Beliefs of Music Educators and Students Concerning the Major Determinants of Musical Talent

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Zusammenfassung

Die vorliegende Studie erforschte die naiven Theorien von Musiklehrern und -studenten bezüglich der Hauptdeterminanten für die Entstehung von Talent. Die Teilnehmer (N = 650+) füllten einen Fragebogen mit geschlossenen Fragen aus zur Einschätzung der als wichtigste oder unwichtigste wahrgenommenen Gründe für Talentunterschiede zwischen hoch befähigten und bloß durchschnittlichen jungen Musikern. Zwei verschiedene Situationen wurden vorgeschlagen: Anfänger und fortgeschrittene Studenten. Drei Ergebnisse stechen hervor: (a) Die wahrgenommene Hierarchie der Kausalfaktoren zeigt sehr große individuelle Unterschiede, welche (b) dennoch Raum lassen für klare generelle Trends, die die Mehrheit teilt; (c) diese Trends sind anscheinend zumeist unabhängig vom Talentniveau oder den Charakteristiken der Antwortenden. Musikalische Fähigkeiten stehen an erster Stelle, gefolgt von Ausdauer, Üben, Interesse und Persönlichkeitseigenschaften. Umwelteinflüsse (z.B. häusliches Musikmilieu, elterliche Unterstützung und Beaufsichtigung, Musiklehrer) und Zufallsfaktoren erhielten hintere Positionen. Die einzigen signifikanten Gruppenunterschiede, die beobachtet werden konnten, setzten die Lehrer etwas gegenüber den Studenten ab und unterschieden ein klein bisschen zwischen den zwei Situationen.

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Abstract

This study explored the lay theories of music educators and students concerning the major determinants of talent emergence. The participants (N = 650+) completed a forced-choice questionnaire assessing the perceived most and least important causes of the difference in talent between high achieving and just average young musicians. Two distinct situations were proposed: beginners and advanced students. Three results stand out: (a) very large individual differences in terms of the perceived hierarchy of causal factors, which (b) still leave room for clear general trends shared by a majority; (c) these trends appear mostly independent of the talent level or the respondents' characteristics. Musical aptitudes were ranked first, followed by perseverance, practice, interest, and personality traits. Environmental influences (e.g., home musical environment, parental support and supervision, music teacher) and chance factors received low rankings. The only significant group differences observed slightly opposed educators and students, and slightly discriminated between the two situations.

1. Introduction

Why do some music students become talented musicians, while most others either attain a much lower level of competence or sometimes even abandon their systematic learning of a musical instrument? Which among the numerous causal factors introduced to explain individual differences in musical performance play a more significant role? Scientific pursuits devoted to a better understanding of musical talent development reach back at least to the beginning of this century with Seashore's (1919) efforts to identify and measure musical aptitudes. Since then, the quest has continued and all the potentially significant causal factors of musical excellence have been investigated through a large diversity of methodological and instrumental approaches. Some scholars assessed the predictive power of multiple variables (e.g., Doxey & Wright 1990; Dregalla 1983; Harrison, Asmus & Serpe 1994; Rainbow 1965; Zdzinski 1991); others focused on specific ones, either the family (e.g., Brand 1985; Davidson, Howe, Moore & Sloboda 1996), the music teachers (e.g., Sosniak 1985), or the amount of deliberate practice (e.g., Ericsson, Krampe & Tesch-Römer 1993). Aiming to bring some structure to the large inventory of variables introduced as causal factors of talent development in past research, and to propose a clear distinction between the two key concepts – giftedness and talent – associated with that field of study, Gagné (1985, 1999a, 2003) proposed a talent development model, labeled Differentiated Model of Giftedness and Talent (DMGT), in which outstanding natural abilities (gifts) are progressively transformed into the systematically developed high level skills (talents) typical of a particular field of human activity. First created in the context of academic talent development, the DMGT

has been recently applied to the analysis of musical talent development (Gagné 1999b, 2000).

1.1 Overview of Gagné's DMGT

When applied to music, Gagné's definitions of giftedness and talent could be adapted as follows. *Musical talent* is the demonstration of systematically developed abilities in playing a musical instrument at a level which places the individual among the top 10 % (Gagné 1998) of peers having had similar training. The term *musical giftedness* designates the possession and use of natural abilities (or aptitudes) in domains (e.g., cognitive, auditory, motor) that influence the development of musical talent, again to such a degree that the level of performance places the person among the top 10 % of same age peers. The DMGT attempts to bring together in an interrelated way all the major determinants of the emergence of talents in any field of human activity. The model is composed of six distinct elements: aptitudes, talents, a learning and practicing (LP) process, interpersonal catalysts, environmental catalysts, and chance (see figure 1).

Natural abilities, which have a clear genetic substratum, can be observed more easily and directly in young children because environmental influences and systematic learning have exerted their moderating influence in

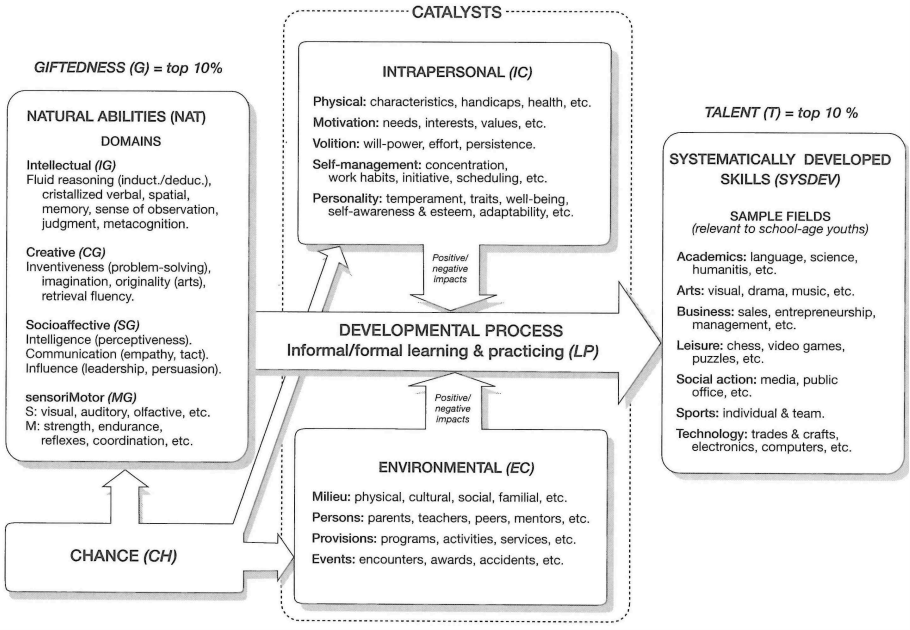

Fig. 1:
Gagné's Differentiated Model of Giftedness and Talent (DMGT, US, 2K).

a limited way only. However, they still show themselves in older children and even in adults through the ease and speed with which individuals acquire new skills in any given field of human activity. The easier or faster the learning process, the greater the natural abilities. It is these natural abilities that many lay persons call "talent" or more appropriately "natural talent"; in this model however they are labeled "gifts" or "high aptitudes". As defined in the DMGT, talents progressively emerge from the transformation of these high aptitudes into the well-trained and systematically developed skills characteristic of a particular field of human activity or performance. Thus, natural abilities or aptitudes act as the raw materials or constituent elements of talents. It follows from this relationship that talent necessarily implies the presence of well above average natural abilities; one cannot become talented without being gifted. However, the converse is not true: it is possible for well above average natural abilities to remain simply as gifts, and not be translated into talents, as witnessed by the phenomenon of academic underachievement among intellectually gifted children.

The process of talent development manifests itself when the child or adolescent engages in systematic *learning and practicing* (LP); the higher the level of talent sought, the more intensive these three activities will be. This LP process can be facilitated or hindered by the action of two types of catalysts: *intrapersonal* and *environmental*. Among the intrapersonal catalysts, motivation and volition (Corno 1993) play a crucial role in initiating the process of talent development, guiding it, and sustaining it through obstacles, boredom and occasional failure. Genetic predispositions to behave in certain ways (temperament), as well as acquired styles of behavior (personality characteristics and attitudes), also contribute significantly to support and stimulate, or slow down and even block talent development. The environment manifests its significant impact in many different ways, either physical or social (e.g., the geographic environment, significant persons like parents, peers or mentors, special programs). Chance is introduced in the model as a fifth causal factor; it affects the four other factors in many different ways (e.g., the randomness of the genetic endowment for abilities or temperament, the chance of having good, educated, financially comfortable parents, and so forth). In a nutshell, talent emerges progressively thanks to a complex choreography between numerous causal influences.

1.2 Is there a hierarchy of causal impact?

As shown in the brief literature review, there is ample evidence to support the causal role of each of the five groups of factors included in the DMGT. What is missing is an assessment of their *relative* causal power. In other words, are some factors more potent in explaining individual differences in musical achievement? We are interested here in *average* levels of impact; it

is clear that no single hierarchy could properly describe the developmental history of every talented musician. Unfortunately, such an assessment does not seem to exist, the major reason being probably that virtually every empirical study covers a very small number of independent variables, which limits comparisons between them. Moreover, one rarely encounters effect size measures, a very good way to assess relative causal efficacy. Finally, frequent sweeping generalizations about the significance of study results give the – false – impression that the author's chosen construct has an impact on achievement well beyond its statistical power.

Even scholars who have examined from a broad perspective the talent development process (e.g., Bloom 1985; Simonton 1994) have either demonstrated a bias toward a specific group of variables and/or omitted to address the hierarchy question. For instance, Simonton (1994, p. 412) identified "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". Unfortunately, there is no attempt to rank them in terms of their relative explanatory power. The only group of academics who came close to answering that question focused on academic achievement. Walberg and his colleagues (see Walberg 1984) surveyed and synthesized close to 3000 empirical studies on the causal influences of student learning, and identified nine significant factors. They grouped them under three 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 size, 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 stress that evident explanatory hierarchy among factors.

In summary, no theory has yet emerged to identify and rank the major determinants of talent. What the literature shows is a multitude of mini-theories that entertain few connections with each other. In fact, they tend much more to compete for the attention of other scholars. And consensus is hard to reach among scholars because of deeply held – and conflicting – beliefs about what factors are most significant. Indeed, as Albee (1982) pointed out, researchers' beliefs guide not only their choice of subjects and independent variables, but also how they analyze and interpret their data.

1.3 From Formal to Lay Theories

To the extent that personal beliefs play a major role in the construction of formal theories of musical talent development, it becomes justified to look at another group of beliefs, namely the collective wisdom of music educators and, to a lesser degree, music students. How can these individuals shed light on the hierarchy question? Music educators are in a privileged position because they can observe directly, on a daily basis, the complex interplay between the various causal factors mentioned above. They see their students struggling to develop their musical competence, some of them progressing much faster than most and achieving, sometimes with little apparent effort, talent level performances. Music educators no doubt develop from their firsthand experiences a set of beliefs that help them explain why some of these students progressively become talented, first locally, then regionally, and even nationally. They can observe their students' motivation level, at least during lessons; they have some information on the degree of support and/or control at home; they can infer from rate of progress individual differences in potentialities, and so forth. Music students also possess unique information about themselves, especially in the domain of intrapersonal characteristics (motivations, needs, temperament, etc.). Just like music educators, they can observe their peers, and through these observations develop their own personal theory of musical talent development.

Outside of music, the study of people's lay theories has grown steadily over the last two decades. Most studies are identified with the field of attribution theory (Weiner 1984). Causal attributions, the reasons given by individuals to explain their successes or failures, have been studied most extensively in the school environment (Good & Brophy 1990), but also in music (Austin & Vispoel 1998). The present study differs from typical attribution studies in many ways: (a) it looks at general explanations instead of personal attributions; (b) it targets talent emergence (outstanding success) instead of ordinary success and/or failure; (c) it covers broad success over time instead of focusing on more specific or localized events, thus examining *dispositional* rather than *situational* personal or environmental characteristics (Austin & Vispoel 1998); (d) it adds to the traditional four causal attributions (natural ability, effort, task difficulty, luck) other potential sources of influence (e.g., family, music teacher, interest, etc.). We found only one study that addressed a similar question (Shaugnessy, Siegel, Stockard, & Stanley 1992); the methodology and sampling left much to be desired. They used a 6-point Likert-type scale to ask 9 teachers, 59 talented students and 29 parents to rate 25 different influences (e.g., early stimulation, mother's and father's influence, hobbies, effort, God, read to at early age, good nutrition, genetics) in terms of their contribution to their (or their child's) giftedness. Because of the scaling approach many sources received high means. No statistical analyses were performed, but apparently large differences were observed between students and adults.

Our study is part of a larger research program designed to assess and compare the lay theories about talent development, including the nature-nurture beliefs, of both educators and students in various fields: general education, arts (music, visual), and sports (see Gagné, Blanchard & Bégin 2001).

2. Method

2.1 Subjects

The study targeted three distinct populations of musicians: teachers, professors, and students. Music *teachers* work with children and adolescents, most of them beginners or intermediate-level students involved in the learning of a musical instrument. The most common instrument taught is by far the piano, followed by the violin, then the recorder. Music *professors* are faculty members in post-secondary music programs; their expertise covers all musical instruments, as well as voice, theory, history, music therapy, and so forth. Most of them also have a parallel career as professional musicians. Because of the complexity of the survey questionnaire, only post-secondary music students were chosen. The total sample of 672 subjects includes 229 teachers, 145 professors, and 298 students. The music teachers, all of them French speaking, are mostly women (84 %) between 30 and 55 years old (80 %); a majority (59 %) holds a B. A. degree in music. Their teaching experience varies considerably around a mean of 17.4 years (SD = 10.3). Among the music professors, 70 % are French speaking; they are distributed almost equally between men and women (54 % vs. 46 %) and their average age is 47 years (SD = 11.7). A slight majority (55 %) hold an M. A. degree, and another 30 % a Ph. D. degree. Their mean teaching experience is 22 years (SD = 11.4). All students, whose average age is 21 years (SD = 5.2), are full-time undergraduates in music programs; their language distribution parallels that of the professors (68 % French). In terms of their sociodemographic characteristics, the two cultural groups are very similar in terms of age (French = 21.3 average vs. English = 20.5), gender (57 % women vs. 53 %), and level of study (66 % college students vs. 57 %).

2.2 Instrument

The MUSAPT questionnaire is a self-administered survey of beliefs about talent development, subdivided into three parts. Part C, from which come the data in this study, uses a forced-choice format to obtain the respondents' personal hierarchy of causal factors. In the first of two tasks, they are asked to compare the 2–3 best and the 2–3 poorest young students of a music teacher. They are given eight possible explanations to choose from:

musical aptitudes (giftedness), intrapersonal (interest, perseverance, personality) and interpersonal (family education, parental supervision) catalysts, chance, and the process itself (studying). They must choose and rank two factors that best differentiate the two groups, and two that least contribute to that difference in performance. In the second comparison situation, the two groups are talented high school students; now they must explain what differentiates *very good* students (who can easily complete a music diploma) from *exceptional* ones (who can hope to win a national competition). The reasoning behind these two situations is that different causal factors might be perceived as being involved in producing low-level excellence, that is among beginners, as compared to high-level excellence. Note that a ninth causal factor (better teachers) is added in the second situation. Three different forms were prepared, one for each target population. First written in French, the three forms were translated to English using the back-to-back approach advocated by Vallerand (1989). Technically, an English translation is made, which is used by another translator to make a French translation. The two French copies are then compared for any significant differences in meaning. Only minor adjustments had to be made.

2.3 Procedure

As a general rule, educators were solicited through the mail. Envelopes containing an invitation letter, the appropriate form of the questionnaire, and a return envelope, were placed in their pigeonhole mailbox at work or mailed home with a cover letter from their professional organization. After 10–15 days, a reminder letter was sent. Approximately 1350 questionnaires were distributed in that way, with a 28 % (n = 376) return rate. In the case of most student samples, class time was solicited from teachers and professors, so that captive groups could be invited to complete the questionnaire.

3. Results

After examining various scoring schemes and noting quasi-perfect (> .95) correlations between them, we adopted the following simple algorithm. Factors chosen as most and second most important causes received scores of 1 and 2 respectively. Factors chosen as least and next-to-least plausible factors received scores of 9 and 8 respectively. Finally, the four (or five) unmentioned factors received a midrange score of 5. An average rank was computed for each of the 8/9 factors; a very low value indicates that the factor was given a higher rank, thus perceived more important as a cause of the differences between the talented and average (or non-achieving) music students. Preliminary analyses revealed few differences between

French-speaking teachers and professors, but much larger ones between the French-speaking ($n = 103$) and English-speaking ($n = 43$) professors. Consequently, a 2×2 analysis design was adopted, focusing on role (educator vs. student) and culture (French vs. English) differences.

3.1 General trends

Table 1 presents the average rankings of the 8/9 factors for the total sample, as well as the four groups; in each situation, the factors are ordered according to their decreasing importance as judged by the total sample. The leftmost column of data shows for each causal factor the percentage of respondents in the total sample who chose it in the first two (+) or last

Table 1:
Mean Rankings for the 8 or 9 Causal Factors of the Two Tasks of Part C, broken down by Role and Culture.

	%+/%–	Total Mean (*SD*)	Educators		Students	
			F	E	F	E
Beginner level						
Aptitudes	50/8	3.44 (2.29)	3.30	2.75	3.79	3.47
Practice	41/7	3.90 (2.04)	4.23	4.82	3.43	3.34
Perseverance	34/6	4.03 (2.00)	4.16	3.95	3.89	3.89
Interest	31/14	4.33 (2.37)	4.54	4.66	3.81	4.61
Personality	29/18	4.64 (2.31)	4.64	4.00	4.58	5.09
Parents (supervis.)	9/29	5.72 (1.96)	5.42	5.57	6.17	5.82
Family (mus. life)	4/37	6.07 (1.81)	6.17	5.95	6.01	5.89
Chance	1/74	7.75 (1.75)	7.32	7.98	8.33	7.87
Advanced level						
Aptitudes	48/8	3.50 (2.38)	3.72	2.65	3.52	3.11
Perseverance	37/6	3.91 (2.08)	4.20	3.26	3.55	4.00
Personality	35/11	4.19 (2.19)	4.03	3.91	4.12	5.03
Practice	33/10	4.21 (2.11)	4.76	4.63	3.64	3.37
Teacher	21/14	4.79 (1.94)	4.74	4.72	4.93	4.67
Interest	14/17	5.07 (2.01)	5.16	5.56	4.76	5.24
Parents (supervis.)	3/30	5.89 (1.72)	5.59	6.00	6.16	6.29
Family (mus. life)	3/33	5.98 (1.71)	5.84	6.33	6.19	5.87
Chance	1/64	7.38 (1.91)	6.88	7.77	8.07	7.41

Note. Means in the main body of the table refer to a 9-point ranking (1. Most important cause; 9. Least important cause). EF = Educators, French speaking (n = 316); EE = Educators, English speaking (n = 43); SF = French speaking students (n = 202); SE = English speaking students (n = 92); total sample N = 653. Sample sizes may vary slightly between levels due to a few missing data. % + = percentage of respondents who chose the factor as one of the two most important (ranks 1 or 2); % – = percentage of respondents who chose the factor as one of the two least important (ranks 8 or 9).

two (–) ranks. Before looking at overall tendencies, it is important to point out the size of the *SD* values, indicators of highly divergent viewpoints in the rankings made by the respondents. For instance, whereas musical aptitude is chosen by 50 % of all respondents as one of the two most important differentiating factors, 8 % place it among the two least important ones. Even chance, by far the least important causal factor in the beliefs of most respondents, appears among the two most important ones in 1 % of the respondents' answers.

This evident lack of consensus does not prevent some clear general tendencies to emerge. Differences among factors and groups were analyzed with a $2 \times 2 \times 2 \times 8$ (Role by Culture by Level by Factor) ANOVA, the two last factors being repeated measures; scores for the "teacher" causal factor in situation 2 were simply ignored. The results appear in table 2. The between subjects area is irrelevant, an unavoidable artifact of the ranking technique; by definition, except for occasional missing data, the mean of a respondent's rankings will be 5.0 and so will be any group means. The first within-subjects main effect, a small global mean difference between the two levels is also an artifact produced by the exclusion of the teacher factor. As expected, by far the most significant within subjects effect ($\eta^2 = .28$), is a global difference in ranking between the eight causal factors when the two situations are combined. That strong effect manifests itself in three ways in the table 1 data: (a) through a clear first rank given to aptitudes, (b) through the presence of perseverance and practice among the next three higher ranked factors, and (c) through the much lower rankings received in both situations by the three environmental catalysts (parental supervision, family musical life, and chance).

3.2 Group comparisons

In order to observe the R × F and C × F interactions clearly, we would have to combine both situations, then look at differences in ranking between the four groups. Some of these stand out clearly in table 1. Differences between educators and students manifest themselves in three major ways: students give (a) much more importance to practice (St. = 3.48; Ed. = 4.52), (b) much less importance to chance (St. = 8.02; Ed. = 7.19), as well as (c) parental supervision (St. = 6.13; Ed. = 5.54). But, note that these differences account for only 2 % of the within-subjects variance. There are statistically significant cultural differences in terms of factor hierarchy, for instance in the importance given to aptitudes (E > F, see table 1) and interest for music (F > E), but the explanatory power is so small that no further examination is warranted. The last significant first level interaction (L × F) concerns global changes in ranking between the two situations. The most important changes, when older very competent musicians are compared to exceptionally talented ones, target first the diminished explanatory role of interest for music (t (652) = 7.45, $p < .0001$) and practice (t (652) = 3.44,

Table 2:
Repeated Measures ANOVA for the Two Sets of Rankings.

Source	*df*	*F*	η^2
Between subjects			
(No role (R) or culture (C) main effects possible due to technique; see text.)			
Within subjects			
Level (L)	1	4.68*	(artifact, see text)
R × L	1	0.31	
C × L	1	2.26	
L × *S* within-group error	649	(0.31)	
Factor (F)	7	254.16****	.28
R × F	7	10.22****	.02
C × F	7	2.74**	< .005
F × *S* within-group error	4543	(6.30)	
L × F	7	8.59****	.01
L × F × *S* within-group error	4543	(2.97)	

Note. Values enclosed in parentheses represent mean square errors. Statistically non-significant 3-way and 4-way interactions are not shown.
* $p < .05$ ** $p < .01$ **** $p < .0001$

$p < .01$), counterbalanced by the increased causal role of chance (t (652) = 5.65, $p < .0001$) and personality factors (t (652) = 4.40, $p < .0001$). In spite of its strong *statistical* significance, the *substantial* significance of that interaction effect remains limited ($\eta^2 = .01$). The teacher as a causal factor of talent emergence receives a modest ranking. The respondents' responses show moderate stability between the two situations; correlations between pairs of scores range from .22 (perseverance) to .55 (chance), with a mean of .39. No second-level interactions attained statistical significance.

4 Discussion

Three results stand out in this study: (a) very large individual differences in terms of the perceived hierarchy of causal factors, which (b) still leave room for clear general trends shared by a majority; (c) these trends appear mostly independent of the talent level or the respondents' characteristics. Let us examine each observation more closely.

4.1 Individual differences

From the large standard deviations observed, it is clear that some respondents attribute much more importance to differences in natural abilities, whereas others have little or no belief in them. Some judge the family environment to play a major causal role, whereas others have strong

doubts about its power. Some strongly believe in the power of practice, whereas others doubt that it can reliably separate the whipping cream from the half & half! In short, all the more explicit positions found in the scientific literature have their defenders within this large sample of music educators and music students; indeed, divergences in viewpoints are equally large in all four groups of this sample. This result was discussed first in an effort to counterbalance the spontaneous tendency of many analysts – sometimes even the researchers themselves – to overgeneralize the importance of statistically significant results, especially when measures of effect size are absent.

4.2 General trends

This large variability in opinions and beliefs does not prevent some clear tendencies to emerge in terms of the relative causal importance of the nine factors proposed. Our discussion will espouse the structure of Gagné's DMGT: natural abilities, catalysts (intrapersonal and environmental), learning and practice, and chance factors. First, there is little doubt in the mind of a majority of music educators and students that musical aptitudes not only exist, but that they play a most important role in the emergence of talent. The results reveal that they occupy most of the time the first, thus most important, causal position in the eight different rankings (2 situations × 4 groups), an eloquent demonstration of the importance of musical aptitudes in the lay theories of talent development held by music educators and students.

On the other hand, the results indicate that high aptitudes share their causal role with other important factors. Except for practice, these complementary causal factors all belong to the same DMGT category, namely intrapersonal catalysts. That category covers a wide range of human characteristics in the physical (e.g., appearance, health) and psychological domains. Figure 1 shows only a few illustrative examples. Based on past scientific studies, three were included in the MUSAPT questionnaire: perseverance or will power (sustained effort), intrinsic motivation (interest or love of music), and personality traits. Perseverance clearly outranks the other two in both situations; it improves its relative position in the second situation, but the two average rankings (4.03 and 3.91) do not differ statistically. Love of music is judged slightly more important than personality traits as a cause of talent emergence among beginning music students. The lower rank in situation 2 could mean that advanced music students become much more homogeneous in their (high) interest for music: one does not pursue such training for years without being intrinsically attracted by that field. This increased homogeneity reduces the perceived value of musical interests as a cause of differences between highly talented and competent students. What is very interesting is the significant increase in importance given to personality traits in situation 2. It appears that traits like auton-

omy, self-confidence, attention to detail, or competitive spirit become more important in the mind of the average respondent as plausible explanations for the difference between national hopefuls and local achievers.

Two environmental influences appear in the MUSAPT questionnaire: the parents and the music teacher. The family influence was dichotomized into a *passive* component (parents' interest for music) and an *active* one (parental encouragement and supervision of practice). It is clear that the passive component is judged to have at best a very modest influence on musical achievement. That the musical "atmosphere" does not account for much – in the eyes of both music educators and students – in differentiating talented musicians from merely competent ones, directly contradicts affirmations by Bloom (1985), Sloboda, Davidson & Howe (1994), and other proponents of a strong environmentalist explanation of talent development. The active component of parental influence does not fare much better: in both situations, parental encouragement and supervision receives barely more support than the passive form of family influence. Concerning the teacher's impact, answers to situation 2 reveal more teacher choices among the two most important factors than among the two least important ones (21 % vs. 14 %), but almost two thirds of the respondents kept that factor among the non-chosen. Thus, the impact is judged by most as significant, but modest. It does not mean that their teaching is not a significant causal factor; rather, the differences in quality of teaching at the high level described in situation 2 are not judged large enough, on average, to have a major differentiating impact on the talent level attained by the students.

As a causal factor, the learning and practice component plays a special role in the DMGT: it corresponds to the *process* through which high natural abilities (gifts) are transformed into the skills that are characteristic of a particular field of talent. No one will deny that this component is crucial in talent development: no skills have yet been discovered that blossom overnight! One needs only to compare novices with experts to realize the huge amount of knowledge and skill generated by months and years of practice. If we look at musical training with this macroscopic perspective, no doubt that *mean* differences in performance will be evident between musicians who have been learning and practicing for different large amounts of time. But, the successive annual means are accompanied by large standard deviations, which represent individual differences in pace of learning when the general pace is kept constant. Similarly, significant incremental differences in knowledge from one school grade to the next are accompanied by large *within-grade* differences in academic achievement. In music, the most extreme testimony comes from music prodigies, those pre-adolescents whose musical expertise surpasses that of most graduate students in music. When judges compare the performances of young musicians who have been training for approximately the same amount of time, they will observe differences that exceed by far any differences in weekly/monthly amount of practice. These differences will reflect differences in *pace of learning*; indeed, some of the best performers will be

practicing not more, and sometimes even less than more average peers. Gagné (1999b) observed just that phenomenon in the results of a study by Sloboda & Howe (1991). These differences in pace of learning no doubt convince music teachers that individual differences in musical aptitudes – in other words, musical giftedness – exist. In the present study, practice is given an important role, placing in second position, just behind aptitudes, as a causal factor of differences between beginners, then moving down to rank 4 in the case of situation 2. Still, while they are significantly different from a statistical standpoint, the two means of 3.90 and 4.21 are not substantially very distant. Again, the less important perceived role in situation 2 might result from a judgment that groups of advanced music students are more homogeneous in terms of their amount of practice.

Chance was borrowed from Tannenbaum's model (1983), and first introduced in the DMGT as a fifth environmental catalyst to stress the randomness of many life events (being discovered by a mentor, accidents, etc.). Its influence became perceived progressively as much more pervasive, especially in determining each person's genetic endowment, thus influencing the level of natural abilities, as well as many intrapersonal catalysts. Consequently, there is some degree of chance in all the causal components of the model, except maybe the learning process. Our conviction of the major causal role played by chance in talent development was clearly not shared by this large sample of music educators and students; they relegated chance to the bottom of the hierarchy of causal factors.

The above analysis confirms that all the causal factors that make up the DMGT, except maybe chance, are perceived by this group of musicians as playing a significant role in talent development. Are they judged to have an equivalent impact? By no means. It seems clear from the responses that high aptitudes have a slight edge over the other contributing factors. At the other extreme, environmental catalysts are judged to play a less significant role. The causal importance of the other components of the DMGT lies somewhere between aptitudes at the top and environment at the bottom. The following hierarchy emerges: (1) high natural abilities (gifts); (2) intrapersonal catalysts (ICs), especially perseverance and will power; (3) the LP process; (4) environmental catalysts; (5) chance factors. Even though (2) and (3) appear almost equal, two reasons lead us to give precedence to ICs over LP. Firstly, the higher the level of talent, the more important ICs are judged compared to practice. Secondly, the LP process does not run on cruise control, but is constantly supported or fueled by motivational energy (needs, interests) and by strength of character, especially when boredom or obstacles affect the motivation level. In other words, the amount and regularity of practice depend to a large degree on the strength of ICs. As a final note, let us repeat that the above ranking is based on explanatory power. As mentioned earlier, a component loses power when variance decreases. If, for example, most parents offer adequate support and supervision to their child, this factor will no longer be able to "explain" differences in achievement.

4.3 Moderator variables

Only two variables, talent level and professional role, produced minimally substantial modifications to the basic hierarchy revealed by the very powerful factor effect. In the case of talent level, one causal factor, intrinsic motivation, lost much importance when respondents compared advanced musicians instead of beginners. In the course of our data collection we discovered that the attrition rate is quite high during the first two years of music training. It seems that children either are enticed by their parents – sometimes forced – to take music lessons or ask for them with little knowledge of the requirements in terms of time investment. Without true interest, they will soon find the repeated exercises very boring, and will quit. After a few years, differences in intrinsic motivation will be drastically reduced, thus exerting less impact on achievement. The three other perceived changes in ranking means – a slightly lower causal importance of practice, compensated by a slightly higher causal importance of both personality traits and chance – while statistically significant remain substantially minor. Recall that the $L \times F$ interaction accounts for only 1 % of the within-subjects variance.

The second moderator effect, confirmed by the $R \times F$ interaction, is somewhat stronger. What sets apart the students from the educators is the almost equal billing they give to the three major factors, namely musical aptitudes (3.54), practice (3.48), and perseverance (3.79). By comparison, educators give relatively much less causal power to practice (4.52) or perseverance (4.11) as opposed to aptitudes (3.41). The students' judgments could be assimilated to a stronger environmentalist leaning than that of educators. Such a leaning is quite understandable and in line with their weaker support of the heritability of musical abilities (Gagné & Blanchard submitted). College-level music students are actively training for a professional career in a field where supply greatly exceeds demand. Jobs are scarce and competition is strong. If they gave natural determinism too much credence as a major cause of success – as opposed to beliefs that focus on motivation, effort, and intensive practice – , students might become disheartened more easily when the going gets tough. In other words, there is a distinct survival advantage in not believing too strongly in the causal role of natural abilities; it keeps one's hopes more alive. It is also quite understandable that these young adults will be less prone to acknowledge the importance of parental supervision than do educators. Whether it is some enduring effect of the normal distanciation between parents and children during adolescence, or the more general human egocentric tendency to underestimate other people's contribution to one's achievements is of little importance here. Finally, how should we interpret the significant difference in the perceived causal role of chance factors? Our hypothesis is that music educators have seen firsthand, through the vicissitudes of their own career paths, that being at the right place at the right time sometimes makes the difference between getting and not getting a desired position in the field of music.

5. Conclusion

Gagné's DMGT (2003) gives a major causal role to high natural abilities (gifts), presented as the building blocks of talent; it implies that the genetic endowment cannot be ignored as an essential determinant of talent. That fundamental premise of his theory applies to all fields of talent. Gagné's position runs counter to the prevalent ideology in the social sciences, a strong environmentalist leaning which Tooby & Cosmides (1992) labeled the Standard Social Science Model or SSSM. It is especially endorsed in music by scholars like Benjamin Bloom, Michael Howe, and John Sloboda. Most interestingly, the present study shows that the most common beliefs of this large group of music educators and students are much closer to Gagné's position than to the SSSM. Not only do they give top ranking to musical aptitudes, but also they relegate environmental factors to the bottom of the causal hierarchy, judging intrapersonal catalysts to be much more important contributors to talent emergence. One is reminded of a similar statement expressed over a century ago by Sir Francis Galton: "By natural ability, I mean those qualities of intellect and disposition, which urge and qualify a man to perform acts that lead to reputation. I do not mean capacity without zeal, nor zeal without capacity, nor even a combination of both of them, without an adequate power of doing a great deal of very laborious work" (1869/1962, p. 77).

In Galton's terms, reputation (talent, eminence) will emerge from proper qualifications (high capacities, gifts), urges and zeal (needs, passions), as well as the power for laborious work (will-power, persistence). Doesn't that position look a lot like the lay theories of our music educators and students? As the French are fond to say: "Plus ça change, plus c'est pareil!"

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