High Ability Studies

ISSN: 1359-8139 (Print) 1469-834X (Online) Journal homepage: https://www.tandfonline.com/loi/chas20

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To cite this article: Françoys Gagné (2004) Transforming gifts into talents: the DMGT as a developmental theory , High Ability Studies, 15:2, 119-147, DOI: 10.1080/1359813042000314682

To link to this article: https://doi.org/10.1080/1359813042000314682

Published online: 11 Oct 2010.

High Ability Studies, Vol. 15, No. 2, December 2004

Carfax Publishing
Taylor & Francis Group

Transforming gifts into talents: the DMGT as a developmental theory[1]

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The Differentiated Model of Giftedness and Talent (DMGT) presents the talent development process (P) as the transformation of outstanding natural abilities, or gifts (G), into outstanding systematically developed skills which define expertise, or talent (T) 3 in a particular occupational field. This developmental sequence constitutes the heart of the DMGT. Three types of catalysts help or hinder that process: (a) interpersonal (I) catalysts, like personal traits and self-management processes; (b) environmental (E) catalysts, like socio-demographic factors, psychological influences (e.g., from parents, teachers, or peers), or special talent development facilities and programs; and (c) chance (C). The DMGT includes a 5-level metric-based (MB) system to operationalize the prevalence of gifted or talented individuals, with a basic 'top 10 per cent' threshold for mild giftedness or talent, through successive 10 per cent cuts for moderate, high, exceptional and extreme levels. Complex interactions between the six components are surveyed. The text ends with a proposed answer to a fundamental question: 'What factor(s) make(s) a difference, on average, between those who emerge among the talented and those who remain average?'

Introduction

The field of gifted education defines its special population around two key concepts: giftedness and talent. If curious browsers were to use these two terms to access the Subject Index of any edited handbook in the field (e.g., Heller *et al.*, 2000; Colangelo & Davis, 2003; Sternberg & Davidson, in press), they would soon discover the fascinating creativity of scholars in their attempts to circumscribe the nature of giftedness and talent. Here are a few examples gleaned from the first edition of *Conceptions of giftedness* (Sternberg & Davidson, 1986); those examples do not exhaust the diversity of the definitions proposed—or omitted—in its seventeen chapters. In some cases, the concept of talent does not appear or is not defined (e.g., Davidson, 1986; Renzulli, 1986; Sternberg, 1986); in other cases, which is the dominant position in the literature, both terms are used as synonyms, as in Marland's well-known definition 'Gifted

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ISSN 1359–8139 print; 1469–834X online/04/020119–29

DOI: 10.1080/1359813042000314682

and talented children are …' (1972, p. 4). Csikszentmihalyi and Robinson explicitly announce that non-differentiation, stating: '*talent*, *giftedness*, and *prodigious performance* will be used interchangeably' (1986, p. 264; emphasis in original text). Occasionally, talent becomes a sub-category of giftedness: 'The second component of giftedness is talent' affirms Feldhusen (1986, p. 113); or 'giftedness encompasses a wide variety of abilities, talents, or propensities' (Haensly *et al.*, 1986, p. 131). For his part, Feldman associates talent with potential and giftedness with achievement. He affirms: 'Talent from a cognitive-developmental perspective is the potential for constructive interaction with various aspects of the world of experience. … If these processes of interaction lead to high level performance, then it is appropriate to speak of giftedness' (1986, p. 287). On the other hand, Tannenbaum does the opposite when he defines giftedness as follows: 'Keeping in mind that developed talent exists only in adults, a proposed definition of giftedness in children is that it denotes their potential for becoming critically acclaimed performers or exemplary producers of ideas' (1986, p. 33). Surprisingly, just a few paragraphs later, Tannenbaum switches the gifted label from promise to fulfillment when he states: 'Those who have the potential for succeeding as gifted adults …' (1986, p. 34). Such terminological inconsistencies abound in the gifted education literature.

If conceptions abound and often contradict one another, scholars keep mentioning one particular idea in almost every discussion of the giftedness construct; they acknowledge, implicitly or explicitly, a distinction between early emerging forms of outstanding abilities, to some extent innate and usually manifested in childhood, and fully developed, adult forms of outstanding abilities. The distinction will be expressed with pairs of terms such as potential *versus* achievement, aptitude *versus* realization, promise *versus* fulfillment, but it will rarely, if ever, be systematically operationalized. I believe that such a distinction can be, and should be made formal. As I recently argued (Gagné, 1999a, 1999b), aptitudes can be described as natural abilities in a particular domain, and achievement as systematically developed skills in a particular talent field. Since its initial presentation (Gagné, 1985), the Differentiated Model of Giftedness and Talent (DMGT) has used that distinction to anchor its definitions of the two concepts.

Giftedness designates the possession and use of untrained and spontaneously expressed natural abilities (called outstanding aptitudes or gifts), in at least one ability domain, to a degree that places an individual at least among the top 10 per cent of age peers.

Talent designates the outstanding mastery of systematically developed abilities (or skills) and knowledge in at least one field of human activity to a degree that places an individual at least among the top 10 per cent of age peers who are or have been active in that field or fields.

These definitions reveal that the two concepts share three characteristics: (a) both refer to human abilities; (b) both are normative, in the sense that they target individuals who differ from the norm or average; (c) both refer to individuals who are 'non-normal' because of their outstanding behaviors. These shared characteristics help understand why giftedness and talent are confounded by most professionals in the field, as well as in common language.

In order to represent more accurately the complexity of the talent development process, the DMGT introduces four other components (see Figure 1): intrapersonal catalysts (IC), environmental catalysts (EC), the talent development process (P) manifested through learning, training and practice, and chance factors (C). As seen in the formal definitions above, precise thresholds specify what is meant by 'outstanding' behaviors; the problem of thresholds, called the prevalence issue, will be addressed later in this text. Finally, the DMGT enters the realm of theory by examining the dynamic interactions among the six components; some interactions have strong empirical bases, others remain assumptions or hypothetical statements.

The present article is structured around the three themes identified above: (a) the six components, (b) the prevalence question, and (c) the dynamics of talent development. The final section will outline how the DMGT differs from typical conceptions of giftedness and talent.

Overview of the six components

The six components of the DMGT can be subdivided into two trios. The first describes the core of the talent development process, that is the transformation of outstanding natural abilities (or gifts) into the high level skills (or talents) of a particular occupational field through a long process of learning, training and practice. The

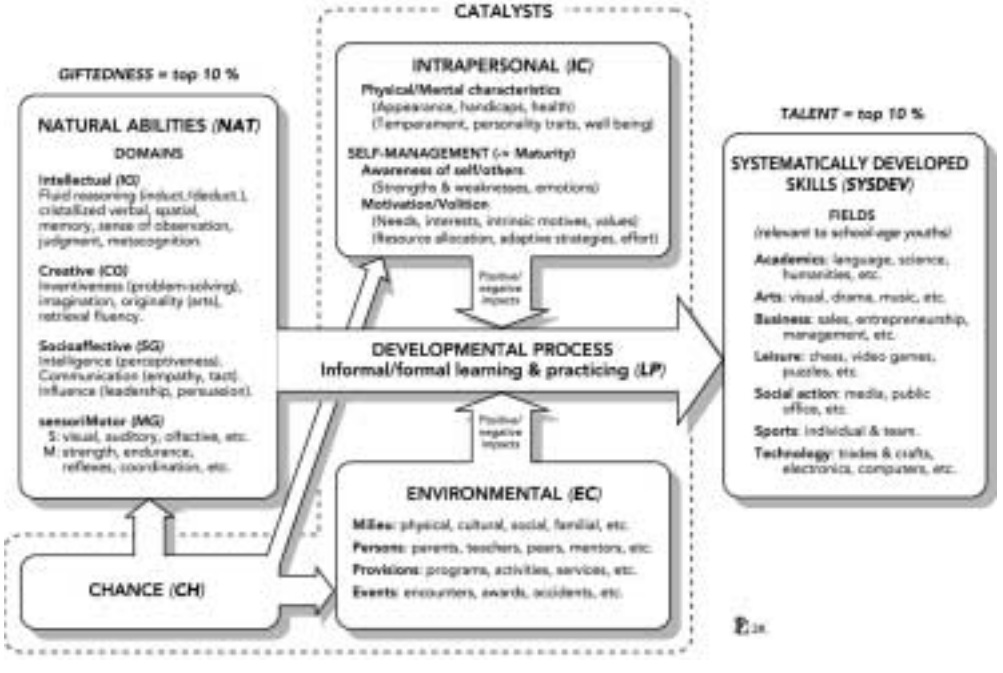

Figure 1. Gagné's Differentiated Model of Giftedness and Talent (2004 update)

members of the second trio have in common the concept of *catalyst* since they act as facilitators or inhibitors in the talent development process. Because I consider that a complete definition of giftedness and talent must include a clear threshold value to separate those who may be so labeled from those who should not, the 10 per cent prevalence estimate will be discussed at the end of this componential survey.

The talent development trio

The DMGT's delineation between gifts and talents is a particular case of the general distinction between aptitude (or potential) and achievement. Some prominent scholars (e.g., Anastasi, 1980; Snow & Lohman, 1984; Snow, 1992) have questioned the relevance and validity of a more traditional definition of aptitude.[2] In counterpoint, Angoff (1988) built a strong defense for such a distinction, using the following differentiating characteristics: (a) slow growth for aptitudes *versus* rapid growth for achievement; (b) informal learning *versus* formal; (c) resistance to stimulation *versus* susceptibility to it; (d) major genetic substratum *versus* major practice component; (e) more general content *versus* more circumscribed; (f) 'old formal' learning *versus* recent acquisitions; (g) more generalizable *versus* narrower transfer; (h) prospective use (predicting future learning) *versus* retrospective use (assessing amount learned); and (i) usable for general population evaluation *versus* limited to systematically exposed individuals. All these characteristics apply perfectly to the DMGT's differentiation between gifts and talents.

Gifts (G). The DMGT proposes four aptitude *domains* (see Figure 1): intellectual, creative, socio-affective and sensorimotor. Each can be divided into any number of categories. Figure 1 shows exemplars borrowed from various sources. These subdivisions should not be considered essential subcomponents of the model since, within each of the four domains, many competing classification systems exist. Just with regard to cognitive abilities, some of the better known taxonomies include Carroll's (1993) three-level system of abilities, Gardner's (1983) multiple intelligences, Snow's (Snow *et al.*, 1984) Radex and Sternberg's (1985) triarchic theory. As knowledge progresses within each ability domain, new taxonomies will no doubt be proposed. For instance, recent work related to the concept of emotional intelligence (e.g., Mayer *et al.*, 2000) could give birth to a new category system within the socio-affective domain.

Natural abilities can be observed through the various tasks that confront children in the course of their development. These include the intellectual abilities needed when learning to read, speak a foreign language or understand new mathematical concepts, and the creative abilities applied to solving various technical problems or producing original work in science, literature and art. There are also the physical abilities involved in sports, music or carpentry, or the social abilities children use in their daily interactions with classmates, teachers and parents. These natural abilities manifest themselves in all children to a variable degree. It is only when the level of

expression becomes outstanding that the label 'gifted' may be used. High aptitudes or gifts can be observed more easily and directly in young children because environmental influences and systematic learning have exerted their moderating influence in a limited way. However, gifts still manifest themselves in older children, even in adults, through the facility and speed with which some individuals acquire new skills in any given field of human activity; the easier or faster the learning process, the greater the natural abilities. Many scholars have stressed the link between natural abilities and learning pace. For instance, Gottfredson states: 'Although researchers disagree on how they define intelligence, there is virtual unanimity that it reflects the ability to reason, solve problems, think abstractly, and acquire knowledge' (1997, p. 93). Carroll similarly affirms: 'Experts have largely neglected what seems to be an obvious conclusion to be drawn from the evidence from IQ tests: that IQ represents the degree to which, and the rate at which, people are able to learn' (1997, p. 44).

Two domains, the intellectual and the psychomotor, have developed psychometrically valid measures of natural abilities (Matthews *et al.*, 2002). IQ tests, group or individually administered, are generally recognized as the most reliable and valid assessments of general cognitive functioning, often referred to as the 'g' factor (Jensen, 1998). In the psychomotor domain,[3] one finds complex batteries of tests to assess the physical fitness of children in elementary or junior high schools (Australian Sports Commission, 1994; President's Council on Physical Fitness and Sports, 2001). The creative domain also has tests, but their psychometric qualities remain well below those of IQ tests, especially in terms of convergent validity (Plucker & Renzulli, 1999). Because of its more recent exploration, the socio-affective domain lags behind in terms of psychometrically sound measures; available instruments predominantly revolve around self-assessments or peer judgments.

Is there still any need to defend the genetic basis of natural abilities? Nowadays, few researchers in the social sciences deny the significant contribution of hereditary factors in explaining individual differences in human characteristics, including physical and mental abilities, interests or temperament. The two domains with the best measures of natural abilities are also those with the most extensive analyses of the nature–nurture question. Particularly during the last two decades, hundreds of studies have examined the contribution of genes to individual differences in general cognitive functioning, comparing identical twins reared together or apart (Bouchard, 1997), identical twins with fraternal ones, or adopted siblings (Rowe, 1994). If any degree of contention is left, it concerns essentially the relative contributions of nature and nurture. Similar evidence has been accumulating with regard to psychomotor abilities (Bouchard *et al.*, 1997).

Talents (T). Talents progressively emerge from the transformation of high aptitudes into the well-trained skills characteristic of a particular field of human activity.[4] These fields can be extremely diverse (see Figure 1); indeed, almost *any* occupational field in which a series of skills needs to be mastered generates large individual differences in performance, ranging from minimum competence to high

level expertise.[5] All individuals whose outstanding skill mastery places them among the top 10 per cent within their occupational field should be recognized as talented. In many of these fields individuals pursue the development of their skills as a leisure (e.g., cooking, gardening, craftsmanship); in some others, leisurely pursuits may even characterize a majority of the participants (e.g., chess, bridge, music and most sports).

Measuring talent is a straightforward enterprise: it simply corresponds to outstanding performance in the use of the specific skills of any occupational field. During the developmental phase of any talent, whether academic, artistic, technological or athletic, many occasions for normative assessments present themselves: teacher exams, achievement tests, competitions, scholarships and so forth. But, after individuals have completed their training, performance rankings usually disappear. How will you know whether the plumber you have called is below or above average compared to his/her peers? How about the mechanic working on your car, the dentist repairing a filling, the accountant preparing your income tax return or the coach managing your child's hockey team? Most of the time, the only guideline will be word of mouth. Even when assessments are available, their validity is often questionable because they rely mostly on peer or superiors' ratings (Anastasi & Urbina, 1997). Only professional athletes have to deal with constant normative comparisons of their performances!

There is no direct bilateral relationship between gift domains and talent fields. A given natural ability can express itself in many different ways depending on the field of activity. Manual dexterity can be modeled into the particular skills of a pianist, a painter or a video-game player; similarly, intelligence can be modeled into the scientific reasoning of a chemist, the game analysis of a chess player or the strategic planning of an athlete. Yet, some occupational fields are associated more directly with specific ability domains. For instance, sports skills are built on the foundations of motor abilities; wine tasting develops from sensory acuity; those participating in knowledge-dependent fields (e.g., traditional professions, technical occupations, mental sports like chess or bridge) build their expertise from natural cognitive abilities; and talent in social interaction occupations (e.g., sales, teaching, health services) is closely associated with high socio-affective abilities.

Talent is a developmental construct. That statement means that soon after youngsters have begun learning a new set of skills, it becomes possible to assess their performances normatively, comparing them with others who have been learning for an approximately equal amount of time. In schools, such assessments can begin as early as kindergarten. Assessments also exist for beginners in music, dance, visual arts or sports. Note that the level of achievement can change as learning progresses. During their first years in school, some students can obtain grades within the top 10 per cent of their class and, consequently, be labeled academically talented. Then, for whatever reason, their progress may slow, justifying a decision to remove them from the talented group. The reverse is equally possible. However, because of high correlations between yearly achievements, most talented students maintain their label for the whole of their formal schooling.

The talent development process (P). The talent development process consists in transforming specific natural abilities into the skills that define competence or expertise in a given occupational field. Competence corresponds to levels of mastery ranging from minimally acceptable to well above average, yet below the defined threshold for talented or expert behavior. Thus, talent is to gifted education what competence is to general education. As usually defined (see Ericsson, 1996), the concept of expertise largely overlaps the DMGT's concept of talent.

Developmental processes can take four different forms: (a) maturation; (b) informal learning; (c) formal non-institutional learning; and (d) formal institutional learning. *Maturation* is a process largely controlled by the genome. It ensures the growth and transformation of all biological structures and physiological processes. That developmental process in turn impacts other functions at the phenotypic level. For instance, research has shown that major changes in brain physiology directly coincide with parallel changes in cognitive achievements (Gazzaniga *et al.*, 1998). *Informal learning* corresponds essentially to knowledge and skills acquired as part of daily activities. Much of what is called 'practical intelligence' (see Sternberg & Wagner, 1986) is the result of such informal or unstructured learning activities. The general knowledge, language skills, social skills or manual skills mastered by young children before they enter the school system result almost totally from such unstructured activities.

The last two developmental or learning processes are formal in the sense that (a) there is a conscious intention to attain specific learning goals, and (b) there is a systematically planned sequence of learning steps to achieve these goals. The first case, that of *non-institutionalized formal learning*, corresponds to autodidactic or self-taught learning. Many individuals, young and old, decide to develop competencies in a particular occupational field, most of the time as a leisure activity. Few will achieve performances that would compare with the best in these fields. But it may sometimes happen, for example, that a self-taught pianist will outperform a majority of music students who have trained for five or six years. In the DMGT framework, these outstanding autodidacts would be labeled as talented (Gagné, 1993). Still, the most common learning process remains institutionally based and leads to some form of official recognition of competency or talent: going to school, joining a sports team or enrolling in a music school, a cooking academy or a public-speaking program.

Theoretically, both gifts and talents can use all four types of developmental processes described above. In practice, some types appear much more appropriate to gifts than talents, or *vice versa*. For instance, maturation affects the growth of talents only indirectly—that is, through its action on natural abilities—the real building blocks of talents. On the other hand, early stimulation programs such as Head Start (Haskins, 1989) can be catalogued as formal institutional attempts to develop general cognitive abilities. However, such systematic interventions are not very common. Consequently, only a very small percentage of at-risk children, those especially targeted by such measures, will have their natural abilities influenced by these programs. As a general rule, these four processes contribute to the development of gifts in inverse proportion to their degree of formality. In other words, the major developmental agent for gifts is maturation, closely followed by informal learning. In

the case of talents, it is the opposite, with formal institutional learning accounting for most of the developmental impact.

The trio of catalysts

Native to chemistry, the term catalyst designates chemical substances introduced into a chemical reaction, usually to accelerate it. At the end, these contributors regain their initial state. In other words, catalysts contribute to a reaction without being constituents of either the initial substance or the final product. In the case of talent development, the constituent elements are the natural abilities, which are slowly transformed into specific skills. Talent is strictly measured through the level of skill mastery; neither the type of the contributing catalysts nor the strength of their contribution has relevance for that assessment. The DMGT distinguishes three types of catalysts: intrapersonal, environmental and chance factors. Each of these may be examined with regard to two dimensions: *direction*—positive/facilitating *versus* negative/hindering—and *strength* of causal impact on the developmental process.

Intrapersonal catalysts. (I). Until recently (see Gagné, 2003a), the intrapersonal catalysts were subdivided into five parallel sub-components: physical characteristics, motivation, volition, self-management and personality. Self-management was the most recent addition to that group. Its introduction as a distinct category results from recent personal research on multitalented individuals (Gagné, 1999c), in which high-level self-management was perceived by virtually all parent interviewees to be one of the most typical characteristics of their multitalented adolescent. From these parent interviews, the concept was defined as covering behaviors such as initiative, efficient time management, autonomy, concentration and good work habits. Its definition overlaps a large group of terms commonly found in the scientific literature (e.g., self-control, dependability, self-efficacy, mental self-governance, enterprise or self-regulation) (Zimmerman, 1998).

Borrowing from a conception of self-management proposed by De Waele, Morval, & Sheitoyan (1993), this catalyst was recently redefined (Gagné, 2003b) and given a much broader and more central role view self-management as 'a practical philosophy of life' (De Waele *et al.,* 1993, p. 5). More concretely, it means 'working toward the optimal integration of one's emotional, spiritual, intellectual, and physical life, at every stage of one's life. It also means recognizing opportunities for using appropriations [self-knowledge, knowledge of others and the environment], relation [mostly interpersonal], decision, and action as resources, to respond to one's needs and develop one's potential' (De Waele *et al.,* 1993, p. 8). This redefinition produced a new dichotomy among intrapersonal catalysts: physical and mental *characteristics* on one side, and *processes* on the other. *Physical* characteristics may take many forms. For instance, when dance schools select young candidates for training, they often use physical parameters (e.g., height, slenderness, leg length) to determine the chances

of a young student attaining high performance levels. In music, hand span directly affects the repertoire of a young musician. The same applies to sports, where physical templates have been defined for many sports.

Mental characteristics cluster around two major constructs: temperament and personality, which represent the nature and nurture poles respectively, or basic tendencies as opposed to behavioral styles (McCrea *et al.*, 2000). Most personality researchers recognize the existence of five basic bipolar personality dimensions, called 'The Big Five' (Digman, 1990) or the Five-Factor Model (FFM). They are commonly labeled: Extraversion (E), Agreeableness (A), Conscientiousness (C), Neuroticism (N) and Intellect/Openness (O). McCrea and Costa (1999) affirm: 'Much of what psychologists mean by the term *personality* is summarized by the FFM, and the model has been of great utility to the field by integrating and systematizing diverse conceptions and measures' (p. 139; emphasis in original text). There is growing evidence for a close relationship between temperament dimensions and adult personality traits (Rothbart *et al.*, 2000); this relationship probably explains why all FFM dimensions have significant genetic underpinnings (Rowe, 1997).

As redefined along the lines of De Waele *et al.*'s (1993) work, *self-management* becomes the central governing process of a person's self-development. Its goal is to foster the highest possible level of personal maturity and self-actualization. As shown in Figure 1, it comprises two major dimensions. The first one, labeled awareness, includes both of Gardner's (1983) personal intelligences (*intra* and *inter*), as well as any process having an influence on the development of the self-concept and self-esteem. The second dimension, labeled motivation/volition, proposes a clear distinction between goal-setting behaviors and goal-attainment behaviors. This distinction is borrowed from Kuhl and Heckhausen's Action Control theory (see Kuhl & Beckmann, 1985). Corno (1993) adapted it to school learning. The term *motivation* is reserved for goal-setting processes (e.g., identifying and selecting interests, needs, motives, passions, values), whereas the term *volition* covers all goal-attainment activities (e.g., resource and time allocation, delay of gratification, effort, perseverance, self-regulation). Both constructs play a significant role in initiating the process of talent development, guiding it and sustaining it through obstacles, boredom and occasional failure.[6]

Environmental catalyst. (E). The environment exerts its positive or negative impact in many different ways. In the DMGT, four distinct environmental inputs are distinguished (see Figure 1). The *milieu* or surroundings can be examined both at a macroscopic level (e.g., geographic, demographic, sociological) and a microscopic level (e.g., size of family, socioeconomic status, neighborhood services). For example, young gifted persons who live far from large urban centers do not have easy access to appropriate learning resources (e.g., sports training centers, music conservatories, magnet schools). Within the child's home environment, the parents' financial comfort, the absence of one of the caregivers, the number and age distribution of siblings within the family, as well as many other elements of the immediate environment can have

some degree of impact on the child's talent development. Psychological factors, for instance the parents' value of educational pursuits or their personal psychological health, are included in the 'persons' category below.

The concept of environmental input brings to mind spontaneously significant *persons*, be they parents, siblings, the extended family, friends, educators, mentors, idols and so on. The significant impact of persons on other persons is probably easier to imagine than that of any other source of influence within the environment. Moreover, the traditional environmentalist beliefs of most professionals in the social sciences, for whom nurture is a much more powerful agent than nature (see Cohen's 1999 critique), increases the importance of humans as significant agents in the lives of their fellow humans. Thus, it is not surprising that a good percentage of the professional literature on talent development, not only in academia, but also in arts, business, or sports, examines the potential influence of significant individuals in the immediate environment of gifted or talented youngsters. This statement applies equally well to the larger literature on human development. Moreover, retrospective interviews of eminent individuals frequently leave the impression that they attribute to significant persons, especially their parents, the lion's share of environmental influences (Cox *et al.*, 1985; Bloom, 1985; Hemery, 1986). In brief, according to a recently proposed label, the explanation of human behavior through environmental causes is the Standard Social Science Model or SSSM (Tooby & Cosmides, 1992).

The *provisions* category includes a wide diversity of individual or group interventions specifically targeted at talent development. In the field of gifted education, professionals have traditionally subdivided provisions into three groups: enrichment (often labeled 'differentiation'), grouping and acceleration. This triarchic distinction suffers from two major logical flaws. First, it unduly opposes enrichment and acceleration, encouraging the stereotypic image that acceleration practices are not enriching. Second, the categories are not mutually exclusive, since many accelerative practices require ability grouping, for instance Advanced Placement courses (College Board, 2001). Massé and Gagné (1983) proposed instead that enrichment be considered the general goal of *all* provisions offered to gifted or talented youngsters, whatever the talent field. Common administrative formats would then be categorized according to at least two major criteria: (a) the presence or absence of ability grouping; and (b) the presence or absence of acceleration. In this way, four major types of formats are distinguished, all of them potentially enriching, on condition of course that their content be of good quality! Finally, the *events* category was created to separate sudden changes in environmental conditions (e.g., moving from a rural to an urban area, the death of a parent, winning a prize or award, suffering a major accident or illness) from more stable environmental influences. Significant events can markedly influence, positively or negatively, the course of talent development.

Chance (C). Tannenbaum (1983) can be credited with the first extensive examination of the role of chance as a contributing factor to talent development. Borrowed from that model, chance was originally introduced in the DMGT as a fifth element

among the environmental catalysts. It soon became clear, however, that chance influences all the environmental catalysts. For example, children have no control over the socioeconomic status of the family in which they are raised, the quality of the parenting they receive nor over the existence of talent development programs in the neighborhood school. Moreover, chance manifests itself in one other major event, namely the transmission of hereditary characteristics. Few human phenomena are more dependent on chance than the specific mix of genes resulting from the random meeting of a particular ovum and one among millions of spermatozoids. Tannenbaum cites Atkinson's belief that all human accomplishments can be ascribed to 'two crucial rolls of the dice over which no individual exerts any personal control. These are the accidents of birth and background' (1978, cited in Tannenbaum, 1983, p. 221). Atkinson's 'accidents of birth' stress the role of chance outside the environmental component, especially through the action of the genetic endowment in the G and IC components. In brief, as shown in Figure 1, there is some direct degree of chance in all the causal components of the model, except the talent development process itself.

The prevalence 'component'

In the DMGT, the labels gifted and talented require 'outstanding'[7] performances in either natural abilities or systematically developed skills. While that adjective clearly targets above average behavior, it does not specify how far above average the threshold should be placed, thus how large the resulting percentage of gifted and talented individuals would then be. This section explains why a prevalence estimate should be included in a complete definition of the giftedness and talent concepts, and why a 10 per cent threshold was chosen for the DMGT.

Background and proposal

Concepts like talent and giftedness require a prevalence estimate for their definitions to be complete because they target atypical subgroups within a general population. Similar concepts such as poverty, obesity, mental deficiency, genius, deafness as well as countless others, also base their definition on normative judgments. By introducing either a percentage estimate (5 per cent of the population) or a threshold (IQ $\geq$ 130), scholars specify the 'extension' they give to a concept—in other words, the boundary separating those belonging to that category from those who do not. In turn, the size of the population further clarifies the meaning of the concept. For instance, if we define the gifted as the top 1 per cent of the population it conveys a totally different message about their exceptionality than if they were defined as the top 20 per cent of the general population. Note that there are twenty times more individuals in the more generous estimate.

It is interesting to point out that Francis Galton was among the first scholars to defend the need for operationalized definitions of normative concepts. In his famous book *Hereditary genius* (1892/1962), he studied the lineage of eminent Englishmen. He described his selection procedure in detail in the second chapter 'Classification of

men according to their reputation' (pp. 49–55). Examining closely biographical handbooks of famous Europeans, as well as obituaries, he concluded that eminence corresponded to a ratio of 1:4000—about 400 individuals at that time—within the population of English males at least 50 years old. He examined a more generous ratio (1:1000), and observed: 'I should feel we had descended to a level where there existed no sure data for guidance, where accident and opportunity had undue influence, and where it was impossible to distinguish general eminence from local reputation or from mere notoriety' (pp. 52–53).

Identifying appropriate thresholds is not an easy task because there are no clear and objective markers on a measurement scale to indicate the passage from one category (e.g., average ability, normal weight) to the next (e.g., gifted, overweight). Any proposed threshold is localized somewhere within a gray zone, with some experts showing more openness—proposing larger percentages—and others maintaining stricter positions. Because there is no 'correct' answer, specialists within a field will have to eventually agree on a 'best' choice, one that will become generalized.[8] Alas, such agreement does not exist in the field of gifted education. In fact, the subject of prevalence is very rarely discussed in major handbooks, and only one of the more popular definitions of the last three or four decades, that of Marland (1972), included a prevalence estimate (see Gagné, 1998b, for a review). The fact that the prevalence question is not discussed does not mean that estimates have not been regularly proposed. In fact, they abound; and the result of that 'creativity' is variability, huge variability, not only within the field but also within the general population (Gagné *et al.*, 1993). Scholars' proposals can easily range from the 1 per cent adopted by Terman (1925) with his threshold of a 135 IQ, or the 3 per cent to 5 per cent in the above mentioned Marland definition, to the 20 per cent advanced by Renzulli (1986) to create the talent pools in his Revolving Door model. What about the ratios used in school districts? In a survey of state policies, Mitchell pointed out that 'states using intelligence and achievement test scores for identification generally use cut-off points which range between the 95th and 98th percentile levels' (1988, p. 240).

After reviewing the literature, I initially adopted a 15 per cent minimum threshold for both constructs (Gagné, 1993). That choice was based on the traditional use of standard deviation units (z scores) to mark the cutoffs between various subgroups. That choice was later revised, giving birth to a five-level system of cutoffs—based on the metric system— with its lowest level fixed at 10 per cent (Gagné, 1998b). Although that minimum leans slightly toward the generous pole of the continuum, it is counterbalanced by the creation of five degrees of giftedness or talent, labeled *mildly, moderately, highly, exceptionally*, and *extremely,* respectively. Each group in this metric-based (MB) system of levels represents the top 10 per cent of the previous group. Table 1 shows these five groups with their corresponding ratio in the general population; z scores, as well as approximate IQ equivalents, complete the table. Note that the 10 per cent estimate applies to each natural ability domain and each talent field. Since there is only partial overlap between domains and fields, it follows that the total percentage of gifted and talented individuals far exceeds ten per cent. Indeed, using a peer nomination form to identify multiple abilities, a recent study

Table 1. Gagné's metric-based (MB) system of levels within the gifted/talented population

Level	Label	Ratio in general population	IQ equivalents	Standard deviation
5	Extremely	1:100,000	165	+ 4.3
4	Exceptionally	1:10,000	155	+ 3.7
3	Highly	1:1,000	145	+ 3.0
2	Moderately	1:100	135	+ 2.3
1	Mildly	1:10	120	+ 1.3

produced an estimate of almost 50 per cent within a large (n = 2500) sample of elementary school children (Gagné, 1998a). It means that almost half the students appeared among the three best in their group (top 11 per cent) at least once as judged by their peers on seventeen different abilities (see Gagné, 1999e). Almost identical results were obtained using teacher nominations on the same instrument.

Comments

A first comment concerns the reference group to be considered when assessing who will be labeled gifted or talented. In other words, giftedness and talent represent the top 10 per cent of what population? As argued elsewhere (Gagné, 1993), different reference groups should be adopted for gifts and talents. In a nutshell, since everyone possesses some degree of every natural ability, it follows that the whole population should serve as the reference base to select the top 10 per cent for any form of giftedness. The only caveat is age. Because natural abilities have strong developmental curves, at least until early adulthood, the comparison must be made with same age individuals. It stands to reason that we cannot compare the cognitive or physical abilities of a 3-year old with those of an 8-year old. In the case of talents, the reference group should be composed of all those: (a) who have attempted to master the specific skills of a talent field, and (b) who have learned and practiced for approximately the same amount of time. The second criterion intends to control for individual differences in amount of learning time, independent of achieved competence. Whatever the occupational field, the percentage of individuals who engage in a program of systematic learning, training and practice remains small. If they attain some level of proficiency, those who have never tried to develop the specific skills of that given field will frequently perceive competent performers as 'talented' because they compare them to the whole population. But, as defined in the DMGT, only those 'who are or have been active in the field' should serve as the reference base to assess the presence of talent.

Let us apply the system to a concrete situation. An unfortunate habit of many keynote speakers consists in illustrating their presentations with examples of gifted or talented behaviors taken from children who show extraordinary precocity either in verbal, mathematical, scientific, moral or social development. As attractive as such

examples may be to impress an audience, they illustrate behaviors that the vast majority of gifted students identified in school districts—the mildly gifted or talented between the 90th and 99th percentiles—will rarely show. According to the DMGT's MB system of levels, the prevalence of *exceptionally* gifted individuals (intellectually), those with IQs of 155 or more, is approximately 1:10,000 within the general population. Since the DMGT defines the total gifted population as the top 10 per cent (IQs ≥ 120) of the same-age general population, the prevalence of exceptionally gifted individuals *within the gifted population* does not exceed 1:1000. It corresponds to one such student in 30 to 40 homogeneous groups of intellectually gifted students. Even full-time teachers of the gifted would, in the course of their whole career, encounter at best just a few of them. In short, exceptional giftedness is a very rare phenomenon. Consequently, when we present extreme examples of behavior to groups of parents or teachers, we risk conveying a distorted image of who the 'garden variety' of gifted and talented individuals really are. And if we present giftedness and talent as very exceptional phenomena, we might tempt school administrators to judge that such a rare population does not require large investments of time and money to cater to their special needs.

Toward a talent development theory

The second part of this text addresses two major questions. First, what types of relationships can be observed between the six components of the DMGT? Second, is it possible to create a hierarchy of the five factors in terms of their relative causal power on talent emergence? In other words, where lies the difference between those who become talented and those who do not? Answers to both questions will include empirical evidence, hypotheses, as well as educated guesses.

A complex pattern of interactions

Five major groups of causal factors have been described above; gifts (G), intrapersonal (I) and environmental (E) catalysts, the talent development process (P), as well as chance (C). Although a detailed examination of the complex relationships between them is not possible in this short overview, I will try to give at least a glimpse of their dynamic interactions.

The basic connection

The most fundamental relationship involves the concepts of gifts and talents. As described earlier, talent development corresponds to the transformation of outstanding natural abilities—or aptitudes—into the skills characteristic of a particular occupational field. In the DMGT, natural abilities are treated as the 'raw materials' or the constituent elements of talents. For instance, the research skills of a chemist are assumed to derive directly from general cognitive abilities related to acquiring and accessing a specific knowledge base, analyzing data, creating relationships—causal or

otherwise—between concepts, extrapolating judgments from observed facts and so forth. Similarly, the skills of a young pianist derive from general sensorimotor abilities, among them two-hand coordination, finger dexterity, motor reaction time, rhythm and auditory discrimination. Because of that basic relationship, the presence of talent necessarily implies the possession of well above average natural abilities; one cannot become talented without first being gifted, or almost so. The reverse is not true, however. It is possible for outstanding natural abilities to remain potentialities, as witnessed by the well-known phenomenon of academic underachievement. In other fields, like arts or sports, those who possess outstanding natural abilities but find little interest in the pursuit of excellence have the possibility to drop out at any time, unless forced by outside agents (e.g., parents) to maintain their involvement. School being a compulsory institution, dropping out can be done, unfortunately, only metaphorically! How strong is the relationship between gifts and talents, especially with respect to the causal influence of the four other components? That crucial question will be examined later.

The learning process as a go-between

The arrows in Figure 1 indicate that intrapersonal and environmental catalysts typically act through the talent development process. For instance, bright and highly motivated students will study more to get better grades. Parents will offer help that will improve the study habits of their children, or will pay for a summer camp in sports which, by offering advanced learning or training opportunities, will help improve their child's performance. That moderator role of the learning process is quite normal; it confirms that talent does not manifest itself overnight. The skills have to be built even when, thanks to very high natural abilities, the first achievements appear almost instantaneous and effortless. Sometimes, environmental influences do not act directly on the learning process, but through an intrapersonal catalyst. For instance, when parents or teachers attempt to increase the motivation of children so that they will study more—and hopefully improve their academic performance—their intervention will impact the process component through the modification of an intrapersonal component. Similarly, when coaches help their athletes develop visualization abilities (Orlick, 1986), they are trying to improve a specific intrapersonal component that will in turn improve the effectiveness of the training process. And a more effective talent development process tends to produce better performances, which in turn lead to an increased talent level. As we will see later, the usual role of the learning process as a go-between does not automatically mean more causal importance.

Bi-directional interactions

Interactions can be very complex. Indeed, it is my conviction that empirical evidence exists to support causal interactions between *any* pairing of the five components, and in both directions in each case. We have already mentioned examples of E $\rightarrow$ I influences; the reverse is also common. For instance, if some

parents observe that their child is expressing a strong interest in astronomy, they might be more willing to invest in a high-quality telescope. Similarly, the strong anxiety reactions of a young musician before a performance might encourage his music teacher to introduce special pre-performance relaxation exercises. The impact—positive or negative—on one's self-concept of being labeled 'gifted' or 'talented' is a typical case of G → I interaction. Conversely, I factors may exert an impact on the development of natural abilities (G). Individuals who feel little motivation to take care of their health will usually avoid physical activities. Compared to those who workout regularly, their physical fitness will no doubt decrease as the years go by. Note that persons who exercise regularly are not necessarily trying to develop a sports talent; they may just want to keep in shape by maintaining or improving their natural physical abilities. As a third example, the E → P causal relationship is easy to visualize; it can be the impact of a new coach's training plan on daily practice activities, of parents moving closer to a music conservatory to allow more regular contact with a master teacher, or the impact of a school's policy changes on the students' amount of homework. Conversely, a poor learning process that manifests itself through a child's unsatisfactory homework may lead the parents and the teacher (E) to offer closer supervision. Finally, interactions can manifest themselves within a given component. The relations between parents and teachers regarding a child's special educational needs, whether they are collaborative or conflictual, represent one of the most common instances of direct interactions within the E component. Similarly, within the I component, self-esteem difficulties may affect the goal setting process.

Talent as a retroactive cause

As the expected (or hoped for) outcome of the learning/training process, talent usually plays the role of dependent variable in most empirical studies devoted to the prediction of outstanding performance. But it can become an independent variable, for instance when it enters into a feedback loop and influences the performers and/or influential persons in their environment. No doubt the early successes of young students, young artists or young athletes serve to heighten their motivation to pursue their training or even increase its intensity. Similarly, parents will become more motivated to maintain or increase their support, coaches will feel more eager to supervise young athletes whose early outstanding performances reveal high talent promise, even sponsors will open their purses wider! As the saying goes: 'Success breeds success'.

In summary, no causal component stands alone. They all interact with one another and with the learning process in very complex ways; and these interaction patterns will differ significantly from one person to the next. As I argued elsewhere after analyzing, with the DMGT framework, the life story of a young exceptionally talented Vietnamese guitarist (Gagné, 2000), individual talent emerges from complex and unique choreographies between the five groups of causal influences.

What makes a difference?

Even though all five causal components are active, it does not mean that they are equally powerful as agents of talent emergence. This is no doubt a truism at the individual level since each talented person follows a unique path toward excellence. But what about averages? Are some factors generally recognized as more powerful predictors of outstanding performance? For all those involved in identifying youth with high potential and planning the development of their talents, this is the ultimate question. That second question must be properly understood. I am not asking 'does the presence (absence) of this component or subcomponent make a difference in terms of talent emergence', but 'do individual differences in the *intensity* of that component or subcomponent within a "normal" range make a difference', or, expressed differently, 'is there a minimum/maximum threshold below/above which that particular component or subcomponent will no longer impact the talent development process?' For instance, when I define giftedness as the possession of natural abilities within the top 10 per cent of the general population, two additional questions spring to mind: a) how strict is that threshold? and b) do individual differences within that top 10 per cent make a difference? These are the kinds of questions which help answer the more general question: 'What makes a difference?'

Literature review

In spite of its theoretical and practical importance, the causal hierarchy question has yet to receive a clear answer, in fact any comprehensive answer. In the field of education alone, thousands of empirical studies have compared high and low achievers hoping to unravel the network of causal factors leading to academic success. Dozens of variables, covering every component and subcomponent of the DMGT, have been measured. Unfortunately, individual studies include too few independent variables to bring even a semblance of an answer to this question. Maybe a meta-analytic look at a large sample of empirical studies would point in the right direction. Walberg and his colleagues did just that, synthesizing almost 3000 published studies on the causes of academic achievement (Walberg, 1984). They identified nine groups of significant factors, which they organized under three major headings: (a) *Aptitude* (1. ability; 2. development; 3. motivation); (b) *Instruction* (4. amount; 5. quality); and (c) *Environment* (6. home; 7. classroom; 8. peers; 9. television). In terms of effect sizes, ability (IQ) came well in front of all other factors with an average correlation of .70 with academic achievement. By contrast, the *best* predictors within the Instruction category had average effect sizes around 1.0 SD, equivalent to a correlation of about .45 (Cohen, 1969); and the *best* predictors in the Environment category had average effect sizes around .70 SD, equivalent to a correlation of .33. Walberg did not mention that obvious explanatory hierarchy among factors. He stated instead: 'The first five essential factors appear to substitute, compensate, or trade-off for one another at diminishing rates of return. … Thus, no single essential factor overwhelms the others; all appear important' (p. 22).

Simonton (1994) also adopted a macroscopic perspective when he examined the lives of great historical figures and tried to tease out the characteristics that might explain why and how they attained the pinnacles in their respective fields, including science, arts, and politics. He surveyed a large variety of psychological constructs 'that participate in the making of geniuses of all species. Genetic endowment, reinforcement schedules, motivation, birth order, childhood trauma, marginality, age, intelligence, risk taking, self-actualization, depression, social learning, authoritarianism, and emulation—I could cite many more instances' (p. 412). Unfortunately, nowhere does one find an attempt to rank them according to their relative causal power. When presenting the various factors, Simonton gives each some degree of prominence, leaving the clear impression that most have equal importance in the emergence of greatness (Gagné, 1999d). In sports, Hemery (1986) completed in-depth interviews with 63 top-level athletes in various sports. Again, although a wide diversity of potential causal influences were discussed in the interviews, the author proposed no causal hierarchy.

C.GIPE and the primacy of chance

My present view could be summarized with the acronym *C.GIPE*. Using one letter per component picked clockwise from the bottom left of Figure 1, it shows the decreasing order of causal impact: from chance at the top of the hierarchy to environmental catalysts at the bottom. Why is chance given such a predominant role? The answer lies in Atkinson's two rolls of the dice: the genetic roll and the parental roll. Note that the genetic endowment affects not only the G component, but also the I component, as shown by the arrows in Figure 1. Two additional facts, both related to the genetic endowment, increase the significance of the chance factor. First, the significance of the genotype as a determinant of human individual differences has kept growing over the last two decades; second, chance directly impacts the next two factors in my proposed hierarchy.

The dot that immediately follows the C announces a special temporary status for the chance factor, because I am currently reconsidering its inclusion as a separate causal component. Logically, chance does not 'cause' anything; it should instead be considered a qualifier of all causal factors, just like their positive or negative valence and the intensity of their impact. In this way, chance would represent the degree of control a person has over a given determinant of talent emergence. This new perspective follows the measurement approach developed in attribution theory (Weiner, 1984; Biddle, 1993). Researchers who study attributions of success and failure classify these factors (e.g., natural ability, effort, exam difficulty, teacher severity) within a three-dimensional system: a) origin (internal/external) of the factor, b) stability (high/low), and c) degree of control (high/low). Modifying the status of chance would imply redesigning the visual representation of the DMGT. The advantage of the present illustration (see Figure 1) is in highlighting the important and diversified presence of chance in talent development, a role that some scholars believe chance plays in the whole of human development (Lewis, 1997).

The major role of gifts

My arguments for giving gifts a second rank rest essentially on data from two giftedness domains: cognitive and physical abilities. In the first case, research has shown that IQ measures are, by far, the best predictor of academic achievement (Jensen, 1980, 1998; Walberg, 1984). In grade school, most correlations between IQ scores and standardized achievement tests range between .60 and .70, a level so high that it almost reaches the minimum threshold of .75 commonly accepted for reliability indices. Even in high school settings, the correlations usually remain around .50, while they decrease to the .30s and .40s when college achievement is assessed. Moreover, there is ample evidence for a primary role of IQ measures as predictors of work performance (Gottfredson, 1997; Schmidt & Hunter, 1998, 2004). In the case of physical abilities, there is also growing evidence that 'natural talent' (giftedness) is a major differentiator between those who can attain excellence in sports and those who cannot. Régnier, Salmela and Russell point out: 'It has been suggested by many scholars that performance predictions can be made only by relying on "stable" variables related to sport success, that is, variables strongly determined genetically' (1993, p. 301). For instance, the Australian Institute of Sport (AIS) supervises the administration of tests of physical fitness to middle school students in most states. They use a two-step system. First, a general fitness test with eight components is offered to a number of students in 8th and 9th grades. Only those who outperform 97 per cent of their peers on any one of these eight components are invited to pass a second battery of nine more advanced physiological measures and performance tests. Again, only those who achieve among the top 10 per cent on subgroups of these tests—depending on the competitive sport chosen—will be invited to an advanced training program supervised and financed by the AIS and the State Institutes and Academies of Sport. Such a selection procedure leaves aside over 99.5 per cent of all adolescents, an eloquent testimony of the AIS's belief that very high natural abilities are required for athletes to develop their talent to national standards.

The importance of intrapersonal catalysts

The placement of intrapersonal catalysts in third rank brings up two questions: (a) why they follow gifts, and (b) why they precede learning and practice. With regard to cognitive gifts, the research literature suggests that the best 'contenders' to prominence among I factors would be motivation-related constructs. As Hemery (1986) said in the last sentence of his book: 'They [sports highest achievers] tell us all something about ourselves and what we may be capable of achieving, if we dream and make the commitment to work hard towards that vision' (p. 204). But what does research say about these contenders? Virtually every comparative study of the relative explanatory power of motivational constructs over IQ measures has shown a clear superiority of the latter. After reviewing the literature, Gagné and St Père concluded the following:

> Motivation's independent contribution to the prediction of scholastic or occupational achievement appears limited. It is frequently non-existent … or much less powerful than the independent contribution of cognitive abilities. … The 4:1 and 6:1 ratios respectively extracted from Walberg's (1984) and Schmidt and Hunter's (1998) syntheses, probably upper-limit estimates, are more or less equidistant from the two extremes. (2002, p. 10)

In other words, when compared directly to *any* measure of motivation or volition, IQ scores 'explain' on average *five times* more achievement variance. As for other constructs included in the I component, there is little literature on their unique contribution to talent development. The term 'unique' means the percentage of variance they account for *after* the impact of natural abilities has been controlled. My guess is that we would find an even higher ratio in favor of IQ measures than the ones reported by Gagné and St Père.

A modest process component

The next question concerns the priority of intrapersonal catalysts over the P component. A group of scholars, led by K. A. Ericsson (e.g., 1996), would strongly oppose such a low ranking. Over the last decade, they have been arguing for a strong causal relationship between level of talent and amount—and quality—of practice, almost to the exclusion of other causal sources, especially natural abilities (Ericsson & Charness, 1994; Howe *et al.*, 1998). Their extreme position has triggered numerous objections in the scholarly world (Schneider, 2000). What they repeatedly overlook in their studies is the large individual differences *within* the groups they compare (e.g., amateurs *versus* professionals; or orchestra members *versus* music teachers). Let us look at one example related to academic achievement. Time spent in school is a relevant measure of the learning and practice component. Standardized achievement test scores show that the range of performances among large cohorts of same-grade students actually covers many grade levels. For instance, data from the norm manuals of the Iowa Tests of Basic Skills (Hoover *et al.*, 1993) reveal that the range of achievement scores of grade 5 students extends from a first grade average to beyond a ninth grade average (Gagné, in press, b) In other words, Ericsson's 'road to excellence' implies much more than just 'practice makes perfect'.

Three additional arguments support the placement of the P component below that of I factors. First, the I group comprises a large number of variables that have been linked to achievement, whereas the P process offers just a few measures, both quantitative and qualitative. I have yet to find a single study that assesses the predictive validity of a large group of variables belonging to the I and P components. However, I strongly believe that the combined contribution of almost any group of I factors will outpredict any combination of P measures. Second, to use a common metaphor, the P 'motor' needs fuel to run, and that fuel comes directly from the intrapersonal and environmental catalysts. It is either passion, competitiveness, parental support, coach admonitions or any other I or E element that helps maintain a steady regimen of learning and practice, especially when the learner encounters obstacles. Third, the preceding argument implies that I or E variables causally *precede* P variables.

Consequently, we would enter the I variables before the P ones in a predictive equation, attributing to the former any covariation. This would automatically increase the predictive power of the I variables.

Scaled-down environmental influences

Relegating the environmental catalysts to the bottom of the causal hierarchy contradicts common sense, as well as much of the social sciences literature. As stated earlier, environmentalism is the leading ideology in the behavioral sciences (Tooby & Cosmides, 1992; Pinker, 1997; Harris, 1998; Cohen, 1999). Yet, over the last two decades, researchers in behavioral genetics have strongly questioned the causal importance of environmental inputs, thus triggering a heated debate (see Collins *et al.*, 2000). Three major arguments are advanced. The first one, commonly labeled 'the nature of nurture', states that most environmental measures are partly influenced by the genotype, which artificially inflates their contribution. For example, Scarr and Carter-Saltzman (1982) demonstrated that the teaching abilities of mothers were strongly (.62) correlated with their intelligence level. Rowe (1994) gives many additional examples of the genotype's influence on 'social' measures. The second argument is based on the recurrent observation in twin and adoption studies that *shared* family influences—the family environment that affects all siblings similarly—account for a very small percentage of individual differences in cognitive abilities and personality. In other words, the parents' rearing behaviors have little to do with what makes their children similar and, at the same time, different from those of other families. In line with other specialists in behavioral genetics (e.g., Scarr, 1992), Rowe gives the following interpretation.

> Some three-quarters of American families fall into this range of social class categories, where rearing effects have been proven weak, despite massive differences in levels of funding for their public schools and massive differences in home intellectual environments. Of course, I do not intend to imply that intelligence develops without exposure to schools, books, television shows, magazines, and good conversations. I mean simply that these exposures can be found in three-quarters of American society in significant abundance to support full intellectual growth (1994, pp. 124–125).

A third argument invokes the phenomenological perspective, according to which environmental influences are continuously filtered through the eyes of the persons who are targeted by them. That perceptual filtering gives more importance to intrapersonal catalysts, strengthening the argument in favor of their placement immediately after the G component. Perceptual differences might explain why environmental inputs contribute much more to *differences* between siblings—called *non-shared* environmental influences—than to similarities between them (Plomin & McClearn, 1993). Finally, the growing interest in the study of resilience (O'Connell Higgins, 1994), the ability of some individuals to achieve high personal maturity in spite of having suffered exceptionally negative environmental influences, suggests that detrimental environmental obstacles can be surmounted (see Bartholomew, 1997, and Gagné, 2000, for a particularly vivid illustration). In summary, the

environmental catalysts have been placed in last position not because such influences are not important, but mostly because E differences found in 'normal' environments (at least 75 per cent of North-American families as argued by Rowe, 1994) will not explain in any significant way the difference between outstanding achievements and more average ones. May I add that 'causal modesty' in that area is an important quality, since it might help reduce the very harmful habit of placing undeserved guilt on various social agents (e.g., parents, teachers, coaches) when anticipated results do not materialize.

Comparing the DMGT with other conceptions

Space does not allow a detailed comparison of the DMGT with other leading conceptions. To do that process justice would require examining each of them individually. As a shortcut approach, I have summarized below four characteristics of the DMGT that appear to me very specific and, in conjunction, make the DMGT a very distinct and unique conception of giftedness and talent.

First, the DMGT stands alone in its clearly differentiated definitions of the field's two key concepts. The separation of potentialities/aptitudes from realizations/achievements is well operationalized through a distinction between natural abilities and systematically developed skills, both concepts associated with the labels 'giftedness' and 'talent' respectively. This distinction leads to another clear definition, that of talent development, which becomes the transformation of natural abilities into the systematically developed skills typical of an occupational field. Only in the DMGT does the concept of talent become as important as that of giftedness to understand the development of outstanding skills and knowledge. Finally, this differentiation between potentialities and realizations permits a much clearer definition of underachievement among gifted individuals. It becomes simply the *non*-transformation of high natural abilities into systematically developed skills in any occupational field. This definition applies to any pairing of one—or more—giftedness domain with any given field of talent.

Second, the introduction within the giftedness and talent definitions of prevalence estimates (top 10 per cent) also constitutes a unique facet of the DMGT among existing conceptions of giftedness. Because it confronts the prevalence issue and proposes a metric-based system of five levels that applies to any giftedness domain or talent field, the DMGT helps maintain a constant awareness of levels of giftedness and talent. The availability of clear thresholds and labels could facilitate not only the selection and description of study samples, but also the comparison of results from different studies. Moreover, the MB system of levels should remind educators in the field that the vast majority of gifted or talented individuals (90 per cent) belong to the lowest (mild) category, and that only a tiny fraction of those identified as gifted or talented in their youth will ever achieve eminence in their chosen field.

Third, the DMGT's complex structure clearly identifies every significant etiological factor of talent emergence, especially those located within the intrapersonal and

environmental catalysts. But, that comprehensive outlook maintains the individuality of each component, clearly specifying their precise nature and role within this talent development theory. The giftedness construct remains well circumscribed, thus more easily operationalized. The catalysts are clearly situated outside the giftedness and talent concepts themselves. This sets the DMGT apart from many rival conceptions[9] where disparate elements are lumped into the giftedness definition itself.

Finally, most published conceptions focus almost exclusively on intellectual giftedness (IG) and academic talent (AT), as well as academically based professions (e.g., scientists, lawyers, doctors and so forth). That tendency led me to label 'IGAT' the target population of most enrichment programs (Gagné, 1995). The DMGT follows an orientation adopted explicitly by only a few past scholars (e.g., De Haan & Havighurst, 1961; Marland, 1972; Gardner, 1983), namely to broaden the concept of giftedness and acknowledge its various manifestations. In that respect, the DMGT stands almost alone in bringing physical giftedness within the fold of the giftedness construct, defining that domain much more broadly than Gardner's bodily-kinesthetic intelligence. This openness should foster closer ties between professionals focusing on academic talent development and those who devote their energies to athletic talent development.

Conclusion

So much more would need to be said to faithfully convey the complexity of the DMGT as it now exists in the thoughts and (unpublished!) notes of its author. Now that the contents and internal structure of the components are well stabilized, future efforts will focus on the developmental theory itself. Two major directions will be pursued. The first will consist in searching the scientific literature for additional empirical evidence in support of the present developmental hypotheses, and for additional hypotheses and corollaries. The second research path will consist in examining possible modifications to the C.GIPE causal hierarchy with regard to (a) stages of talent development, (b) fields of talent, (c) levels of excellence, (d) gender differences, (e) cultural differences, and so forth. The past decades of slow progress to clearly identify 'what makes a difference' should be a humbling reminder that there is still a long distance to cover to get close to that lofty goal. Still, what an exciting challenge it offers to all scholars who dream of unearthing the roots of excellence!

Notes

1 The present article is an adaptation of two recent presentations of the DMGT (see Gagné, 2003, in press, a).

2 I did examine closely Snow's very unorthodox definition of aptitude (Snow & Lohman, 1984; Snow, 1992). It is much too complex to present here. Suffice it to say that I found too many points of disagreement to endorse that view and integrate it in the structure of the DMGT.

3 The gifted label appears specific to the field of education; rarely does one sees the term employed by educators in arts, or by professionals in sports; there, the common expressions for giftedness are 'talent' or 'natural talent'. If the DMGT were more generally endorsed outside of general

education, we might see a more frequent use of the expression physical or psychomotor giftedness. Then, talent would more specifically apply to outstanding performance.

4 When I conceived the DMGT at the turn of the 1980s, I decided to adopt the term 'domain' for categories of natural abilities (gifts) and the term 'field' for talent areas; I hoped in that way to reduce confusion when discussing these two category systems. Csikszentmihalyi (see Csikszentmihalyi & Robinson, 1986) independently proposed a very distinct differentiation, which he described as follows:

> If by 'domain' we mean a culturally structured pattern of opportunities for action, requiring a distinctive set of sensori-motor and cognitive skills—in short, a symbolic system such as music, math ematics, or athletics—we may designate by 'field' the social organization of a domain. A field includes all the statuses pertinent to the domain; it specifies the habitual patterns of behavior—or roles—expected from persons who occupy the various statuses. (pp. 278–279)

That differentiation differs totally from my own. Note the perfect overlap between domains and fields; in terms of numbers and potential subcategories, both concepts would be identical, since the concept of field is just the analysis of a domain from a sociological, legal, and administrative perspective. My own definition of field does not distinguish these two perspectives. Because I analyze the phenomenon of talent development from a less macrocospic or societal outlook, and more from a psycho-educational point of view, such a distinction is, to me, of limited usefulness.

5 The International Labour Organization (ILO) created decades ago an International Standard Classification of Occupations (ISCO) designed to classify as logically as possible all past, present, and future occupations worldwide. The ISCO was last revised in 1988 by the Fourteenth Conference of Labour Statisticians, and renamed ISCO-88 (see http://www.ilo.org/public/english/bureau/stat/class/isco.htm; accessed 18 November 2004). It includes almost ten thousand distinct occupations grouped into a hierarchical system of ten major, 27 submajor, over a hundred minor and hundreds of unit categories. The ten major categories are: 1) legislators, senior officials, and managers; 2) professionals; 3) technicians and associate professionals; 4) clerks; 5) service and sales workers; 6) agricultural and fisheries workers; 7) crafts and related trades workers; 8) plant and machine operators; 9) elementary occupations; and 10) the army. Most of these occupations—except maybe those in the ninth category—offer sufficient range in the level of skills to be mastered to make possible the differentiated identification of competent *versus* talented individuals.

6 Moon recently proposed a structure closely related to my self-management sub-component. She defines it as follows: 'The development of personal talent involves the acquisition of a number of specific skills from the personal domain, skills such as personal decision-making and self-regulation. The development of these skills, in turn, is facilitated by strong executive abilities' (2003, p. 8). That quote shows that the two major types of skills defining her personal talent strongly overlap the motivation (decision-making) and volition (goal attainment) dimensions of my self-management sub-component.

7 The adjective 'outstanding' was carefully chosen to approximate the level of marginality I had in mind for the basic level of giftedness and talent. The term 'superior' appeared too generous, whereas the term 'exceptional' conveys the image of a more restrictive subgroup. Of course, I totally avoid 'extraordinary', except to describe very high levels of natural ability or achievement; I would place that level just below 'prodigious'. Unfortunately, many professionals in the field do not exhibit the same carefulness in their qualifications of gifted or talented behavior.

8 Such agreement recently happened in the field of nutrition with the generalization of the Body Mass Index [weight in kilos/(height in meters)^2]. Professionals in that field agreed on the

following operationalizations: underweight (< 20), normal (20–25), overweight (26–29), and obese (30+). These shared thresholds make possible geographical comparisons, as well as age-group comparisons.

9 Feldhusen defines giftedness as follows: 'Our composite conception of giftedness then includes (a) general intellectual ability, (b) positive self-concept, (c) achievement motivation, and (d) talent' (1986, p. 112). Renzulli presents the following definition:

> Gifted behavior consists of behaviors that reflect an interaction among three clusters of human traits—these clusters being above average general and/or specific abilities, high levels of task commitment, and high levels of creativity. Gifted and talented children are those possessing or capable of developing this composite set of traits and applying them to any potentially valuable area of human performance' (1986, p. 73).

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