The Fullerton Longitudinal Study: A Long-Term Investigation of Intellectual and Motivational Giftedness

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The Fullerton Longitudinal Study is a contemporary prospective investigation that spans approximately a quarter of a century. Commencing at age 1, children and their families were systematically followed every 6 months from infancy through preschool and annually at ages 5 through 17. They were again assessed at age 24. The course of development for intellectually and motivationally gifted children was studied across a breadth of developmental domains including academic, cognitive, self-perceptions, temperament, behavioral, social, family/environmental processes, and adult educational achievement. Presented are the methodology and unique aspects of this research that contribute to the study of giftedness. Major findings regarding these two distinct dimensions of giftedness are presented, with some implications for practice and directions for future research.

The longitudinal investigation is not just a research method, but also an investment into understanding human development—that is, studying change over time. Such studies are not commonplace because they are expensive and laborious to conduct, require an endless commitment on the part of both investigators and participants, and because results are not readily produced. There is uncertainty at various levels: funding, maintenance of the study sample, and longevity of research staff, as well. However, the arduous and intensive input into this endeavor is invaluable for the richness of and insight into the developmental histories and trajectories that can only be obtained in this manner. Rather than furnishing a snapshot at various points in time as characterized by the cross-sectional approach, the longitudinal method offers a dynamic motion picture of lives across time.

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Herein, we present our professional journey, rationale, and goals in conducting the Fullerton Longitudinal Study (FLS) with a focus on two distinct dimensions of giftedness: intellectual and motivational. The FLS is a contemporary prospective investigation that spans approximately a quarter of a century. A cohort of children and their families was systematically, objectively, and intensively studied from infancy through early adulthood. The course of development for these two dimensions of giftedness has been studied to date across a breadth of developmental domains: intellectual performance, motivation, academic achievement, self-perceptions, temperament, behavioral, social, family/environmental processes, and adult educational achievement.

Uniqueness of the FLS for Investigating Intellectual and Motivational Giftedness

There are numerous unique aspects to the methodological design of the FLS pertaining to investigating giftedness (Gottfried, Gottfried, Bathurst, & Guerin, 1994). The most noteworthy are presented below.

First, the designation/identification of giftedness was determined independent of children's educational contexts. Quite often in research studies on giftedness, participants are selected initially on the basis of educators' nominations and subsequently the sample is administered psychological/educational tests for designation as gifted or not gifted. There are two major drawbacks to this procedure. One drawback is that factors other than giftedness, such as creativity, gender, or classroom behavioral functioning, may intrude into the educators' nominations, resulting in ascertainment bias. The other drawback is that when identification or designation of giftedness occurs within the school context, there is the possibility that this labeling could have some unknown confounding effect on the research outcomes. For example, if teachers believe that certain students are gifted and they nominate them for research projects, or enrichment or special programs, there can be halo effects or alterations in expectations operating, not to mention potential modifications in the child's self-perceptions or reactions of classmates. When

parents are informed that their child is gifted, there can be reactions from various family members, as well.

In the FLS, the designation of gifted or nongifted was not based on teacher nominations or school assessments. Rather, it was based on testing in the laboratory without informing parents, teachers, participants, or the investigators as to specific participants' group designation. Hence, there was no ascertainment bias, halo effect, or labeling. Furthermore, investigators did not know the identity of the individuals' giftedness status, nor did the testing staff have cross-time knowledge of who was gifted. Indeed, these designations were made years after data collection was completed.

Second, the gifted and comparison groups emerged from the same cohort. The latter was not a control group constructed by matching subjects or random selection. The problems of control or comparison groups in the ex post facto situation are notorious and have long been recognized in the psychological, sociological, and epidemiological literature. In the FLS, the cohort comparison group was not recruited, matched, or fabricated by any procedure on the part of the investigators. The investigation involved the ongoing study of a single cohort from infancy onward without any intervention. In the course of development, some children emerged as gifted and were compared with those who did not, that is, their peer comparison cohort in the respective domain. Hence, we were afforded the opportunity to investigate the antecedent, concurrent, and consequential developmental aspects of both dimensions of giftedness.

Third, participant attrition was low. Attrition is always a factor that can compromise the integrity of a longitudinal study. It is a feat to follow a sample of substantial size and maintain a high rate of participation, particularly across decades. In the FLS, not less than 80% of the participants returned at any assessment, and we were fortunate to have 84% of the original participants assessed at age 24. Moreover, we examined whether there were differences between those who continued to participate and those who did not at various assessment waves and on different measures. No differences were obtained. Hence, there is no evidence of differential attrition.

Fourth, across the time frame, the FLS encompassed a comprehensive array of conceptually derived measures tapping various devel-

opmental domains. The methodological design involved obtaining contemporaneous and continuous information. To date, more than 17,000 variables have been collected on each participant. However, in longitudinal studies when participants are repeatedly tested on the same or similar measures, there is always the possibility of testing or practice effects. Seldom do tests have parallel forms. Thus, we have employed a multisource methodology whenever possible. Data were collected not only across time, but also across persons (children, parents, and teachers) and across context (laboratory and home), as well as by directly obtaining school records. Furthermore, cross-corroboration of findings was conducted comparing and integrating findings from the FLS with other longitudinal studies when measures were comparable (e.g., Bradley et al., 1989; A. W. Gottfried, 1984). All of the foregoing procedures were done to enhance the level of confidence and generalizability of findings. On the other hand, by testing children over time on the same measure, we are in the position of applying growth curve analyses to the study of giftedness (e.g., Cheng & Gottfried, 2004).

Lastly, because we have studied the participants from infancy through early adulthood, we can study a number of important cross-time developmental issues. These include the short- and long-term outcomes of giftedness (e.g., educational consequences): (a) whether there is continuity of giftedness (e.g., once gifted always gifted, and whether there are late bloomers); (b) the early developmental, educational, and environmental characteristics of giftedness (follow-back or reverse-contingency analyses); and (c) whether the different dimensions of giftedness studied can be predicted from early developmental measures (predictive models).

Sample and Methods of the FLS

Sample

The FLS was launched in the fall of 1979. One hundred and thirty 1-year-old infants and their families were recruited from birth notifications from hospitals surrounding California State University,

Fullerton. The criteria used in the selection process were that all infants were full term, of normal birth weight, and free of visual and neurological abnormalities. All families spoke English. At the outset of the study, the sample comprised 52% males and 48% females. Participants were predominantly European American (90%) with inclusion of other ethnic groups (Hispanic, East Indian, Hawaiian, Iranian). Most (53%) of the children were firstborn; 31% were second born and 16% were third or later born.

At the outset of the investigation, the participants resided typically within an hour from the research site. However, geographic mobility is common in the course of development and family life. Our study population eventually resided throughout the United States and even abroad. Maintaining contact was a laborious task in itself. We succeeded by constantly updating records as to not only the residence of the participants themselves, but also by collecting information about personal contacts who might know the families' whereabouts (e.g., neighbors, close relatives, pediatricians). Tracking lost subjects was also made possible with the advent of Internet search engines and services.

The socioeconomic status of the sample represented a wide, middle-class range, from semiskilled workers through professionals, as determined by the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975; also see A. W. Gottfried, 1985; Gottfried, Gottfried, Bathurst, Guerin, & Parramore, 2003). Much effort went into the selection of a socioeconomic index that would be suitable for a potentially long-term study. The Hollingshead was employed because it was the only measure at the time that was appropriate for estimating socioeconomic status of unmarried individuals and heads of households of both genders, as well as for families. One never knows the course of events in families who are to be studied longitudinally (e.g., divorce, mother's entry into the work force, dual-earner families). The role of socioeconomic status in children's development in the FLS is presented in Gottfried et al. (2003). The mean Hollingshead Social Status Index was 45.6 (SD = 11.9) at the initiation of the FLS and 48.6 (SD = 11.4) at the 17-year assessment. For further details concerning the sample characteristics, see A. W. Gottfried et al. (1994) and Guerin, Gottfried, Oliver, & Thomas

Table 1
Fullerton Longitudinal Study Assessment Waves

Assessment	Age in Years
Laboratory	
Infancy	1, 1.5, 2
Preschool	2.5, 3, 3.5
Elementary School	5, 6, 7, 8, 9, 10, 11
Junior High School	12, 13
High School	14, 15, 16, 17
Surveys	24
Home Visits	
Infancy	1.25
Preschool	3.25
Elementary School	8

(2003). Having a range of predominantly middle-class families displaced the distribution of IQ scores upward, thereby enhancing the probability of obtaining a larger number of gifted children than would be expected or found in the population at large. This permitted a sizable number of gifted children to study given the overall sample size.

Beginning at age 1, the participants were assessed in the university research laboratory at 6-month intervals during infancy and the preschool years, and annually from age 5 throughout school to age 17. At each assessment through adolescence, a comprehensive battery of standardized measures was administered. At age 24, the participants were surveyed with respect to demographics, but primarily regarding their educational progress. During infancy, preschool, and middle elementary years, the homes of the participants were directly observed to appraise the social and emotional supports and cognitive enrichment being furnished by parents to the children, as well as the physical characteristics of the family environment. There were a total of 23 assessment waves throughout the course of investigation; these are displayed in Table 1.

Measures

Throughout the course of investigation, numerous, well-established, standardized measures of known and substantial reliability and valid-

ity were administered. When needed, we developed our own measures to address specific issues of interest. These also were subjected to psychometric analyses to establish their effectiveness. Whenever possible, measures were intentionally selected for inclusion to enable repeated assessment over time with the identical instrument. This allowed for analyses that are not unduly influenced by measure variance, that is, the use of different measures of a similar construct. Whereas numerous measures were collected on the participants and their families, the major categories of measures that have been examined regarding giftedness included intelligence, academic intrinsic motivation, academic achievement and competence, self-concept, temperament, behavioral and social functioning, and home/family environment. These are listed in Table 2.

Intellectual Giftedness. In our research on gifted intelligence, we selected the traditional and ubiquitous standard cutoff score of 130 IQ or above, and designated those who scored at or above as the gifted group (for details, see pp. 42–43 in A. W. Gottfried et al., 1994). This resulted in 19% (20 of 107) of the children in our longitudinal study sample being designated as intellectually gifted at the age 8 assessment. IQ measured at age 8 was used to designate gifted IQ because of its reliable, predictive validity to subsequent school years through adolescence and beyond (e.g., Brody, 1992; Deary, Whalley, Lemmon, Crawford, & Starr, 2000; McCall, 1977). For example, in the FLS, the correlation between IQ at ages 8 and 17 is .77. These intellectually gifted children were then compared to their cohort peer comparison. As noted above, the 19% was not unexpected because of the upward displacement of the distribution curve resulting from sampling a wide range of middle-class families. Furthermore, this percentage is in accord with the thresholds adopted by other well-known researchers in the field of giftedness; see Gagné (1998) for a review. To date, there is no percentage of giftedness across study samples that has been universally established.

Motivational Giftedness. Gottfried and Gottfried (2004) conceptualized and proposed a construct of gifted motivation and have established empirical support and validation (Gottfried, Gottfried, Cook,

& Morris, 2005). According to the conceptualization, gifted motivation applies to those individuals who are superior in their strivings and determination pertaining to an endeavor. Hence, motivation in the extreme is considered gifted just as is intellectual performance in the extreme.

This aspect of the research focused on this phenomenon within the domain of academic intrinsic motivation, inasmuch as this is a realm that has inherent ties to cognition (A. E. Gottfried, 1985, 1990; A. W. Gottfried et al., 1994). Academic intrinsic motivation is defined as enjoyment of school learning characterized by an orientation toward mastery; curiosity; persistence; task-endogeny; and the learning of challenging, difficult, and novel tasks (A. E. Gottfried, 1985; Gottfried, Fleming, & Gottfried, 1994, 1998, 2001). In our previous work on intellectual giftedness, we proposed in the Potentiality-Enrichment Theory that academic intrinsic motivation is inherently tied to the development of intellectual giftedness, albeit not in one-to-one correspondence; that is, they are not one and the same construct (Gottfried & Gottfried, 1996; A. W. Gottfried et al., 1994). In the conceptualization advanced, gifted motivation moved beyond this previous perspective by considering academic intrinsic motivation as its own form of giftedness (Gottfried & Gottfried, 2004; Gottfried et al., 2005).

The following criteria provided a foundation for developing the conceptualization of gifted motivation: (a) significant differences exist between the intellectually gifted and their comparison cohort in academic intrinsic motivation, (b) academic intrinsic motivation is uniquely related to academic achievement above and beyond IQ, (c) there is continuity in academic intrinsic motivation from early childhood through adolescence, and (d) aspects of environment are related to academic intrinsic motivation. Academic intrinsic motivation is noticeable by teachers, is related to parents' motivational practices and children's family environments, and can be impacted by the environment (Gottfried & Gottfried, 2004).

Academic intrinsic motivation as defined above was measured with the Children's Academic Intrinsic Motivation Inventory (CAIMI; A. E. Gottfried, 1986), a reliable and valid instrument that provides measurement of four subject area scales (reading, math,

Table 2
Summary of Major Measures Collected in the Fullerton Longitudinal Study

Developmental Era	Measure	Age(s) Administered (Years)
	Intellectual and Cognitive	
Infancy	Bayley Scales of Infant Development	1, 1.5, 2
Preschool	McCarthy Scales of Children's Abilities	2.5, 3, 3.5
	Minnesota Child Development Inventory	2.5
	Test of Early Language Development	3.25
	Kaufman Assessment Battery for Children	5
	Minnesota Preschool Inventory	5
Elementary School	Wechsler Intelligence Scale for Children–Revised	6, 7, 8
Junior High School	Wechsler Intelligence Scale for Children–Revised	12
High School	Wechsler Intelligence Scale for Children–III	15
	Wechsler Adult Intelligence Scale–Revised	17
	Academic Intrinsic Motivation and Cognitive Mastery Motivation	
Infancy through Early Childhood	Bayley Infant Behavior Record	1.5, 2, 2.5, 3, 3.5, 5, 6
Elementary School	Young Children's Academic Intrinsic Motivation Inventory	7, 8
	Children's Academic Intrinsic Motivation Inventory	9, 10
Junior High School	Children's Academic Intrinsic Motivation Inventory	13
High School	Children's Academic Intrinsic Motivation Inventory–High School	16, 17
	Academic Achievement and Competence	
Preschool	Kaufman Assessment Battery for Children Achievement Scale	5
Elementary School	Wide Range Achievement Test–Revised	6
	Child Behavior Checklist–Teacher and Parent Report Form	6, 7, 8, 9, 10, 11
	Woodcock-Johnson Psycho-Educational Battery	7, 8, 9, 10
	Woodcock-Johnson Psycho-Educational Battery–Revised	11

Junior High School	Woodcock-Johnson Psycho-Educational Battery–Revised	12, 13
High School	Woodcock-Johnson Psycho-Educational Battery–Revised	14, 15, 16, 17
	Self-Concept	
Elementary School	Self Description Questionnaire–I	10
Junior High School	Self Description Questionnaire–II	12
High School	Self Description Questionnaire–II	14, 16
	Temperament	
Infancy	Infant Characteristics Questionnaire	1.5
Preschool	Toddler Temperament Scale	2
	Behavioral Style Questionnaire	3, 3.5, 5
Elementary School	Middle Childhood Temperament Questionnaire	8, 10, 12
High School	Dimensions of Temperament Survey—Revised	14, 16
	Behavioral and Social Functioning	
Preschool	Eyberg Child Behavior Inventory	3.25
	Preschool Behavior Inventory	3.5
	Child Behavior Checklist–Parent Report Form	4, 5
Elementary School	Child Behavior Checklist–Teacher and Parent Report Form	6, 7, 8, 9, 10, 11
Junior High School	Child Behavior Checklist–Parent Report Form	12, 13
High School	Child Behavior Checklist–Parent Report Form	13, 14, 15, 16, 17
	Home/Family Environment	
Infancy	Home Observation for the Measurement of the Environment (HOME)–Infant Version	1.25
Preschool	HOME–Preschool Version	3.25
	Family Environment Scale	3, 5
Elementary School	HOME–Elementary Version	8
	Family Environment Scale	7, 8, 10
Junior High School	Family Environment Scale	12
High School	Family Environment Scale	14, 16, 17

social studies, and science), as well as a scale for school in general. In the high school years, the subject designation of reading was changed to English, and social studies changed to history (see A. E. Gottfried et al., 2001, for further explanation). The CAIMI was administered at ages 9, 10, 13, 16, and 17 years. Because the school-in-general scale assesses overall pleasure inherent in learning in the academic setting, it was chosen to be used in this research to develop the contrasting groups and also to analyze previous motivation.

In the absence of a standardized cutoff score to designate gifted motivation that does exist in the case of gifted intelligence (e.g., IQ equal to or greater than 130), we applied the following rationale to create the study groups to be compared. Due to recent research demonstrating that the stability of academic intrinsic motivation increases in adolescence and maintains strong cross-time consistency with stability path coefficients as high as .86 (Gottfried et al., 2001), we chose this developmental period as our frame of reference for selecting the designated gifted motivation and comparison study groups rather than middle childhood, which is suitable for designating gifted IQ because of the substantial stability of IQ scores beginning at that point in development. The school-in-general scale raw scores (henceforth referred to as the general score) of the CAIMI at ages 13, 16, and 17 years were aggregated to provide an appraisal of the adolescents' overall pleasure inherent in learning in the academic setting. Aggregation was done to optimize reliability (Epstein, 1979; Rushton, Brainerd, & Pressley, 1983) by creating a composite of the most consistently, highly motivated adolescents, and at the same time maximized the available sample size. At ages 13, 16, and 17, there were 108, 112, and 111 participants assessed, respectively. The aggregation resulted in 111 participants.

To be concordant with the occurrence of gifted intelligence in our study, we likewise identified the top 19% of the aggregated motivation scores (for details, see p. 176 in Gottfried et al., 2005). This resulted in 21 of the 111 participants displaying consistently extremely high motivation through the adolescent years of 13 through 17. In the absence of a standard cutoff score for gifted motivation, we operated under the assumption and heuristic that gifted motivation occurs at a frequency similar to gifted intelligence. However, no

assumption was made that all of the same children would be in both groups. Hence we did not expect gifted motivation and gifted intelligence to be identical. The use of a cutoff score allows for identification of students in the educational setting (see p. 183 in Gottfried et al., 2005).

Major Findings for Intellectual Giftedness

Before presenting the findings, it should be noted that intellectual and motivational giftedness were analyzed separately within the same longitudinal data set and same paradigm. Therefore, the results are presented individually for each construct.

At the outset, it is important to highlight that the intellectually gifted were not different than the cohort comparison group with respect to their temperament, behavioral, social, or emotional functioning.

Cognitive Ability

Regarding intellectual giftedness, significant differences between the gifted IQ group and their cohort peer comparison emerged on the psychometric sensorimotor tests of intelligence beginning at age 1.5 years. The difference between the groups was maintained throughout the course of investigation, indicating parallel continuity. In contrast to the cohort peer comparison, virtually all children who emerged as gifted at age 8 revealed a developmental index score of 130 or greater during infancy, specifically at 1.5 and/or 2 years. In our conceptualization, we interpreted this as potential for subsequent intellectual giftedness. Additionally, children who became intellectually gifted were more advanced in their language development as early as 1 year of age on receptive language skills and on both receptive and expressive language skills thereafter. This finding is in accord with the literature involving anecdotal retrospective reports (e.g., Freeman, 1991, 2001; Gross, 1993), a further indication of early cognitive acceleration. Parents also observed the early advancement of the children who later emerged as gifted. During the early years, they rated these

children as advanced on intellectual and language skills relative to the ratings of the parents of the comparison group children.

Intellectually gifted children were cognitively well-rounded; that is, as a group they excelled across an array of intellectual measures (e.g., verbal, quantitative, memory, and the like). Their cognitive advantage was evident in their academic achievement, as well. From school entry, they performed at a higher level across diverse subject areas, classroom competence, type of assessment (e.g., standardized tests, teacher and parent rating, school reports), and across time. They were less likely to have their kindergarten entry delayed and were never held back in a grade. Gifted children were significantly more likely than their cohort comparison to obtain at least one extremely superior test score in the opening years of their education. Teachers' reports about children who later became gifted indicated that they were more competent in the classroom. This is important because the children were not in the same classroom, school, or even school district; instead, this was based on the reports of hundreds of teachers over time, hence precluding teacher bias. Further, these ratings were gathered prior to an age when children are typically identified as gifted in the school system. Therefore, it is probable that teachers were astute enough to judge the children on the basis of classroom behavior and not on a gifted label.

Cognitive Mastery and Academic Intrinsic Motivation

In our investigation of early developmental aspects of gifted IQ, the children who eventually emerged as intellectually gifted evidenced superior cognitive mastery and academic intrinsic motivation from infancy through the early school years. In infancy and into childhood, the gifted exhibited greater goal directedness, object orientation, attention span, and were more positively engaged in the testing situation. As early as age 7 and thereafter through adolescence, they exceeded their cohort in academic intrinsic motivation. Additionally, they had more positive perceptions of their academic competence, as well as lower academic anxiety. This particular finding set the stage for the conceptualization and investigation of the construct of gifted motivation.

Cognitively Stimulating Home Environment

Gifted children were embedded in intellectually and culturally advantageous home atmospheres. This was pervasive across distal or global (e.g., parental education but not mothers' IQ), proximal (e.g., parental involvement and responsiveness, play materials, variety of stimulation), and family relationship (e.g., cohesiveness and autonomy) variables. Their families had higher intellectual and cultural orientations. Not only were the gifted children provided with cognitively enriched environments, they were also more active in eliciting developmentally enhancing experiences. They made more requests of their parents for cognitively relevant extracurricular activities. We concluded that children who become intellectually gifted are more environmentally engaged and may benefit more from their environment.

Potentiality Enrichment Theory

Based on these three foregoing dimensions, we proposed the Potentiality Enrichment Theory, which pertains to how children become intellectually gifted. First, the children who became gifted evidenced early signs of reach as indicated by their early acceleration of language skills and elevated sensorimotor intelligence scores (developmental index scores equal to or greater than 130) at 1.5 and/or 2 years. These advancements have implications for the early assessment and detection of the emergence of intellectual giftedness. Second, at the heart of superior intellect may be motivation for or pleasure inherent in acquiring knowledge—that is, intrinsic motivation. From infancy and through adolescence, gifted children displayed more cognitive mastery and intrinsic motivation for learning. However, we asserted that this relationship between high intellect and high motivation was not in one-to-one correspondence, which is not one and the same. Third, children who emerged as gifted had a dynamic ongoing intellectual ecology that facilitated cognitive advancement. The implications for parents and educators are to furnish a continuously enriched and challenging cognitive environment that is responsive to the child's bids for stimulation. We asserted that "giftedness is not a chance event . . . that giftedness will blossom when children's cognitive ability, motivation and enriched environments

coexist and meld together to foster its growth" (A. W. Gottfried et al., 1994, p. 184).

Major Findings for Motivational Giftedness

Cross-time, pervasive differences from school entry through early adulthood resulted, favoring adolescents with gifted motivation compared to the cohort comparison. These differences included early motivation, academic achievement across a variety of measures, classroom functioning, intellectual performance, self-concept, and postsecondary educational progress.

Motivationally gifted adolescents, in contrast to their cohort peer comparison group, had higher academic intrinsic motivation during elementary school. Throughout the school years, the motivationally gifted performed at distinctly higher levels on an array of educational outcome variables. This array included individually administered achievement tests assessing reading and math, teacher and parent ratings of student achievement, cumulative high school grade point averages (GPA) obtained from school records, and SAT Verbal and Quantitative scores. The motivationally gifted had more positive academic and nonacademic self-concepts.

Regarding classroom competence in elementary school, based on the ratings provided by several hundreds of teachers, the motivationally gifted were noticed to be harder working and learning more. Hence their classroom functioning was more competent and indicative of greater motivation to learn.

None of the highly motivated adolescents dropped out of high school, whereas 6% of the cohort peer comparison did so. Regarding their postsecondary educational accomplishments, the motivationally gifted had attained more education. They were more likely to take the SATs, enroll in 4-year colleges directly out of high school, obtain college degrees, and be enrolled in graduate school at age 24.

Differences between motivationally gifted adolescents and their cohort comparison group emerged on IQ tests, albeit both groups were at or above average (neither group average was in the gifted IQ range). Nevertheless, gifted motivation proved to be distinct from

gifted intelligence. That is, those who were motivationally gifted were not necessarily intellectually gifted, as well. Three findings distinguished between gifted motivation and gifted intelligence. First, there was no statistically significant overlap between the groups, meaning that those with gifted motivation are not necessarily intellectually gifted. In fact, the majority did not overlap. Only eight children were both intellectually and motivationally gifted in the entire study sample (see p. 181, Gottfried et al., 2005). Second, regression analyses revealed that academic intrinsic motivation predicted high school GPA above and beyond the variance due to IQ. This independent contribution of academic intrinsic motivation to the prediction of academic achievement above and beyond IQ across many measures was also previously reported (see pp. 124–125, Gottfried & Gottfried, 2004; see pp. 181–182, Gottfried et al., 2005). Third, the coefficient of alienation, a measure of noncorrelation, indicated that the overwhelming majority of variance in academic intrinsic motivation is not accounted for by IQ, further supporting the view that gifted motivation and gifted intelligence are distinct constructs. Therefore, this research serves to expand the definition of giftedness to include the construct of gifted motivation in its own right.

There are important implications of the gifted motivation construct. First, validating the construct of gifted motivation not only broadens and elaborates conceptions of giftedness, but such enhancement of giftedness dimensions has implications for student identification and program development. Because gifted motivation is a distinct construct that contributes uniquely to educational success, and it is not identical with gifted intellect, then motivation should be considered as a criterion in and of itself to augment the selection of students into programs for the gifted and talented (see, for example, Clinkenbeard, 1996; Gottfried & Gottfried, 1996, 2004; A. W. Gottfried et al., 1994). Second, regarding program development, educators need to be mindful of the necessity for motivationally engaging students in the learning process. Finally, motivation should not be considered simply a catalyst for the development of other forms of giftedness, but should be nurtured in its own right. Thus, we concluded that "teaching the desire to learn may be as important as teaching academic skills" (Gottfried & Gottfried, 2004, p. 129).

Directions for Future Research in the FLS

Given the scope of the FLS, there are several issues we intend to address pertaining to the longitudinal course of gifted intelligence and gifted academic intrinsic motivation. These may include the following:

1. Is there continuity of gifted intelligence? Longitudinal studies of intellectual giftedness, including Terman's, typically tested their participants on a single occasion. Despite increases in the magnitude of correlations across time with advancement in age, it is not known whether gifted intelligence remains stable throughout the school years. It must be determined whether children who are intellectually gifted during the elementary years continue to be intellectually gifted upon high school completion.

2. The continuity issue also pertains to the question of whether late bloomers in intellectual giftedness exist. Are there children who were not intellectually gifted at age 8 years, yet became gifted by age 17 years? The FLS is uniquely in the position to address this matter because a complete history of systematic ongoing testing for the sample over time has been collected.

3. We found that intellectually gifted children press their parents for enriched environmental stimulation. Hence, a bidirectionality exists between children and their environments. Given these findings in the early course of development, we plan to examine gifted adolescents with regards to their self-selection of extracurricular activities, engagement in leadership roles, and the nature of the demands they placed on themselves.

4. We have studied the 24-year outcome data pertaining to the motivationally gifted. We are now in the process of addressing developmental outcomes through age 24 for the gifted intellectual group.

5. The FLS study sample as a group (when not differentiated as gifted and comparison group) revealed a particularly dramatic decline in math and science academic intrinsic motivation (Gottfried et al., 2001). This is in accord with the United States school population consistently scoring below many other countries on math and science achievement tests. Therefore, an important question arises as to

whether the intellectually and motivationally gifted show a decline when distinguished from their cohort. The FLS can directly address this longitudinal question because motivation and other academic self-appraisals have been assessed in math and science from elementary school through high school.

6. Findings from the FLS revealed that when parents employed more task-endogenous motivational practices with regard to their children's academic performance as compared to task-extrinsic strategies, children had higher academic intrinsic motivation and academic achievement (Gottfried et al., 1994). However, based on this finding, we plan to examine whether the parents of intellectually and motivationally gifted children use such motivational practices differentially over time.

7. Given the identification of intellectual and motivational giftedness, we plan to address the synergistic effect of these two distinct forms of giftedness on long-term developmental outcomes.

8. Finally, given the long-term and multivariate nature of the FLS, it remains to be determined whether early aspects of development and environment can predict intellectual and motivational giftedness.

In conclusion, it is hoped that our efforts in conducting the FLS elucidate the course of development of intellectually gifted and motivationally gifted children. Moreover, we look forward to the findings being used by educators and practitioners to advance the well-being and effectiveness of gifted children to contribute to themselves and society.

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