A Nation Empowered

Evidence Trumps the Excuses Holding Back America's Brightest Students

VOLUME 2

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Long-Term Effects of Educational Acceleration

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Abstract

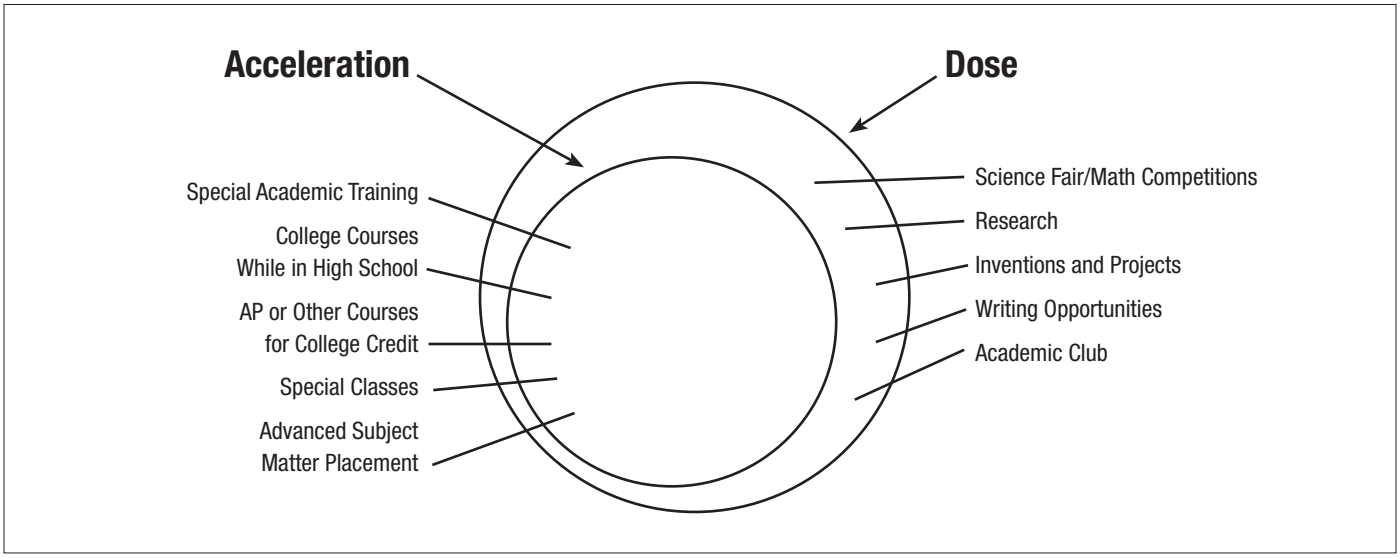
Educational intervention comes in many forms. Educational acceleration is an important class of interventions that comprise the appropriate educational dose for an individual. Dosage implies that one specific intervention may not be as relevant as the right mix, number, and intensity of educational interventions for any given person. This chapter reviews findings from the Study of Mathematically Precocious Youth (SMPY), a longitudinal study of thousands of intellectually talented students followed for many decades to the present. The long-term educational-occupational impact and positive subjective impressions about educational acceleration from academically advanced participants reported in these studies supports the importance of educational acceleration and, more broadly, an appropriate educational dose. The longitudinal research findings reveal that an educational program designed to move students at a pace commensurate with their rate of learning is educationally appropriate and necessary. Exceptionally talented students benefit from accelerative learning opportunities, have few regrets about their acceleration, and demonstrate exceptional achievements. What matters for each student is a consistent and sufficient educational dose across a long span of time, what we think of as life-long learning, or learning at a pace and intensity that matches a student's individual needs. All students deserve to learn something new each day, and if academically talented students desire to be accelerated and are ready for it, the long-term evidence clearly supports the intervention.

Introduction

When you want to improve your physical health, you don't have to eat one specific type of food or exercise in a specific way. Rather, you need an appropriate mix of healthy foods and exercise — no one thing is required. A variety of foods and exercise exist and different combinations of exercise and foods, which match the individual's needs and preferences, are in some sense interchangeable in the quest for a healthy lifestyle. What matters is that the individual gets the appropriate combination of healthy food plus exercise that match his or her preferences and needs. Could this common idea from health translate into the world of education? Consider the cases of two hypothetical high school students, Suzie and Greg. Suzie is engaged in her Advanced Placement (AP) courses, conducts research after school, recently joined the chess club, and is in a special math class. Greg recently skipped a grade, is taking a college course while still in high school, is an avid competitor in science fairs, and after school is working on an invention that he thinks will help cure a rare disease. How should we think about the educational interventions in which Greg and Suzie are involved? Furthermore, how might participation in these interventions influence their long-term educational decisions, career paths, and achievements later in life? First, let's consider the concept of educational acceleration.

Educational acceleration has been formally defined by Pressey (1949, p. 2) as "progress through an educational program at rates faster or at ages younger than conventional." Both Suzie and Greg are involved in educational interventions that offer cognitive and academic stimulations that fit this definition of acceleration. For example, Suzie is taking AP courses and is in a special math class, whereas Greg has skipped a grade and is taking a college course in high school (see Southern & Jones, 2004; this volume). However, they are also both involved in educational opportunities that fall outside the formal definition of acceleration, and might be considered educational enrichment (e.g., pull out classes or special camps). Acceleration combined with enrichment has been recommended by gifted educators as best professional practice when serving the needs of talented students (National Mathematics Advisory Panel, 2008; Rogers, 2007). Conducting research, competing in science fairs, working on an invention, or participating in an academic club are all

Figure 1: Illustration Of How Educational Dose Encompasses More Than Acceleration.



From Wai et al. (2010). Illustration of how educational dose encompasses more than acceleration. Interventions in the smaller circle, such as college courses while in high school, are examples of what is traditionally considered as educational acceleration. Interventions outside the smaller circle, such as science fair/math competitions, are examples of educational interventions beyond acceleration. Copyright © 2010 by the American Psychological Association. Reproduced with permission.

examples of activities outside the traditional definition of acceleration.

Although involved in very different activities, both students are intellectually stimulated and engaged, and that is the key to individual development of talent. It is likely that they each have educational experiences tailored to their needs, which also could be considered an appropriate 'educational dose' (Wai, Lubinski, Benbow, & Steiger, 2010). Figure 1 shows how educational dose encompasses more than the targeted forms of acceleration. For example, interventions in the smaller circle (e.g., special academic training and college courses while in high school) are examples of what is traditionally considered to be educational acceleration. However, interventions outside the smaller circle but within the larger circle (e.g. science fair/math competitions, research) are examples of educational interventions beyond acceleration. Therefore, accelerative options are central to the concept of dose, which refers to "the density of advanced and enriching precollegiate learning opportunities beyond the norm" (Wai, et al., 2010, p. 861); however, they are complemented by other educational opportunities. Therefore, these different types of educational interventions combine to provide a stimulating and challenging educational program for academically talented students.

Some educational opportunities are much more effective than others and many individual types of educational acceleration (see Rogers, this volume; Southern & Jones, this volume) have been found to have a positive effect on learning (e.g., Benbow & Stanley, 1996; Colangelo, Assouline, & Gross, 2004; Heller, Mönks, Sternberg, & Subotnik, 2000; Kulik & Kulik, 1984; Southern, Jones, & Stanley, 1993), and oftentimes educational acceleration is needed to challenge academically talented students appropriately. In addition to being challenged and engaged, students may also gain in maturity. Accelerated students can use the time they have saved for various options, including career advancement, creative accomplishment, or personal use (Park, Lubinski, & Benbow, 2013; Pressey, 1955; Terman, 1954).

Long-Term Effects of Educational Acceleration from the Study of Mathematically Precocious Youth

The Study of Mathematically Precocious Youth (SMPY) is a longitudinal study of thousands of students in the top one percent of intellectual talent (Lubinski & Benbow, 2006) comprised of various groups at different levels of cognitive ability (e.g., Cohorts 1 and 4: top 1%; Cohort 2: top 0.5%; Cohort 3: top 0.01%; and Cohort 5: intellectually talented top math/science graduate students). These groups, most of whom were originally identified in the 1970's, 1980's, and 1990's around age 13 based on their Scholastic Assessment Test (SAT) scores, have been followed longitudinally from those early years to the present. Collectively, the SMPY studies provide a long-

term evaluation of the impact of educational acceleration on educational and occupational criteria as well as offer a retrospective evaluation of how students felt about the intervention. For example, did the accelerated students have positive or negative views about their educational experiences?

Nearly all the studies reviewed here have identified students based on an above-level assessment process known as the Talent Search Model (Olszewski-Kubilius, this volume). Talent searches identify students through a two-step process (Assouline & Lupkowski-Shoplik, 2012). Step one begins with the performance on a grade-level standardized test, which is typically administered in the school. Students *who score in the top 3 to 5% on a grade-level standardized test* are invited to take college entrance exams, specifically the SAT (College Board, 2014) and the ACT (ACT, Inc., 2014). The number of junior high aged students who take these exams in the 7th and 8th grades is now over 100,000 per year, and their score distributions are very similar to college-bound high school seniors. The average talent search participant can assimilate a typical high school course in three weeks, and those scoring in the top 0.01% can assimilate double this amount or more (Benbow, & Stanley, 1996; Stanley, 2000).

An important caveat is that research on the effectiveness of accelerative opportunities as presented in these studies is quasi-experimental at best (Campbell & Stanley, 1963; Cook & Campbell, 1979) because such opportunities have not been withheld from students for ethical reasons. Since the SMPY studies began in the 1970's, more accelerative and enrichment opportunities have become available (Wai et al., 2010) both inside and outside school and on-site and online. When students reflect on choices they made in the past, it is important to remember that they only can evaluate the path they took, not the path untraveled. All the studies described here should be considered within this context.

SMPY Findings Reviewed In This Chapter

This chapter reviews key findings from six longitudinal studies from SMPY surrounding the long-term educational-vocational and social-emotional impact of acceleration. The first four studies were reviewed by Lubinski (2004), and that chapter provides a wider historical context. Many of the empirical findings reviewed in this chapter were anticipated to some degree by early scholars (e.g., Allport, 1960; Hobbs, 1951; Hollingworth, 1926; Paterson, 1957; Pressey, 1949; Seashore, 1922; Terman, 1954; Thorndike, 1927; Tyler, 1974), and for many decades there has been a large body of empirical work supporting educational acceleration for talented youths (Colangelo & Davis, 2003; Lubinski & Benbow, 2000; VanTassel-Baska, 1998). Although neglecting this evidence seems increasingly harder to do (Ceci, 2000; Stanley, 2000), putting research into practice has been challenging due to social and political forces surrounding educational policy and implementation (Benbow & Stanley, 1996; Gallagher, 2004; Stanley, 2000). This chapter will focus on the key findings from Lubinski (2004) and updated findings from two recent SMPY studies that provide the strongest evidence for the long-term impact of educational acceleration, and more broadly the concept of educational dose. Finally, educational implications will be considered and some conclusions will be drawn.

Study 1: A 10-year longitudinal study of the top 1 in 10,000 in mathematical and verbal reasoning (SMPY Cohort 3).

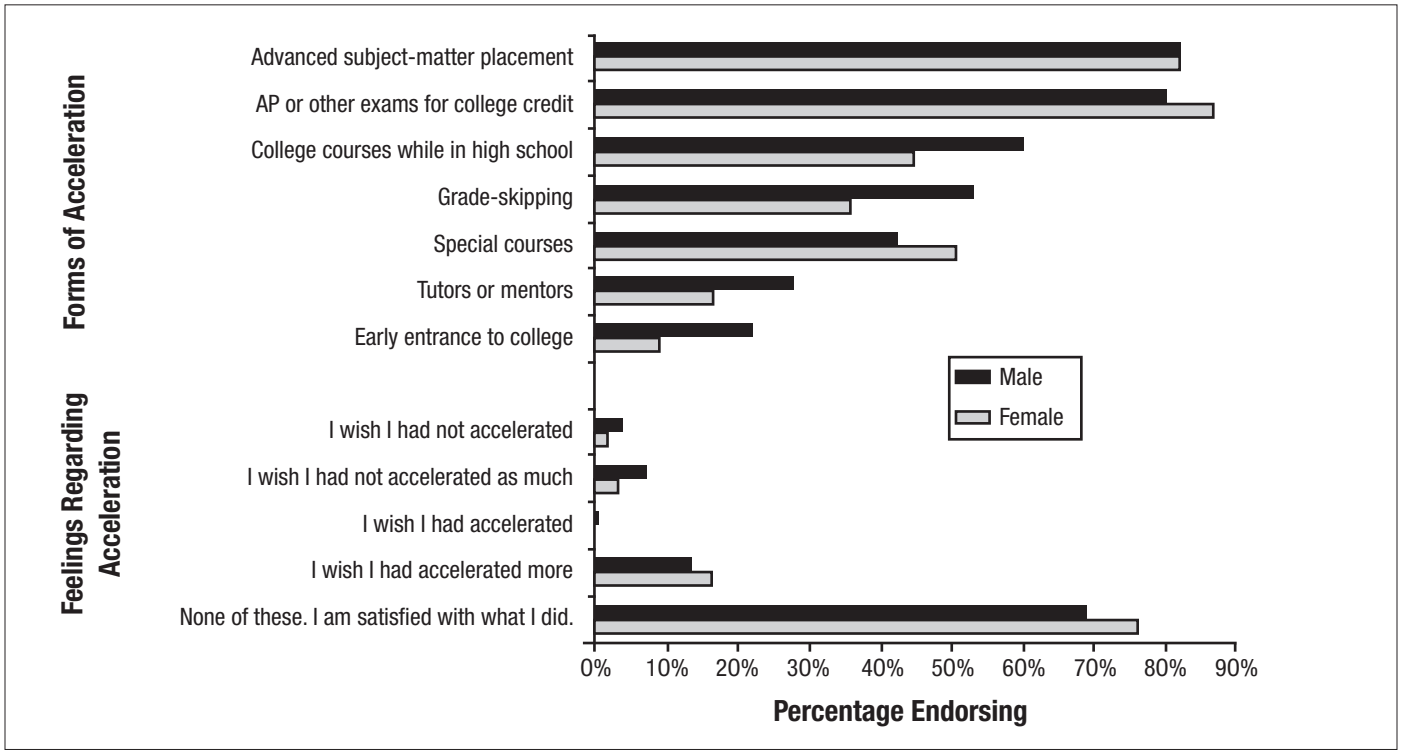
Lubinski, D., Webb, R. M., Morelock, M. J., & Benbow, C. P. (2001). Top 1 in 10,000: A 10-year follow-up of the profoundly gifted. *Journal of Applied Psychology,* 86, 718-729.

This study examined the profoundly gifted SMPY group (N=320, identified in the 1980's at age 13) in the top 0.01%, a group with an average IQ of 180. Figure 2 shows the different types and the high degree to which this group took part in acceleration. Remarkably, approximately 80% of this group had advanced subject matter placement and AP or other exams for college credit; approximately 40% grade skipped and took special courses; and approximately 15% entered college early. When asked about their feelings regarding acceleration, 70% said they were satisfied by their choices, 13% wished they had accelerated more, and only 5% wished they had not accelerated. Figure 3 illustrates participants' subjective views about the impact of acceleration on various educational and personal life aspects. Participants rated academic progress and interest in learning as the highest and social life and getting along with same age peers as the lowest, but all categories showed essentially no effect to favorable effects, indicating their views about the impact of acceleration on their experiences were generally favorable.

Study 2: A 20-year longitudinal study of the top 1% in reasoning ability identified at age 13 (SMPY Cohorts 1 & 2).

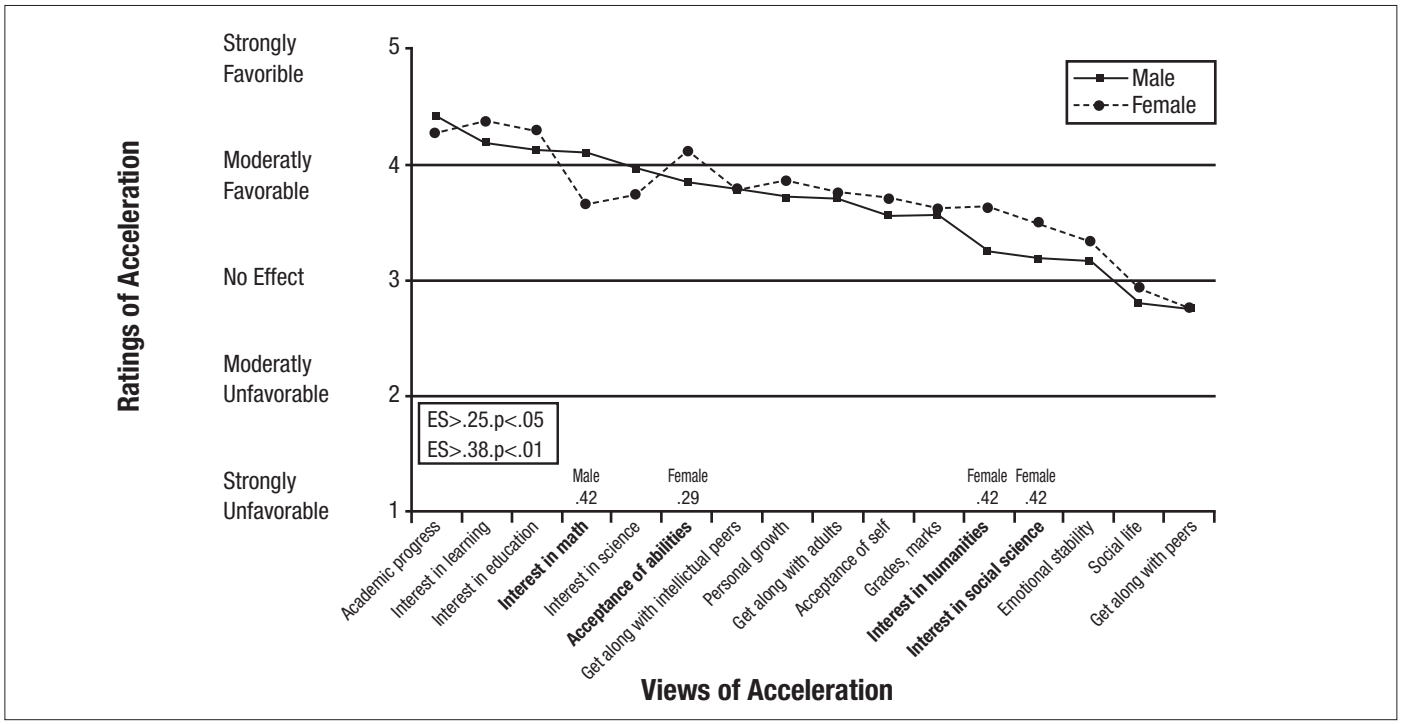
Benbow, C. P., Lubinski, D., Shea, D. L., & Eftekhari-Sanjani, H. (2000). Sex differences in mathematical reasoning ability: Their status 20 years later. *Psychological Science,* 11, 474-480.

Figure 2: Participation In Accelerative Programs And Satisfaction Of SMPY Cohort 3.



From Lubinski, Webb et al. (2001). Participation in accelerative programs and satisfaction of SMPY Cohort 3. Copyright © 2001 by the American Psychological Association. Reproduced with permission.

Figure 3: Subjective Views Regarding Acceleration.



From Lubinski, Webb et al. (2001). Copyright © 2001 by the American Psychological Association. Reproduced with permission.

This study surveyed SMPY participants identified in the top one percent of ability, who had accelerated earlier in life (N = 1,975). Participants were asked at age 33 about the influence of acceleration on their educational planning, career planning, and social development. Of the participants, 70% viewed acceleration as having a "somewhat positive influence," "positive influence," or "strongly positive influence" on their educational planning. Respondents also indicated that acceleration had a positive influence on their career planning; less than 10% of participants thought that it had a negative impact on their career planning. However, the results concerning the impact of acceleration on their social development (the ability to form friendships) were essentially neutral.

Participants were also asked how supportive they were of grouping students according to ability level (also known as homogeneous grouping):

> *"A number of educational policy makers have proposed the following: eliminating homogeneous grouping for instruction (i.e., grouping students according to their abilities and skills, as in reading groups and honors classes) and, instead, teaching students of all ability levels in the same group. How supportive are you of this proposal?"*

The question was worded negatively for a bias against homogeneous grouping, and it is important to keep in mind that in the 1970's the range of accelerative options was limited. However, despite these caveats, 80% of the study participants were "somewhat" to "very" unsupportive of eliminating grouping based on ability level.

Study 3: Three decades of longitudinal data on the Advanced Placement (AP) program (SMPY Cohorts 1 through 5).

Bleske-Rechek, A., Lubinski, D., & Benbow, C. P. (2004). Meeting the educational needs of special populations: Advanced Placement's role in developing exceptional human capital. *Psychological Science,* 15, 217-224.

This study focused on the educational and socio-emotional impact of AP participation (N = 3,700). It includes each of the SMPY groups already examined in the first two studies along with an additional group in the top one percent (Cohort 4, N = 173, identified at ages 12-14 between 1992 and 1997, primarily from the state of Iowa). Cohort 5 is also introduced in this study (N = 709, identified during their first and second years of graduate school in 1992). Cohort 5 consists of an intellectually talented group of math/science graduate students from premier training programs throughout the U.S. These students were not identified via the talent search testing in middle school, but were identified while they were in graduate school. They provide a useful comparison group to the cohorts identified via the talent search.

AP Participation. Both SMPY participants and graduate students were highly involved in AP. With the exception of Cohort 1, for which there was limited AP availability, 76% to 86% of the other groups took at least one AP course, with the average number of AP courses taken ranging from 3.3 to 3.8, which is quite impressive considering the fact that these AP courses were taken before they were as widely available as they are today. The percentage of participants who took at least one AP course and indicated that it was their favorite ranged from 22% to 49%.

This study provides more evidence supporting the fact that intellectually talented students benefit from specialized learning environments such as AP courses. These courses help to meet their unique intellectual and social/emotional needs while they are still in high school. AP courses provide gifted students with the appropriate developmental placement needed by all students for optimal learning: a curriculum that progresses at a pace commensurate with their rate of learning.

High School Likes and Dislikes. The study authors reported participants' high school likes and dislikes in relation to AP involvement. Students were positive about working hard and being intellectually challenged. SMPY participants (Cohorts 1 through 4) and math/science graduate students (Cohort 5) showed quite similar patterns. Both groups liked academic and intellectual activities and disliked the lack of such activities. Sixty percent cited academic and intellectual activities and 49% cited social life and extracurricular activities as things they liked about high school. Regarding high school dislikes, 45% cited lack of intellectual stimulation or engagement and 30% cited social isolation and peer pressure. The intellectual engagement participants enjoyed ranged from associating with other highly intelligent classmates, taking AP classes, having a solid education, and working hard. The lack of intellectual engagement they disliked ranged from not having similarly-able or motivated classmates, the slow pace of instruction, not being taught enough, and not being challenged intellectually.

For students in all groups studied, students who took one or more AP courses were more likely than those who did not to list academic and intellectual activities as something they liked about high school. Among both groups, students involved in AP were less likely than those not involved in AP to list a lack of intellectual stimulation or engagement as something they disliked about high school.

Degree Attainment. For Cohorts 1 and 2, longitudinal data on the attainment of higher degrees was available at age 33. For participants who took at least one AP course in high school, 70% had obtained a master's degree or higher. For participants who did not take an AP course, this number was 43%. And even after controlling for mathematical reasoning ability, students who were involved in AP were more likely to obtain an advanced educational degree. The authors concluded, "Thus, through self-selection or something intrinsic to the AP program itself, AP involvement is a positive predictor of educational success and satisfaction for intellectually talented youth" (p. 219).

Comparisons to Normative Data. Relative to same age, typically-developing peers, SMPY students were quite different on various educational and social preferences. For example, 85% of a normative sample of 1,560 Indiana high school students cited friends and socializing as a high school like, with only 40% of that sample liking educational aspects (Erickson & Lefstein, 1991). This is the reverse pattern from the SMPY samples reviewed here who liked educational aspects more than social aspects of high school. Nineteen percent of Indiana students cited the opposite sex and dating as a favored aspect of high school, whereas less than two percent of SMPY participants did so. Thirty-five percent of Indiana students cited homework or term papers and six percent cited tests and exams as a high school dislike, whereas less than seven percent of SMPY participants cited exams, homework, or studying as a high school dislike. A small percentage of SMPY participants cited early mornings (two percent) and long school days (one percent) as a dislike, whereas for Indiana students these percentages were much higher at 23% and 20% respectively. Overall, this illustrates that SMPY participants, in comparison to their same age, typically developing peers, tend to be more focused on academics and their intellectual development.

Study 4: A comparison of top math/science graduate students with same-age SMPY participants tracked over 20 years (SMPY Cohorts 2 and 5).

Lubinski, D., Benbow, C. P., Shea, D. L., Eftekhari-Sanjani, H., & Halvorson, M. B. J. (2001). Men and women at promise for scientific excellence: Similarity not dissimilarity. *Psychological Science,* 12, 309-317.

This study reported data from SMPY participants in the top one percent of ability (Cohort 2) with same-age intellectually talented math/science graduate students (Cohort 5). The SMPY group (females = 528, males = 228) were compared to top math/science graduate students (females = 346, males = 368). The findings reported here refer to the educational experiences of graduate students and talent search participants. Roughly 90% took part in some form of acceleration. The different types of acceleration experienced ranged from AP involvement (approximately 90% for talent search participants, which is more than comparable graduate students (66%); advanced subject matter placement (approximately 60%); college courses in high school (approximately 33%); and grade skipping (approximately 12%). Overall, approximately 79% reported a positive experience and less than three percent reported a negative influence of their acceleration experience. Generally, the findings for both graduate students and talent search participants were quite similar, with only a few comparisons being statistically significant[1]. However, twice the percentage of talent search students were grade skipped, twice the percentage of graduate students were presidential scholars, and fewer talent search females participated in a math/science contest during college.

Study 5: A 40-year longitudinal study examining the effects of grade skipping (SMPY Cohorts, 1, 2, & 3).

Park, G., Lubinski, D., & Benbow, C. P. (2013). When less is more: Effects of grade skipping on adult STEM accomplishments among mathematically precocious youth. *Journal of Educational Psychology,* 105, 176-198.

This 40-year longitudinal study (N = 3,467) investigated the impact of grade skipping (or whole-grade acceleration), one of the most effective educational opportunities (see Lupkowski-Shoplik, Assouline, & Colangelo, this volume; Rogers, this volume). Participants across three SMPY groups who had skipped one or more grades were compared to those who had not grade skipped but were statistically matched on a number of important characteristics, to determine whether there were differences many years later on the earning of STEM (science, technology, engineering and mathematics) doctorates, publications, and patents. Across all these educa-

1. Group differences were significant for only three of the 19 educational experiences: math-science contest or special program before college $\chi 2(3, N = 1,251) = 20.6, p < .001$; math-science contest or special program during college, $\chi 2(3, N = 1,173) = 11.1, p < .05$; and favorite high school class being in math or science, $\chi 2(3, N = 1,223) = 87.7, p < .001$. No differences were significant between male and female graduate students, but talent search females differed significantly from the other groups for the first two items above, and both talent search males and females differed significantly from the graduate students as a whole. See Lubinski, Benbow et al. (2001) for more detail.

Table 1: Percentages Of Participants Earning Outcomes Across Each Cohort And For All Cohorts Together.

		Percentage Earning Outcome			
Cohort and group	**N**	**Doctorates**	**STEM PhDs**	**STEM Publications**	**Patents**
1972 Cohort					
Matched Controls	358	15.1	3.6	6.4	2.2
Grade Skippers	179	27.4	10.1	12.8	4.5
1976 Cohort					
Matched Controls	231	23.8	14.3	21.2	8.2
Grade Skippers	116	31.0	18.1	25.9	9.5
1980 Cohort					
Matched Controls	68	33.8	17.6	23.5	10.3
Grade Skippers	68	45.6	29.4	38.2	17.6
All Cohorts					
Matched Controls	657	20.1	7.9	13.4	5.2
Grade Skippers	363	32.0	16.3	20.9	8.5

The last two columns list the percentage of participants in each category with one or more peer-reviewed publication in a STEM field or patent, respectively. From Park et al. (2013). Copyright © 2013 by the American Psychological Association. Reproduced with permission.

tional and occupational outcomes, some of which can be considered creative achievements, grade skippers, in comparison to matched controls, showed a large advantage. Concerns about accelerated students 'burning out' were not supported by the research findings, Students who skipped one or more grades began and finished their STEM graduate degrees earlier and produced more publications at a younger age.

The non-accelerated students in this study also were very successful, earning advanced degrees, publishing scientific papers, and securing patents at an impressive rate. However, the accelerated students were even more accomplished than the comparison group. This illustrates the long-term impact of one potent form of educational acceleration. Grade-based acceleration, when used appropriately with very highly-able mathematically talented adolescents, can have positive effects on long-term productivity in STEM fields, 30 to 40, or more, years after the educational intervention.

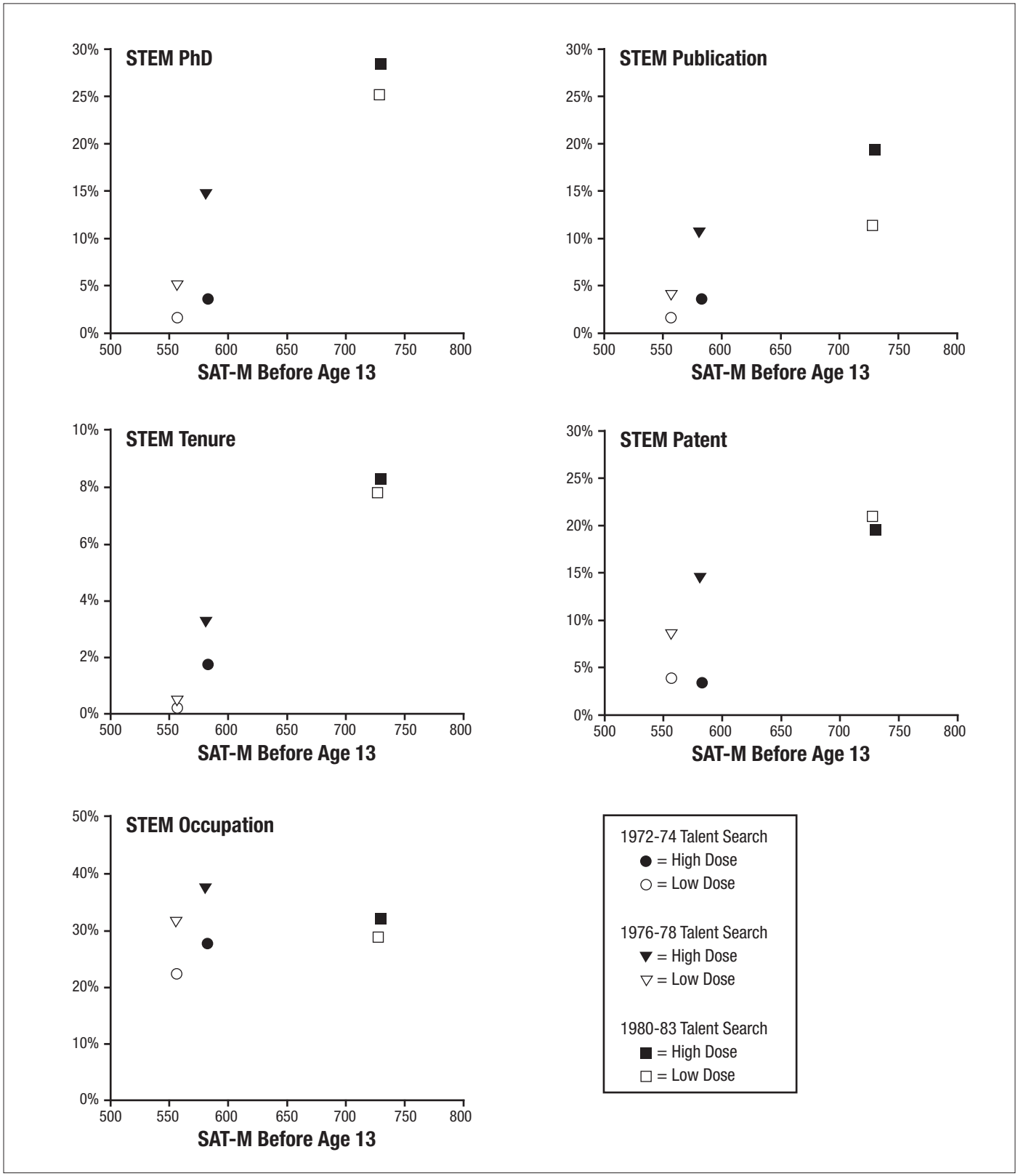
Study 6: A 25-year longitudinal study examining the effects of educational dose among intellectually talented students and top math/science graduate students (SMPY Cohorts 1, 2, 3, & 5).

Wai, J., Lubinski, D., Benbow, C. P., & Steiger, J. H. (2010). Accomplishment in science, technology, engineering, and mathematics (STEM) and its relation to STEM educational dose: A 25-year longitudinal study. *Journal of Educational Psychology,* 102, 860-871.

This 25-year longitudinal study incorporated the various academic interventions of educational acceleration, enrichment, and stimulation into the concept of 'educational dose.' As described at the beginning of this chapter, educational dose is "the density of advanced and enriching precollegiate learning opportunities beyond the norm that students have participated in" (Wai et al., 2010, p. 861). The research reported here takes into account accelerative opportunities (including grade skipping, college courses while in high school, AP courses, or advanced subject matter placement) as well as other appropriately challenging enriching educational activities, such as science or math competitions, special classes, research, inventions and projects, and writing opportunities.

Figure 1 illustrates the various components of acceleration and enrichment activities investigated in this study in three of SMPY's talent search groups (N = 1,467) as well as the math/science graduate student group (N = 714). As described previously, Figure 1 includes accelerative as well as other STEM-related educational opportunities and shows how the two types of educational activities can complement each other to fully develop a student's talents.

Figure 4: STEM Educational Dose And STEM Outcomes.



STEM = science, technology, engineering, and mathematics; SAT-M = math section of the Scholastic Assessment Test. From Wai et al. (2010). Copyright © 2010 by the American Psychological Association. Reproduced with permission.

For this 25-year longitudinal study, each different type of pre-college educational opportunity was summed to determine the educational dose level. Referring back to hypothetical students Suzie and Greg introduced earlier, both were involved in four different learning opportunities, so they each had a dose level of four. This study focused on STEM learning opportunities and outcomes. Two groups were formed within each Cohort: those with a relatively higher educational dose of STEM opportunities and those with a relatively lower educational dose. These two groups within each SMPY sample were then compared on STEM outcomes 25 years later—PhDs, publications, university tenure, patents, and occupations. Figure 4 illustrates these findings. Cohort 1 is represented by circles, Cohort 2 by triangles, and Cohort 3 by squares. The higher dose group is indicated by filled shapes and the lower dose group by unfilled shapes. The y-axis shows the proportion attaining each outcome, and the x-axis shows SAT-Mathematics scores at age 13. Along the x-axis, SAT scores differ for the cohorts because they were initially selected at the top one percent (Cohort 1), top 0.5% (Cohort 2), and top 0.01% of ability (Cohort 3). As can be seen within each panel, even though SAT scores were similar across groups, the group with a higher educational dose was more likely to attain each of these outcomes. The earning of STEM PhDs, publications, patents, and university tenure were all much higher for the higher scoring groups, and the percentage in a STEM occupation was higher for the lower scoring groups with a higher STEM educational dose. The same general analysis was performed within the math/science graduate student group, and a similar pattern of findings emerged. This illustrates the long-term impact of educational acceleration, and more broadly the concept of educational dose. This longitudinal study indicates the number of pre-collegiate STEM educational opportunities that mathematically talented adolescents experience is related to subsequent STEM accomplishments achieved over 20 years later. This is evidence for the powerful impact that educational experiences have on students' later accomplishments.

Summary of Empirical Findings

The first five studies from SMPY reviewed in this chapter independently as well as collectively demonstrate the long-term impact of the various forms of educational acceleration. The sixth study combined all these individual educational opportunities into the concept of educational dose, finding that participants with a higher dose of educational acceleration and enrichment, even when controlling for ability, were more likely to have earned creative educational and occupational achievements many years later. Some of the studies also reviewed evidence showing that, overall, students who had accelerated viewed their educational histories positively, and many said they would have accelerated more, not less. These studies combine to show the powerful impact of educational acceleration in the lives of these talented students, with accelerated participants reporting satisfaction with their experiences as a whole. The key findings of these studies are listed in Table 2.

Educational Implications and Conclusions

The educational implications of these studies are quite clear. They collectively show that the various forms of educational acceleration have a positive impact. The key is appropriate developmental placement (Lubinski & Benbow, 2000) both academically and socially. Each student is different, and decisions on whether a student should engage in acceleration should be made thoughtfully based on evidence (Assouline, Colangelo, Lupkowski-Shoplik, Lipscomb, and Forstadt, 2009) and tailored to their individuality (Wai, Lubinski, & Benbow, 2009b). However, the long-term studies reviewed here show that adults who had been accelerated in school achieved greater educational and occupational success and were satisfied with their choices and the impact of those choices in other areas of their lives. Additionally, for some of these students, educational acceleration might help them to mature as well as to save valuable time, which could be allocated for career advancement (see McClarty, this volume), creative accomplishment, or personal use (Park et al., 2013; Pressey, 1955; Terman, 1954). Some accelerative opportunities, such as grade-skipping or early entrance to college, are likely more potent in boosting educational and occupational outcomes compared to others, and saving such time. (see Hertzog and Chung, 2015, for longitudinal findings mirroring SMPY for early entrance to college).

However, overall, it may not be any one educational intervention that matters, but the appropriate dose or stimulation that matters (Wai et al., 2010). The groups examined in these studies grew up in a time where there were relatively fewer opportunities for educational acceleration and enrichment compared to present-day opportunities. Consider the vast number of online educational options that are now available to students, from massive online open courses (MOOCs) to the Khan Academy. Students have many ways to be stimulated intellectually and avail themselves of accelerative opportunities both inside and outside the classroom. Because one size does not fit all, no one intervention is going to be right for everyone. What matters is that each student re-

Table 2: Key Findings From The SMPY Longitudinal Studies.

Study 1	Academically talented students who accelerate in school view the impact of acceleration on their life experiences quite positively.
Study 2	At age 33, the vast majority of participants who had been accelerated in school viewed acceleration as having a positive influence on their educational planning as well as on their career planning. They viewed the impact of acceleration on their social development (the ability to form friendships) as essentially neutral, indicating it had neither a positive nor a negative impact.
Study 3	Participation in Advanced Placement (AP) courses was a positive predictor of education success and satisfaction for intellectually talented students.
Study 4	Roughly 90% of the exceptionally talented students studied took part in some form of acceleration. The vast majority reported a positive experience with acceleration.
Study 5	Grade-based acceleration, when used appropriately with very highly-able mathematically talented adolescents, can have positive effects on long-term productivity in STEM fields, 30 years or more after the educational intervention.
Study 6	Even when controlling for ability, participants with a higher dose of STEM educational acceleration and enrichment were more likely to have earned creative educational and occupational achievements *more than 20 years later*. This is evidence for the powerful impact that pre-college eduational experiences can have on students' later accomplishments.

ceives a consistent and sufficient educational dose across his or her educational experience, which will thus essentially comprise what we might consider to be life-long learning (Lubinski, Benbow, & Kell, 2014).

It is important to emphasize that appropriate developmental placement is important for all students (Humphreys, 1985). Educational acceleration is essentially appropriate pacing and placement that ensures advanced students are engaged in learning for life. Every student deserves to learn something new each day (Stanley, 2000). The evidence clearly supports allowing students who desire to be accelerated to do so, and does not support holding them back.

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