The Multidimensional Model of Musical Giftedness (3MG):

Breaking new ground in understanding musical talent and musical thinking

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Abstract

Much research has explored cognitive functions and the nature of information processing since the cognitive revolution began with the advent of computers in the 1950s. With the establishing of music psychology attention was directed also to the cognition and processing of music. However, the initial reluctance of Science to avoid the study of emotions became a problem especially in studying music; which is a cultural phenomenon with the inherent ability to trigger strong affective responses. The Multi-Dimensional Model of Musical Giftedness (3MG) takes the significance of affective responses and emotive skills into account in outlining the likely constituents of musical giftedness domains. Based on available research a conceptual model is outlined as based on domain generality and domain specificity, thus proposing an understanding of musical giftedness as a set of core skills and sets of key skills particular to different musical domains.

Introduction

Any effort to define musical giftedness must first deal with nomenclature. An individual superior to most others in regard to musical skills has prompted the use of a number of different labels. This is also true of giftedness research and gifted education in general (cf. Gagné, 1985; Ziegler & Raul, 2000). The many available labels reflect not only differing epistemological worldviews but most certainly also disagreements and the considerable complexity of the matter at hand. However, these labels may be more or less subsumed under either genotype (genetically determined potential) or phenotype (the developed and observable behaviour resulting from a certain genotype). In addition, there are also popular all-inclusive terms in use comprising every musical activity or aspect of musical behaviour (see Table 1).

Table 1. *The variety of labels used in the literature of musical behaviour.*

Genotype	**Phenotype**	**All-inclusive terms**
Musical aptitude	Musical talent	To be musical
Musical capacity	Musical ability	To be “unmusical”
Musical intelligence	Musical achievement	
	Creative musical talent	
	Musical expertise	
	Musical excellence	
	Musical eminence	
	Musical elite talent	
	Musical genius	
	Musical competence	

In the following I will use the term *musical giftedness* when referring to individuals who for any possible reason appear "more musical" than most others; that is, they learn musical structures quicker, have better memory for music; they more easily discriminate tonal and rhythmic patterns, are more expressive, more emotionally attuned to music, more sensitive to timbre and—depending on type of musical skill—they also have a propensity for exceptionally efficient motor learning. Implicit in the term is also a social recognition for market profit, which might not be an issue early in a musician's development but certainly becomes one as music performance becomes a profession (cf. Rosen, 1981).

Contentions in defining musical giftedness

One of the major controversies in defining musical giftedness is whether one general capacity or several separate capacities underlie music as human behaviour. In attempting to identify musical giftedness the construct has usually been understood as one single dimension where at some point an individual crosses a boundary beyond which he or she becomes viewed as "gifted" (Table 2). Most likely music behaviour is *both* general and specific. To be musically gifted cannot reasonably be one-dimensional. Musical giftedness is beyond doubt *multi*-dimensional and there cannot exist one type of giftedness but rather several!

Table 2. *Identifying markers for musical giftedness as suggested in the recent literature..*

Winner and Martino (2000):	**Haroutounian (2000; 2002):**
Early interest in musical sounds	Perceptual awareness
Musical memory	Perceptual discrimination
Perfect pitch	Metaperception
Musical generativity	Creative interpretation
Multiple music-cognitive representation	Behavior/Performance
Sensitivity to emotion in music	Motivation
Bastian (1989):	**Subotnik et al. (2004):**
Expressive abilities	Persistence
Emotionality	Self-confidence
Learning with ease	Knowledge of Self
Musical memory	Socially skilled
Physical suitability	Self-promotive
Auditory skills	Learning with ease
Multi-skilled across domains	Risk-taking
Intrinsic motivation	Charisma

Consider that music cognition differs neurologically from other kinds of cognition (Koelsch, 2005; Patel, 2007; Peretz & Zatorre, 2009) and that by the use of EEG and neuroimaging techniques research has established structural differences as well as differences in brain activation patterns when comparing musicians with non-musicians. In addition, there are within-group differences amongst musicians when imagining music and when composing music (Gaser & Schlaug, 2003; Münte, Altenmüller, & Jäncke, 2002; Parsons *et al.*, 2005; Petsche *et al.*, 1993; Petsche, Von Stein & Filz, 1996; Schlaug *et al.*, 1995a; 1995b; Schneider *et al.*, 2002) suggesting that an astounding performer does not necessarily have the abilities needed to also be an equally astounding composer! Also, there is supportive but more circumstantial evidence reinforcing the notion that qualitative differences in information processing exist when comparing general music cognition with *gifted* music cognition (eg. Bruer, 2002; Eysenck, 1990; Hassler, 1990; 1992; Shuter-Dyson & Gabriel, 1981; Winner, 1996). There is therefore good reason to view the processing of musical stimuli

both in general terms as a universally human and evolutionary phenomenon but also as more specialised human behaviour as based on unique information processing capacities.

Differentiating between gifted and general musical thinking

A useful line of theory and research is to frame the cognitive functions involved in the processing of musical stimuli as lower order thinking and higher order thinking in accordance with *Bloom's Taxonomy of Educational Objectives* (Bloom *et al*., 1956) and its recent revision (Andersen *et al*., 2001; Hanna, 2007).

Higher order thinking occurs when a person takes new information as well as information stored in memory and inter-relates and/or rearranges and extends this information to achieve a purpose or making sense in perplexing situations (Lewis & Smith, 1993). This process could be viewed as typical of gifted musical thinking also (Figure 1).

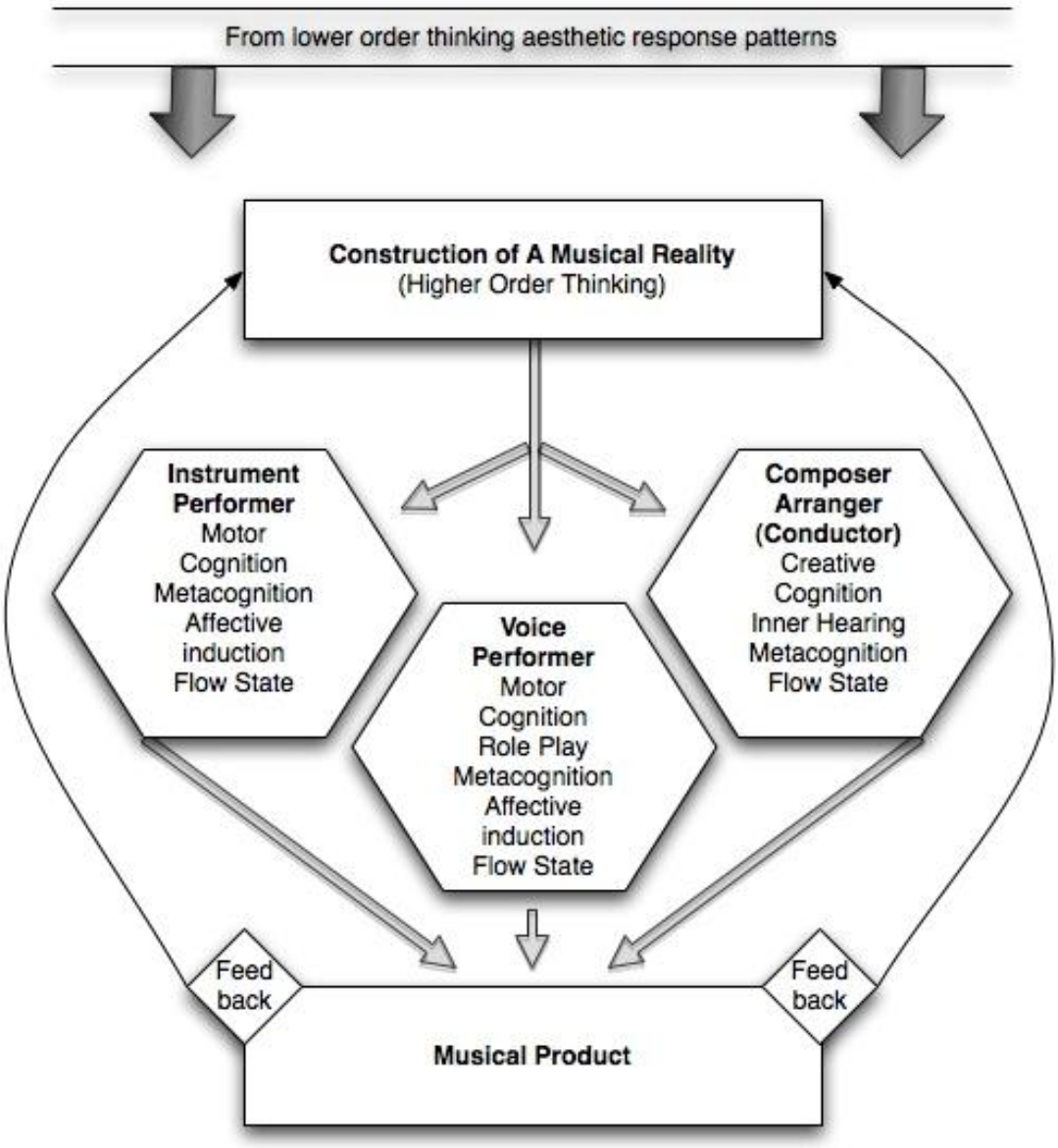

Figure 1. *An outline of higher order musical thinking contents/functions as pertaining to the Multi-dimensional Model of Musical Giftedness (Persson, 2009; 2010).*

What then differentiates general musical mind from the gifted musical mind? Most people tend to be consumers of music. Music in contemporary society is either used intentionally and in public as a background to manipulate consumer behaviour (eg. Dubé, Chabat, & Morin, 2006) or personally for the purpose of building group identity, keeping group cohesiveness or is listened to passively for aesthetic pleasure or mood management (Hargreaves & North, 1999). A great many also sing and play instruments for their own

enjoyment (Lamont, Hargreaves, Marshall, & Tarrant (2003). Musical thinking for most individuals therefore tends to be a simple aesthetic response (Figure 1), characterised mainly by *passive* input. This processing of music does not necessarily lead to an output in terms of any of the attributes more associated with higher order musical thinking. Lower order musical thinking is when inter-relating, rearranging, and extending musical information does generally *not* occur. There is little or no problem solving in operation (Figure 2). Everyone can relate to music in this way. The few who are *de facto* "unmusical" are neurologically dysfunctional—congenitally or traumatically—in relation to the general music capacity (Kalmus & Fry, 1980; Ayotte *et al.*, 2000; Peretz *et al.*, 2002; Stewart & Walsh, 2002). Homo Sapiens is a musical species and lack of individual skills is *not* to be equalled to being void of this general capacity for music (Blacking, 1987; Sloboda, Davidson & Howe, 1994; Koelsch *et al.*, 2000).

For someone musically gifted the processing of musical information is by necessity more complex and also has additional functions. The process is active and intentional by creating, recreating, generating, analysing and/or communicating a musical product. Lower order musical thinking may develop into higher order thinking given that the necessary prerequisites are present. These are genetic potential (Hunt, 1997), a considerable capacity for processing and learning all things musical with ease and efficiency, socio-emotional support during skill development (Manturzewska, 1990) and a very large investment in time practicing motor skills as well as cognitive skills (Ericsson, Krampe, & Tesch-Römer,1993; Hallam, 2001; Haroutounian, 2002; Harnischmacher, 1997; Nielsen, 2001). It is also likely that personality—especially in terms of how an individual relates to Neuroticism and Introversion plays a significant role (Eysenck, 1990; Kemp, 1996).

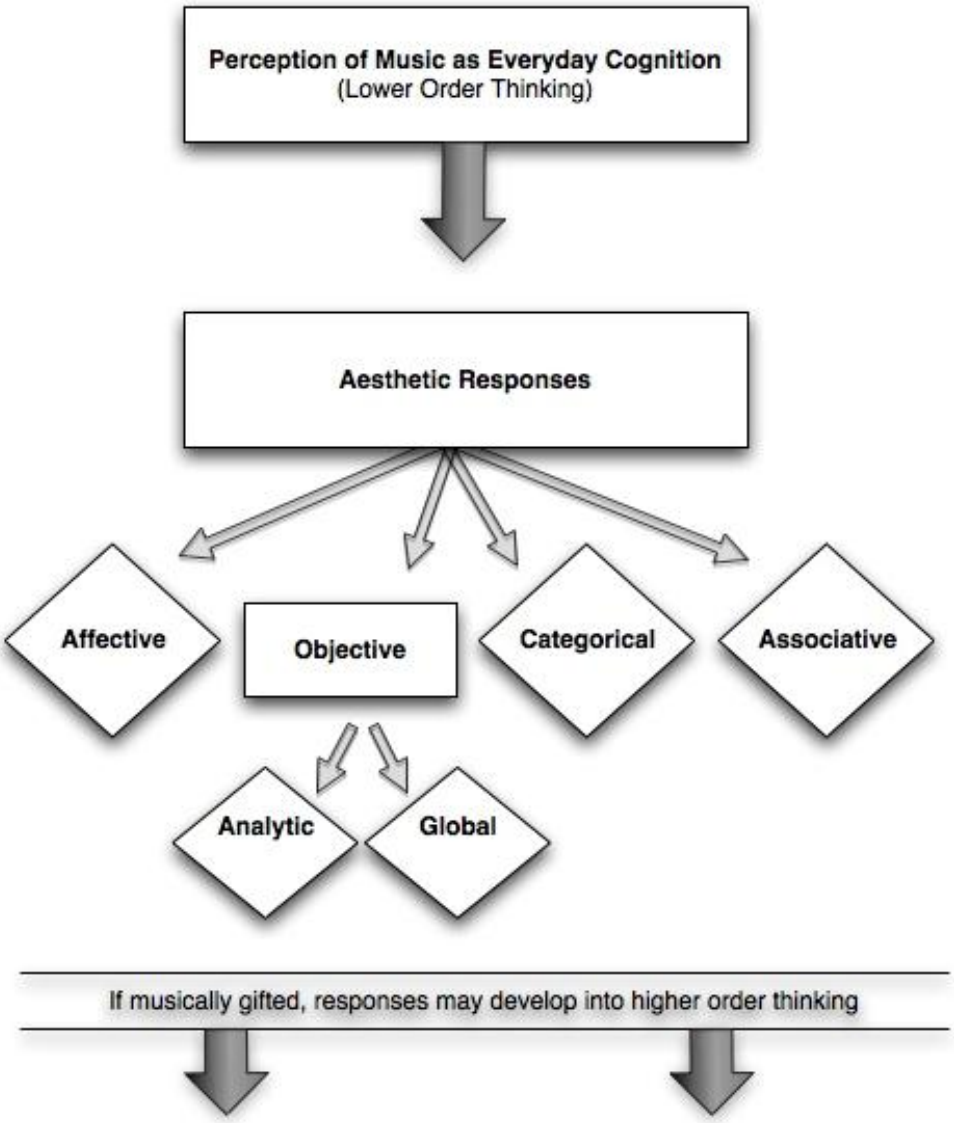

Figure 2. *A flow chart suggesting musical thinking as aesthetic response according to the Hargreaves (1982) aesthetic reaction taxonomy (see Persson, 2010).*

Most individuals could develop at least a degree of higher order musical thinking. To this all responsible education aspires (Boardman, 1989; Halpern, 1998), but the difference between the gifted and the non-gifted is most likely one of domain specific neurological processing speed, metacognition, problem solving (Hettinger-Steiner & Carr, 2003; Swanson, 1992), and I argue also one of flow, affective intensity, sensitivity and

emotive skills (cf. Bastian, 1989; Bastian & Koch, 2010; Scherer, 2004; Scherer & Zentner, 2001).

Proposing a model for Giftedness in Music then, rests on a series of feasible assumptions, some of which are the direct result of research and others are in need of research though their feasibility are at the very least implicated in the already existing body of empirical knowledge. These assumptions are the following (cf. Simonton, 1999; Oerter, 2003):

- Musical giftedness needs to be understood in terms of *core skills* common to all domains in which giftedness is to be studied or identified.
- Musical giftedness needs to be understood in terms of *key skills* specific to particular musical domains.
- Musical giftedness is dependent on heredity, but biologically determined potential must be stimulated and allowed to develop in a suitable environment to manifest.
- The nature of stimulation and development differs between musical domains.
- Everyone has musical capacity unless there is a neurological dysfunction. But everyone is not, nor can they become, musically gifted.
- Lack of individual and developed musical skill is not to be equalled to being void of musical capacity.
- Extensive practice of skills is the only means to develop a gifted individual to mastery of those skills thereby reaching full potential.
- Identification of musical giftedness is three-dimensional: 1) objective and generalizable; 2) subjective and individual, and 3) social as based on estimated value or appreciation in a context of supply and demand.

Proposing a Multi-Dimensional Model of Musical Giftedness (3MG)

The core skills of the model are the core operations of musical intelligence, namely those often included in psychometrically constructed aptitude tests: pitch, rhythm, tempo, timbre, loudness and spatial location. However, included in this set of cognitive functions should most likely also be added affective responses in relation to music. It is difficult to imagine any kind of musical activity without emotionality being an integral part, especially since recent neurophysiological research points towards the differentiation between emotional processing in general and the emotional processing of music in the brain (Peretz, 2001).

The key skills of musical giftedness are more difficult to outline since there is as yet no consensus of domain specificity, which skills are to be included and what constitutes them. However, while all musically gifted probably share the musical core skills, the additional skills needed to excel in a chosen field of pursuit must by necessity differ to some degree. I propose that there are tentatively three such distinctive domains as seen from a Western Classical Music perspective (Persson, 2009; 2010): voice performance, instrument performance and composing (including conducting and arranging). These domains are characterised by both unique and shared key skills (see Table 1). Note that voice and instrument performance are not construed as "creative" in this model. In Western Classical music performers usually have limited opportunities of being creative. Rather, they follow established performance norms and are more accurately characterised as being *recreative* (Persson, 2004; Polony, 1995).

Table 3. *A suggestion how musical giftedness could be outlined in terms of giftedness domains and their domain specific skills. Note that this division pertains to Western classical music.*

Giftedness domain	Domain specific key skills	Type
Voice performance		
	Voice quality	Physiological
	Voice motor function	Physiological
	Acting skills	Personality
	Auditory skills	Cognitive
	Musical memory	Cognitive
	Emotive skills	Personality
Instrument performance		
	Motor function	Physiological
	Appropriate physical attributes	Physiological
	Auditory skills	Cognitive
	Musical memory	Cognitive
	Emotive skills	Personality
Composing/Conducting/Arranging		
	Auditory skills	Cognitive
	Inner hearing	Cognitive
	Creativity	Personality
	Emotive skills	Personality

The construction of a musical reality, more or less unique to each piece of music performed or composed, is likely to be the foundation of gifted musical thinking for all of the three domains. Musical reality is defined as "the subjective, dynamic, emotional basis from which musicians draw motivation, construe artistic understanding and generate [musical products]" (Persson, 2001; p. 284). However, the construction of such a musical understanding varies to a degree with personal preference (Persson, 1993; 2001). It is important to observe, however, that the understanding of the music to be learnt or created is

always construed in accordance with some kind of personal *subjective* significance; one which gifted musicians often appear unwilling to abandon or reconstrue once learned and settled (Mayer, Allen & Beauregard, 1995; Persson, 1993).

The three domains of musical giftedness share metacognitive functions; or metaperception in Haroutounian's (2002) terminology, which is "the artistic counterpart to metacognition … describing the cognitive/perceptual functioning of a musician or any artist while making interpretive decisions" (p. xvi), as well as the state of flow relating to executing a skill at an expertise level. The experience involves a sense of control; or more precisely lacking the sense of worry about losing control, which yields a strong and positive emotional experience (Csikszentmihalyi, 1992).

Tied to the state of flow is the cognition of motor skills needed by the instrument and voice performer. Motor skills are of less significance to a composer, arranger, or a conductor. Unique to the latter domain, however, is inner hearing, which Campbell (1989) explains is that which, when using music notation, an individual "hears what he sees, and sees what he hears," once the skill has been developed (See also Gordon, 1995). Brodsky and associate researchers (2003) suggest that this ability is the most outstanding mark of a gifted musical mind. Inner hearing appears tied to cognitive motor processing because of rhythm. Note that this is unique to musical thinking as opposed to other thinking (Brodsky *et al*., 2008; Chen, Zatorre & Penhune, 2006). While all gifted musicians are likely to have the ability developed in a way that differentiates them from non-musicians, the ability of inner hearing is useful but probably not necessary to a performer. For conductors, composers and arrangers, on the other hand, it is the most striking feature about their domain of giftedness. EEG patterns are different when composing music in comparison to imagining music by inner hearing (Petsche *et al.*, 1993; Petsche, Von Stein & Filz, 1996), suggesting that conductors rely on other cognitive skills than do composers and arrangers.

One aspect of gifted musical thinking more or less unique to giftedness in the performance domain is affective Self-induction. Performers tend to "get into the mood" of a piece prior to performing it by either remembering an emotional state, or conjuring up an event from memory thereby inducing a desired emotional state (Persson, 1993; 2001). Performers learn such emotive skills intuitively. Composers, in comparison, seem not to be reliant on such mood induction, which is not to say that they are necessarily less impressed by, or moved by, the emotional cues contained in musical structures. I propose, however, that a flow state is more significant to a composer than to other types of musicians (Danish composer Vagn Holmboe, 1991 would be one example). Research has indeed discovered that the musically *creative* process in many ways is much like that of a scientist's (Collins, 2005; Root-Bernstein, 2001; Root-Bernstein & Root-Bernstein, 2004; Wille & Wille-Henning, 2008). Hence, while the gifted composer and arranger could be considered cognitively as a type of musical scientist, the performer tends to be cognitively more attuned to a global kind of emotional reality.

Unique to voice performers is acting or role-playing. It is difficult to imagine a singer with no inclination for also embodying role characters or physically expressing the meaning of sung texts. Flow states are importance also in acting as Martin and Jackson (2008) point out, but the acting skill as such has been defined as one of expert memory for lines and characters (Noice & Noice, 1997; 2006).

Gifted musical thinking in the 3MG-model contains a dynamic feedback mechanism relevant to all of the musical giftedness domains. Any performance process—recreative or creative—is constantly monitored by musicians in order to communicate, optimise emotional response and/or achieve certain ideals or norms continuously in accordance with their conceptualized musical reality, the unfolding of the musical structure, or with situational factors such as audience response, perceived expectations and demands.

Stage fright will affect gifted processing of musical stimuli and will also risk inhibiting the cognitive functions involved: The evolutionary fight or flight response has precedence over flow and the unfolding of the positive emotion-based artistic expression (Fredrikson & Gunnarsson, 1992; Steptoe & Malik, 1995).

Concluding thoughts

We need to recognize the fact that almost all research into musical ability thus far has been pursued in a context of Western Classical Music *only* (Middleton, 2002). This is a considerable weakness! Add to this that attempts made to construe an understanding of musical giftedness to date has been entirely based on aspects of cognitive processing. The study of emotions has been conspicuously missing until quite recently (Juslin & Sloboda, 2001; Strongman, 1987). That there exists an obvious relationship between musical expression and emotional experiences—irrespective of musical genre and context—has been known and recognised since Antiquity. This dimension of the musical phenomenon mysteriously disappeared as cognitive science became interested in music as merely an issue of perception. This subjective dimension—appropriately termed *musical reality* (Persson, 1993; 2001)—has only recently become the focus of systematic empirical research (Juslin & Sloboda, 2001). Musicians' subjective understanding is real and very tangible to them and to their educators and audiences. Such a subjective reality must be part of any conceptual model of musical giftedness lest musical giftedness will be a construct of little use and ecological validity. The affective impact of music also needs to be considered in differentiating between gifted and non-gifted musical cognition on the assumption that gifted musicians are more attuned to emotion-eliciting stimuli than the general population is. Famed singer Janet Baker once argued that "musicians' business is emotion and sensitivity—to be the sensors of the

human race" (in Crofton & Fraser, 1985; p. 112). Composer Fredrick Delius, similarly, exclaimed that "how can music ever be a mere intellectual speculation or a series of curious combinations of sound that can be classified like articles in a grocer's shop" (in Crofton & Fraser, 1985; p. 49).

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