variables (e.g., self-esteem, extraversion, energy level) that predicted college grade point average (GPA) more robustly than SAT scores did. Similarly, Hogan and Weiss (1974) found that high self-discipline distinguished Phi Beta Kappa undergraduates from non-Phi Beta Kappa students of equal intellectual ability. In two large samples of undergraduates, Tangney, Baumeister, and Boone (2004) found that self-discipline correlated positively with self-reported grades, as well as a broad array of personal and interpersonal strengths.

In the current investigation, we used a multimethod, multisource approach and a longitudinal, prospective design to test three hypotheses:

- Self-discipline measured in the fall will predict academic performance the following spring. Specifically, compared

with their less impulsive counterparts, highly self-disciplined students will earn higher final GPAs and achievement-test scores, come to school more often, watch less television, start their homework earlier, and more likely gain admission to a competitive high school program.
- Self-discipline measured in the fall will account for more variance in academic-performance outcomes than will IQ measured in the fall.
- Self-discipline measured in the fall will predict final GPA, controlling for IQ and first-marking-period GPA.

Our investigation proceeded in two stages. For Study 1, we recruited eighth graders and measured self-discipline and academic performance in the fall and spring. In Study 2, we replicated this study, adding a behavioral delay-of-gratification task of our own design, a group-administered IQ test, and a questionnaire about study and lifestyle habits.

METHOD

Research Participants

The participants were two consecutive cohorts of eighth-grade students recruited from a socioeconomically and ethnically diverse magnet public school in a city in the Northeast. Fifth-grade students are admitted to this school on the basis of their grades and standardized test scores. At the end of the eighth grade, roughly 70% of these students are selected for a more competitive high school program.

In Study 1, 71% of the school's 198 eighth-grade students ($N = 140$) elected to participate. In mid-November 2002, when the self-discipline measures were administered, the mean age of the participants was 13.4 years ($SD = 0.37$). Fifty-five percent of the participants were Caucasian, 32.1% were Black, 8.6% were Asian, 3.6% were Latino, and 0.7% were American Indian. Fifty-six percent of the participants were female.

In Study 2, 83% of the students ($N = 164$) elected to participate. In mid-October 2003, when the self-discipline measures were administered, the mean age of the participants was 13.8 years ($SD = 0.51$). Fifty-two percent of the participants were Caucasian, 31.1% were Black, 12.2% were Asian, 4.3% were Latino, and 0.6% were American Indian. Fifty-four percent of the participants were female.

Procedure

With the intent of creating a composite self-discipline score for each participant, we recorded questionnaire data from students, parents, and teachers, as well as delay-of-gratification data, in the fall of 2002 for Study 1. We collected the same data and, additionally, administered an IQ test in the fall of 2003 for Study 2. Academic-performance data for each study were recorded approximately 7 months following the collection of the self-discipline data. With the exception of the parent and teacher questionnaires used in Study 2, we confirmed 7-month test-retest reliability for all self-discipline measures by administering them again in the spring.

Measures for Study 1

We employed two widely used self-report measures of self-discipline. The Eysenck I.6 Junior Impulsiveness Subscale (EJI; Eysenck, Easting, & Pearson, 1984) was designed exclusively for children and includes 23 yes/no questions about doing and saying things impulsively. The Brief Self-Control Scale (BSCS; Tangney et al., 2004) is a 13-item questionnaire that is face valid for adolescents but has previously been used only with adult subjects to measure self-regulatory behavior in four domains: thoughts, emotions, impulses, and performance.

Simultaneously, we asked parents and teachers to complete the Self-Control Rating Scale (SCRS; Kendall & Wilcox, 1979). This 33-item questionnaire asks the rater to assess the child using a scale from 1 to 7, where 4 represents "the average child," 7 represents "maximally impulsive," and 1 represents "maximally self-controlled." Items tap the ability to inhibit behavior, follow rules, and control impulsive reactions. To avoid confounding teachers' ratings and teacher-determined grades, we asked students' homeroom advisors rather than subject teachers to complete the questionnaires. To accommodate different interpretations of "average child," we standardized each teacher's scores about his or her own mean prior to all statistical analyses.

To assess the ability to delay gratification, we used the Kirby Delay-Discounting Rate Monetary Choice Questionnaire (Kirby, Petry, & Bickel, 1999). This questionnaire, originally designed for adults but face valid for adolescents, contains 27 questions. Each question asks the respondent to choose either a smaller, immediate reward or a larger, delayed reward. From these responses, we calculated a discounting rate (k), a parameter that reflects the degree to which future rewards are diminished in value as a function of the delay that must be endured to receive them. As a measure of internal reliability, a consistency value was calculated for each subject as the proportion of responses that were consistent with that subject's k value. To normalize the distribution of scores, we used a natural-log transformation of k for all statistical analyses.

We recorded data for a variety of academic-performance variables from school records. These variables included report-card grades, TerraNova Second Edition Achievement Test Normal Curve Equivalent (NCE) scores from April 2003, attendance, and selection into the school's high school program, a decision made by a committee of eighth-grade teachers and administrators on the basis of the student's likelihood of success in that more rigorous academic program.

Measures for Study 2

For self-reported self-discipline, we again used the EJI and BSCS. However, because several teachers and parents in Study 1 had complained that the format of the SCRS questionnaire confused them, we omitted it from Study 2. Instead, we adapted

the Brief Self-Control Scale for parents and teachers with permission of the authors (R.F. Baumeister, personal communication, July 1, 2003).

In addition to the Kirby Monetary Choice Questionnaire, which taps the ability to delay hypothetical gratification, we included a behavioral measure of the same ability. In a task we designed and called the Delay Choice Task, we gave each participant an envelope that held a $1 bill. We then asked the student to either take the dollar at that moment or return it to us in exchange for $2 dollars a week later, coding the choice to take the dollar immediately as "0" and the choice to wait as "1." We administered the same task again in the spring of 2004 to assess 7-month test-retest reliability.

We also added a measure of intelligence: the Otis-Lennon School Ability Test Seventh Edition (OLSAT7) Level G. This 40-min group-administered intelligence test measures verbal, quantitative, and figural reasoning skills most important to academic learning. The OLSAT7 School Ability Index (SAI) is a standard score normalized according to the student's age in months, with a mean of 100 and a standard deviation of 16. SAIs were converted to percentile ranks, which show standing relative to students of the same age, and then finally to NCE scores for use in all parametric statistical analyses.

We recorded the same academic-performance variables as in Study 1. In addition, we asked students in spring 2004 to answer questions about their study and lifestyle habits (e.g., "What time do you usually start your homework?").

RESULTS

Highly self-disciplined adolescents outperformed their more impulsive peers on every academic-performance variable, including report-card grades, standardized achievement-test scores, admission to a competitive high school, and attendance. Self-discipline measured in the fall predicted more variance in each of these outcomes than did IQ, and unlike IQ, self-discipline predicted gains in academic performance over the school year.

Reliability and Validity of the Self-Discipline Measures

The measures of self-discipline demonstrated satisfactory internal reliability and 7-month test-retest stability. Summary statistics are given in Table 1.

Intercorrelations (*r*s) between single measures of self-discipline in Study 1 ranged from .12 to .66, with an average of .31. Intercorrelations between single measures of self-discipline in Study 2 ranged from .06 to .73, with an average of .32. To increase validity and reduce multicollinearity, we created composite measures of self-discipline. Scores for some variables were recoded so that for all variables, the larger the score, the higher the level of measured self-discipline. First, we created a composite self-reported self-discipline score for each student as the mean of standardized scores for the EJI and BSCS. Next, we standardized this score and averaged it with standardized scores for the teacher, parent, and delay-of-gratification measures. We calculated the internal reliability of these linear combinations using a formula specific to linear combinations of standardized scores (Nunnally, 1978). The reliability (*r*) of the composite self-discipline score was .96 for Study 1 and .90 for Study 2. We give correlations between single measures of self-discipline and the composite measure in Table 1. Composite self-discipline in Study 2 did not correlate significantly with IQ ($r = .13$, $p = .10$).

Self-Discipline Predicts Academic Performance More Robustly Than IQ Does

As shown in Table 2, compared with their more impulsive peers, highly self-disciplined eighth graders earned higher GPAs and achievement-test scores, were more likely to gain admission to a selective high school, had fewer school absences, spent more time on their homework, watched less television, and started their homework earlier in the day. Most correlations between self-discipline and academic-performance variables ranged from medium to large in effect size (Cohen, 1992), and all were statistically significant. In contrast, correlations between IQ and academic-performance variables were at most medium in magnitude, and only half were statistically significant in the predicted direction. For example, in Study 2, the correlation between self-discipline and final GPA ($r = .67$) was twice the size of the correlation between IQ and final GPA ($r = .32$). A comparison of these correlation coefficients following the approach of Meng, Rosenthal, and Rubin (1992) showed that self-discipline predicted six of eight academic-performance variables significantly better than did IQ (see Table 2).

When IQ and self-discipline were entered simultaneously in a multiple regression analysis, self-discipline accounted for more than twice as much variance in final GPA ($\beta = .65$, $p < .001$) as IQ did ($\beta = .25$, $p < .001$). These findings are consistent with Figure 1, which shows that final GPA varied more steeply as a function of self-discipline than as a function of IQ.

Self-Discipline and Changes in GPA Over the School Year

To test the effect of self-discipline on grades controlling for past academic achievement in Study 1, we conducted a simultaneous multiple regression analysis with final GPA as the dependent variable and first-marking-period GPA and self-discipline measured in the fall as predictors. The overall regression was significant, $R^2 = .85$, $F(2, 135) = 386.73$, $p < .001$. Self-discipline predicted final GPA, controlling for first-marking-period GPA ($\beta = .10$, $p = .02$; see Table 3).

In Study 2, we tested the effect of self-discipline on grades controlling for both past academic achievement and IQ. We conducted a simultaneous multiple regression analysis with final GPA as the dependent variable and first-marking-period GPA, April achievement-test scores, self-discipline measured in the fall, and IQ as predictor variables. The overall regression was significant, $R^2 = .90$, $F(3, 151) = 451.49$, $p < .001$. Self-dis-

TABLE 1

Summary Statistics for the Self-Discipline Measures

Measure	Observed range	Internal reliability	Test-retest stability	Mean	*SD*	*r* with composite self-discipline
Brief Self-Control Scale (1–5)						
Study 1	1–5	.83	.75	3.10	0.74	.66
Study 2	1–5	.86	.76	3.26	0.73	.68
Eysenck I.6 Junior Impulsiveness Subscale* (0–23)						
Study 1	1–22	.80	.58	11.48	4.71	.56
Study 2	1–22	.83	—	11.06	5.02	.66
Self-Control Rating Scale–parent* (33–231)						
Study 1	42–179	.96	.76	89.55	30.57	.74
Study 2	—	—	—	—	—	—
Self-Control Rating Scale–teacher* (33–231)						
Study 1	33–210	.99	.83	80.21	43.35	.78
Study 2	—	—	—	—	—	—
Kirby Monetary Choice Questionnaire* (.0002–.2485)						
Study 1	.0004–.2485	.98	.60	.03	0.05	.57
Study 2	.0002–.2485	.98	—	.02	0.04	.67
Brief Self-Control Scale–parent (1–5)						
Study 1	—	—	—	—	—	—
Study 2	1–5	.91	—	3.91	0.75	.71
Brief Self-Control Scale–teacher (1–5)						
Study 1	—	—	—	—	—	—
Study 2	1–5	.97	—	4.12	0.99	.71
Delay Choice Task (0–1)						
Study 1	—	—	—	—	—	—
Study 2	0–1	Not applicable	.41	.82	0.39	.51

Note. We report scores in a manner consistent with the originally published scoring protocols; asterisks indicate those measures for which higher scores indicate lower self-discipline. For correlations with the composite measure of self-discipline, these scores were recoded such that higher scores indicate higher self-discipline.

cipline predicted final GPA, even when controlling for IQ and first-marking-period GPA ($\beta = .08$, $p = .02$; see Table 3).

DISCUSSION

We found that self-discipline predicted academic performance more robustly than did IQ. Self-discipline also predicted which students would improve their grades over the course of the school year, whereas IQ did not.

The multimethod, multisource approach to measuring self-discipline employed in this study provided a sounder measure of trait self-discipline than used in most prior studies of this age group. There was high test-retest stability for the measures; the ratings of parents, teachers, and students concurred (average $r = .41$ in Study 1 and .47 in Study 2); preferences for deferred rather than immediate hypothetical monetary rewards correlated positively with these personality measures (average $r = .12$ in Study 1 and .33 in Study 2); and preference for deferred rather than immediate real monetary awards correlated positively with all other types of self-discipline measures (average $r = .14$ in Study 2). Thus, adolescents reliably differed in their ability to choose successfully between conflicting desires and impulses, and when we measured self-discipline by a composite measure rather than by a single measure, we found that self-discipline substantially influenced academic performance.

When it comes to predicting student achievement, does self-discipline outdo IQ? In Study 2, we found that correlation coefficients between self-discipline and most achievement indicators were significantly higher than and at least twice the size of correlations between IQ and the same outcomes. Also, the standardized regression coefficient of self-discipline was more than twice that of IQ in a simultaneous multiple regression

TABLE 2

Intercorrelations Between Academic-Performance Indicators and Composite Self-Discipline Score and IQ

Academic-performance variable	Study 1 (N = 140)	Study 2 (N = 164)		Two-tailed p of difference between the IQ and self-discipline correlations
	Self-discipline	Self-discipline	IQ	
First-marking-period GPA	.52***	.66***	.34***	<.001
Final GPA	.55***	.67***	.32***	<.001
Spring achievement test	.29**	.43***	.36***	n.s.
Selection to high school	.42***	.56***	.26**	<.001
School absences	−.17*	−.26**	−.07	.06
Homework hours	—	.35***	−.09	<.001
Television hours	—	−.33***	−.06	.01
Time of day homework is begun	—	−.26**	.18*	<.001

Note. GPA = grade point average.
*p < .05. **p < .01. ***p < .001.

predicting final GPA. These results suggest that, indeed, self-discipline has a bigger effect on academic performance than does intellectual talent.

We see three possible objections to this conclusion. First, it can be argued that self-discipline in this study was measured with greater reliability than IQ, and that this alone accounts for its higher correlation with GPA. However, an argument against this hypothesis is the accuracy and precision of the Otis-Lennon test. This widely used measure has a Kuder-Richardson internal reliability coefficient of .9 and a standard error of measurement of 5.7 SAI units on a scale from 0 to 160 (Otis & Lennon, 1997). Moreover, correlations (*r*s) between the single self-discipline measures and final GPA ranged from .33 to .57, whereas the correlation between IQ and final GPA was only .32.

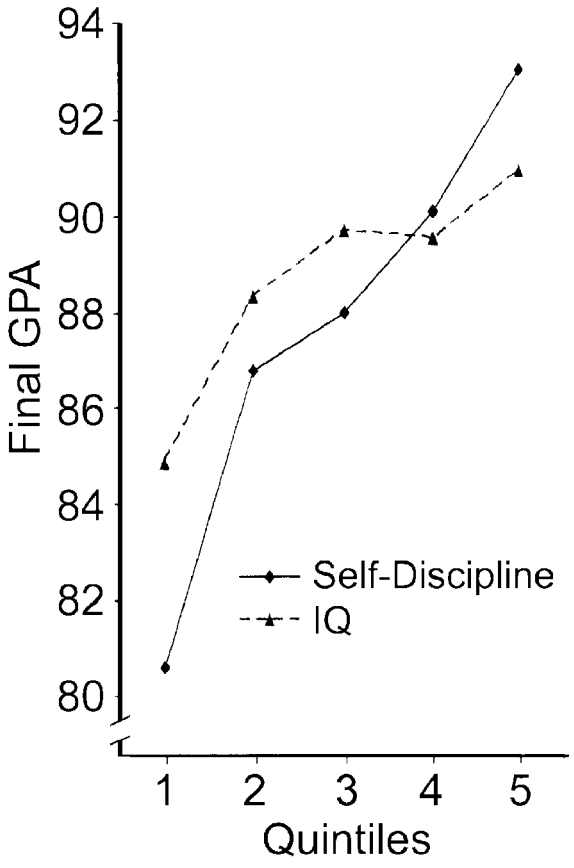

Fig. 1. Final grade point average (GPA) as a function of ranked quintiles of IQ and self-discipline in Study 2.

A second objection to the claim that discipline outdoes talent in predicting academic performance is that in the studied population, there was restriction of range for IQ, but not for self-discipline. Indeed, whereas the standard deviation for the Otis-Lennon is 16 for a normative population, in the current study of magnet-school students, the standard deviation for the Otis-Lennon was just under 10. In contrast, for the only self-discipline measure for which normative data for the same age group are available—the EJI—the variance in the present study was typical of a normative population. According to classical test theory (Lord & Novick, 1968), the unattenuated population correlation (ρ) between IQ and final GPA in the current study is estimated as .49, still smaller than the observed correlation between self-discipline and GPA (r = .67). Moreover, the fact that students from this school were admitted on the basis of their

TABLE 3

*Summary of Simultaneous Multiple Regression for Variables Predicting Final Grade Point Average (GPA) in Study 1 (***N** *= 137) and in Study 2 (***N** *= 154)*

Variable	*B*	*SE B*	β
Study 1			
First-marking-period GPA	0.96	0.04	.87***
Self-discipline	0.95	0.39	.10*
Study 2			
IQ	0.01	0.01	.01
First-marking-period GPA	0.84	0.04	.89***
Self-discipline	0.76	0.33	.08*

*p < .05. ***p < .001.

past academic success and the finding that academic success and self-discipline were highly correlated suggest that there was likely some restriction on range for self-discipline, as well as for IQ. To address this limitation, we plan to replicate these studies with more heterogeneous populations of adolescents.

Finally, the claim that discipline influences achievement more than talent does is weakened if one puts more stock in standardized achievement-test scores than in report-card grades: In Study 2, the correlation between self-discipline and achievement-test scores ($r = .43$) was nonsignificantly higher than that between IQ and achievement-test scores ($r = .36$). However, we believe that insofar as GPA reflects performance on hundreds of exams, papers, class discussions, and homework assignments assessed by multiple teachers over the course of a school year, GPA is a more valid indicator of academic achievement than a standardized test that samples a student's knowledge and skills over the course of a few hours. We also suspect that some of the common variance between IQ and achievement-test scores is due to shared method variance. It may be that independently of what they know or can do, some students excel at both kinds of multiple-choice tests taken under strict time limits.

Underachievement among American youth is often blamed on inadequate teachers, boring textbooks, and large class sizes. We suggest another reason for students falling short of their intellectual potential: their failure to exercise self-discipline. As McClure (1986) has speculated, "Our society's emphasis on instant gratification may mean that young students are unable to delay gratification long enough to achieve academic competence" (p. 20). We believe that many of America's children have trouble making choices that require them to sacrifice short-term pleasure for long-term gain, and that programs that build self-discipline may be the royal road to building academic achievement.

Acknowledgments—This research was supported by a National Science Foundation Graduate Fellowship and by National Institute of Mental Health Grants MH-52270 and MH-63430 (both to M.E.P.S.). For helpful comments on this manuscript, we thank Dianne Chambless, Sara Jaffee, Christopher Peterson, John Sabini, and Joseph Strayhorn. For assistance in gathering and processing data, we gratefully acknowledge the efforts of Alan Carniol, Daphnee Jean-Francois, Derek Freres, Kelly Li, Alex McCauley, and Jennifer Yu.

REFERENCES

Cohen, J. (1992). A power primer. *Psychological Bulletin*, *112*, 155–159.

Eysenck, S.B., Easting, G., & Pearson, P. (1984). Age norms for impulsiveness, venturesomeness and empathy in children. *Personality and Individual Differences*, *5*, 315–321.

Hogan, R., & Weiss, D.S. (1974). Personality correlates of superior academic achievement. *Journal of Counseling Psychology*, *21*, 144–149.

Kendall, P.C., & Wilcox, L.E. (1979). Self-control in children: Development of a rating scale. *Journal of Consulting and Clinical Psychology*, *47*, 1020–1029.

Kirby, K.N., Petry, N.M., & Bickel, W.K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology: General*, *128*, 78–87.

Lord, F.M., & Novick, M.R. (1968). *Statistical theories of mental test scores*. Reading, MA: Addison-Wesley.

McClure, R.F. (1986). Self control and achievement motivation in young and old subjects. *Psychology: A Journal of Human Behavior*, *23*(1), 20–22.

Meng, X.-L., Rosenthal, R., & Rubin, D.B. (1992). Comparing correlated correlation coefficients. *Psychological Bulletin*, *111*, 172–175.

Mischel, H.N., & Mischel, W. (1983). The development of children's knowledge of self-control strategies. *Child Development*, *54*, 603–619.

Mischel, W., Shoda, Y., & Peake, P.K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology*, *54*, 687–696.

Nunnally, J. (1978). *Psychometric theory*. New York: McGraw-Hill.

Otis, A.S., & Lennon, R.T. (1997). *Otis-Lennon School Ability Test (OLSAT) technical manual*. San Antonio, TX: Harcourt Brace Educational Measurement.

Shoda, Y., Mischel, W., & Peake, P.K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology*, *26*, 978–986.

Tangney, J.P., Baumeister, R.F., & Boone, A.L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, *72*, 271–322.

White, J.L., Moffitt, T.E., Caspi, A., & Bartusch, D.J. (1994). Measuring impulsivity and examining its relationship to delinquency. *Journal of Abnormal Psychology*, *103*, 192–205.

Wolfe, R.N., & Johnson, S.D. (1995). Personality as a predictor of college performance. *Educational and Psychological Measurement*, *55*, 177–185.

(RECEIVED 10/20/04; REVISION ACCEPTED 12/01/04;
FINAL MATERIALS RECEIVED 12/21/04)