BACKGROUND MUSIC AND THE LEARNING ENVIRONMENT: BORROWING FROM OTHER DISCIPLINES.

by

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1. Introduction

I. Background

Human beings have always enjoyed a special relationship with the organisation of audible sound we call music. Indeed, music is our oldest form of expression (Menuhin 1979), and we know of no culture or civilisation to have existed without some form of music-making. Through the passage of time, the roles and functions of music have represented manifold expressions to people, and in the present day music is ubiquitous and readily available to all who seek it. Recent advances in digital music technology and portable/personal music-playing devices have resulted in background music being listened to by more people than ever before. One market research study (Lo 2005) estimated “explosive growth and more to come” in the mp3 player market.

The nature of human inquisitiveness extends to our need to understand our emotional responses to music: Why does it move us so? How does it inspire, motivate, console and relax us? Is music an unnecessary albeit enjoyable adjunct to human existence or are there intangible but real effects imparted on the human condition? And pertinent to this study, what is the relationship between the presence or absence of music and human task performance?

The body of academic research into the physiological, psychological and cognitive effects of background music (BM) on human beings is growing rapidly. Advances in neuroscientific brain imaging techniques and the emergence of relatively new fields such as music therapy, music medicine and music psychology - as well as the highly sophisticated commercial retail marketing sector have been at the forefront of research into the effects of BM on human behaviour and response. For example, medical studies have been exploring the use of music with heart beat regulation, memory restoration with dementia patients, re-routing verbal expression

through music and improving recovery rates following surgical procedures (Pelletier 2004). Marketing specialists are researching the link between music, brand association and eating/drinking habits, and manipulating customer satisfaction in adverse situations such as crowded places, waiting cues and on-hold phone calls (Lammers 2003; Jacob 2006). In comparison, the education sector has undertaken fewer investigations into the use and effects of BM in educational settings and those that do exist tend to focus on whether BM can lift performance or change the behaviour of school students in the classroom (Hallam and Price 1998).

II. Aims and significance

The purpose of this essay is to review the growing body of research into the effects of BM listening on human mood and behaviour in a multi-disciplinary context. Ultimately, it is hoped that outcomes resulting from this research paper will better equip schools and parents with knowledge about the effects and applications of music in maximising the learning environment; in particular improving cognition and constructive behaviours. I will examine methodological flaws within some research models, namely the selection of music for research, and propose ideas for further studies in the educational context.

There is little documented evidence of discriminate BM use in schools. However, the sum of research from other disciplines and perspectives creates a powerful educators' lobby for more serious consideration of the creative use and implementation of BM within educational settings.

III. Scope and limitations

The scope of this essay deals with BM listening on a conscious and sub-conscious level. BM refers to "music intended to be heard but not actively or purposely listened to" (Musselman 1974, in Bendall (1994)). It does not refer to organised, analytical listening, and is distinct from music education curriculum programs or practical music making. This is not intended to be an advocacy paper for music education's inclusion in curricula. This paper researches the **associated** benefits (non-musical) derived from the listening of BM; benefits in knowledge or performance in the other intelligences as listed by Howard Gardner (1984).

The behavioural effects encountered when listening to music will be considered short-term unless otherwise stated. There may well be lasting effects resulting from music listening, but that is beyond the scope of this paper. In any case, short-term benefits are not insignificant, for the best learning often takes place in small time sectors when arousal and on-task performance levels are high. This is the value of carefully selected BM: to enhance the level of arousal required for optimal learning.

The scope of this study describes how educators can maximise all learning experiences. Whilst this study deals with music, educators should be constantly searching and evaluating the correlation between environmental conditions, classroom facilities and student outcomes. Lighting, temperature, ventilation, noise, decoration and space management should all be considered as arousal stimuli, and many of these factors are being explored (Leung and Fung 2005).

2. Why and how we learn

I. The learning environment

"Learners instinctively want to understand how the world works. This understanding gives them an improved capacity to cope with their environment" (Author-Unknown n.d). We can substitute 'human beings' for 'learners', as surely no creature has such a disposition or a desire to learn as humankind. This is supported by music education philosopher Elliott (1995) who asserts that the true goals in life are self growth, self-esteem and enjoyment (p.119). But we know this. Every parent and educator has witnessed their children's intrinsic enjoyment when a new sense of the world is understood. Self-growth comes not only from introspection and self-knowledge, but also from understanding the world around us. The successful acquisition of self-knowledge results in self-esteem (ibid, p.118), which prepares the learner for new experiences and increased consciousness.

> Human beings seek self-esteem and happiness more than anything else
>
> -Aristotle

Self-esteem is essential for positive human behaviour and for further learning preparedness. It provides us with the courage to try new things and decreases our fear of failure. The modern day educational climate subscribes to positive reinforcement methodologies to boost the self-esteem of students. We believe that any increase in self-esteem results in greater resilience in difficult times. Successful learning results in self-esteem leading to a renewed desire to learn.

And unless this cycle is interfered with, we have a working model of the self-motivated individual.

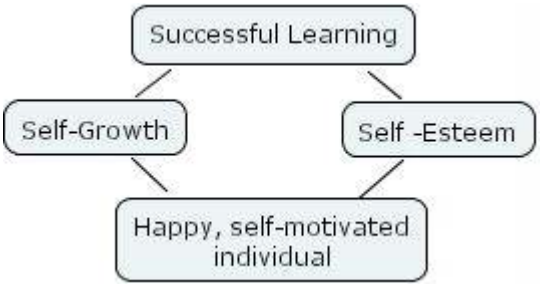

Figure 1: Successful learning model

This self-motivated individual has experienced success and enjoyment in learning, and wants to repeat the experience. S/he has probably entered into the first stage of 'flow', a term invented by psychologist Mihaly Csikszentmihalyi (1990) which implies an optimal learning zone in which one has a depth of concentration, is enjoyably lost in the activity and extremely focussed on the task at hand. We have many synonyms for this learning condition: focussed, engaged, switched-on, in the zone (usually for sport), fired up (in competition) and I'm sure, many more. In its purest sense, Csikszentmihalyi's realization of 'flow' comes about when the challenge set is met by the skills required.

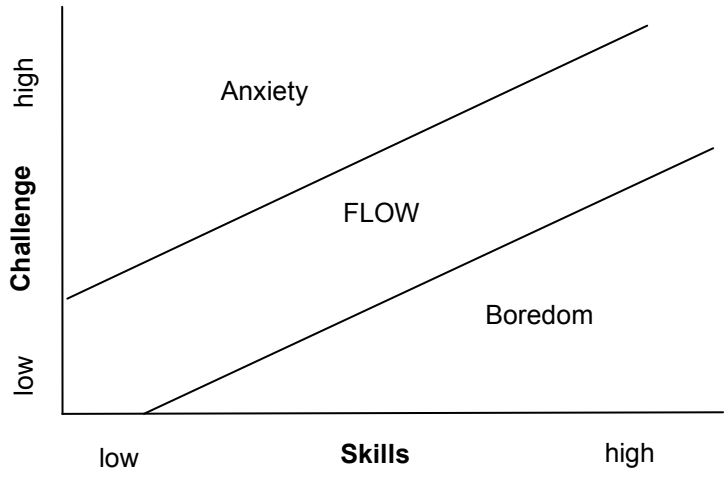

Figure 2: adapted from Csikszentmihalyi (1990) pg. 74

For now, I would like to consider flow as an increase in **on task performance** (OTP).

II. Emotions, feelings and learning readiness

Our mood state, affected by our emotions and feelings can enhance or interfere with the successful learning model of the engaged individual.

Human understanding of the role of the emotions in human intelligence and behaviour has grown and changed significantly over the centuries. For the Greek Philosophers the rational ruled the emotional. Cognition and emotion were considered separate entities and the ideal human state was one in which the mind kept the emotions in check. Indeed, this model from Plato's **The Republic** is today generally refuted by scholars, the position being that emotions are indeed essential to cognition and decision making processes. Recent neuroscience study showing more neural connections between the limbic system to the intellectual neo-cortex (Michels 2001) and well known writings of Daniel Goleman (1996) assert that feeling is no less important to thought in decision-making and acting. In fact Goleman takes this further reasoning that emotional intelligence (known as EQ or EI) is the central and most vital form of knowing. According to him, it is a much greater predictor of life success than the historically valued intelligences used in the Stanford-Binet IQ testing system. Howard Gardner, in his landmark **Frames of Mind** (1984) also challenges old intelligence theories placing emotional intelligence and musical intelligence amongst others as unique ways of knowing alongside language and mathematic/analytical intelligences.

> …the little emotions are the captains of our lives and we obey them without realizing it.
>
> -Vincent Van Gogh, 1889

It is accepted that emotions produce physiological changes and can alter our mood state. In emotional states of arousal, the pulse rate rises, as does body temperature and blood pressure; facial expressions change and so forth. Alpay (2002) suggests that this arousal is a natural human condition which prepares us for the primal 'flight or fight' response instinctive in survival. Our attention narrows, and we become alert and ready to respond to a given situation. In his excellent paper on arousal and education, Alpay puts forward a crucial point; that when internal (or intrinsic) motivational drives are low, external arousal is often necessary to attend to learning situations in the classroom (p.5). Learning is dependent upon appropriate emotional state, the right level of arousal, good mood and a sufficient level of self-esteem. Generally, this emotional state needs to be positive, but as Forgas (2006) argues, some tasks are better handled in a negative emotional state as it encourages greater caution and accuracy. Also, Wilson (2000) found that a sad emotive state helped students memorize negative facts such as war history, world tragedy etc, and likewise a cheerful state encouraged the learning of positive facts such as the achievements of mankind.

But what external stimulants arouse?

III. Music, emotion and arousal

The senses. Learning environments can be influenced through visual imagery, colour, aromatherapy, and sound. It is this sensory learning environment that has the capacity to influence student motivation for learning tasks.

Sound refers to speech, ambient noise and music, and neuroscientists have found that each is processed in different parts of the brain (Carey 2002).

Of all the emotional stimuli, music is held in special esteem. We celebrate life's joys and tragedies with music and the youth culture often define their identity with music. Yehudi Menuhin (1979) refers to music as a form of expression which is clearer and more in touch with our emotional selves than the abstract nature of words. Mursell (Elliott 1995) says that music is the most emotive of the arts, and that this is the secret of its universal appeal. Music is "the emotional essence of (an) experience crystallised in tone" (ibid). Stephen Handel (1989) explains why music is more emotive than visual art: "Listening is centripetal; it pulls you into the world. Looking is centrifugal; it separates you from the world". Through recent fMRI (functional magnetic resonance imaging) and PET (positron emission topography) studies, leading neuro-cognition scientist Stefan Koelsch (2005) has confirmed the linking of emotionally valent music with the known emotional centres of the brain. Interestingly, and as an aside, he discusses the trend in using music stimuli rather than the historical precedent of using visual art images:

> However, during the past years, the neurosciences have discovered that music is also a valuable tool to investigate emotion. Important advantages of music are
> (1) That music is capable of inducing emotions with a fairly strong intensity
> (2) That such emotions can usually be induced quite consistently across subjects, and
> (3) That music can induce not only unpleasant, but also pleasant emotions, which are rather difficult to induce by static images.
>
> (p.412)

Does it follow therefore, that music- through the emotions -can arouse and manipulate human behaviour? And specifically for the purpose of this paper- can music arouse in us a readiness to learn, enhance an optimal learning environment and increase on task performance? Savan (1996) says that because emotion and physiological changes are inextricably linked, then music **will** exert physical change. Whether or not this can be

transferred into better learning behaviours is the major issue to be explored in the remainder of this paper.

IV. Arousal and learning

The historical view of external stimuli including BM acting upon a learning situation has been based on Cognitive Learning Theory. This theory of working memory suggests that the mind has limited attention resources in processing parallel steams of information, and can succumb to overload when subjected to too much information. As far back as 1890, William James wrote about the fact that in comparison with long-term memory, working memory is very limited (Miyake and Shah 1999). So in this context, it has historically been assumed that BM would probably interfere with cognitive processing. However, Gardner's 'Theory of Multiple Intelligences' and much neuroscientific study on the brain and working memory suggest that since processing of separate intelligences takes place in different parts of the brain, categorisation of perceived impediments may not be that straightforward. A simple analogy is that of the tri-athlete who is able to run, swim and cycle a great distance because each activity uses different muscles. Davidson and Powell (1986) conducted experiments on the effects of BM in the science classroom and found an increase in on task performance as a result. They further reasoned that any increase in on task performance should cause an enhancement in academic achievement (p.29).

Another well known psychological model of performance and arousal was developed by Yerkes and Dodson in 1908, and provides a useful representation to clarify this further. Known as the Yerkes-Dodson law, it suggests that arousal will increase task performance to an optimum level, but once that level is crossed, task performance deteriorates (Wikipedia-Contributors 2006). We could consider the arousal stimulant to be 'interference' once it crosses this threshold. Using this understanding,

Hallam, Price et al. (2002) suggest that BM can be used to increase or maintain student arousal levels for study purposes. This, they explain, is dependant on the set performance task. The greater the cognitive challenge, the less stimuli required whereas tasks requiring stamina or persistence, or tasks menial in nature will benefit from higher levels of arousal to increase motivation. This has been borne out in many studies (Oldham, Cummings et al. 1995), Alpay (2002), Giles (1991) and Lesiuk (2005).

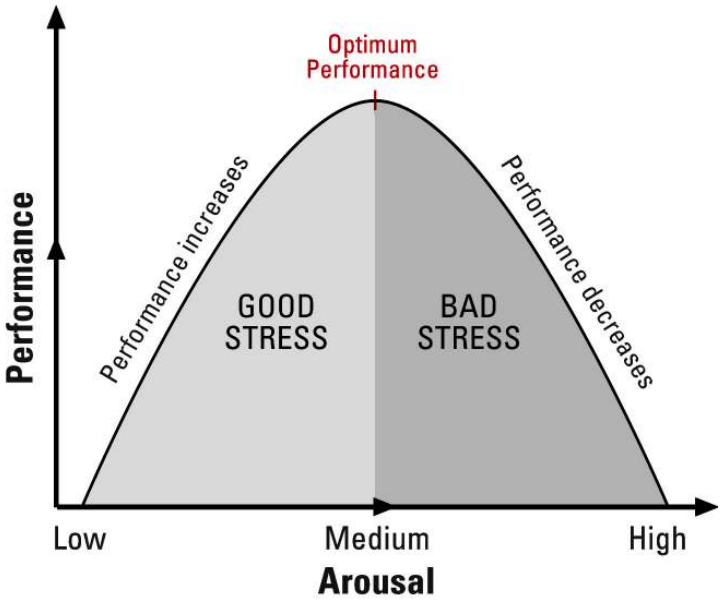

Figure 3: Yerkes-Dodson Law van Gorp (2002)

Furnham and Allass (1999) argue that when considering arousal, an additional factor which must be taken into account is personalty profile. Taking from Eysenck's 1967 theory in which personality types are labelled as introvert or extrovert, Furnham and Allass claim that personality type will determine the amount of "external stimulation required [in creating] an optimal level of arousal" (p.28, 29). Obviously, the human personality is unique and each one fits somewhere along the introvert–extrovert continuum rather than at the poles. This implies that a personalised stimulation level would be required to achieve an optimum arousal level for every individual. This is supported by Alpay (2002, p4) who summarises "…introverted students are generally perceived to desire little arousal,

which would otherwise cause anxiety, whereas extroverts are likely to desire relatively high levels of arousal". Extroverts have a higher threshold than introverts in tolerating BM and perhaps noise. This serves as a reminder to the educational community for the need to acknowledge individual learner profiles.

The most significant findings of Furness and Allass (1999) were that introverts performed better than extroverts in silence, and worse when subjected to television distraction (p.29).

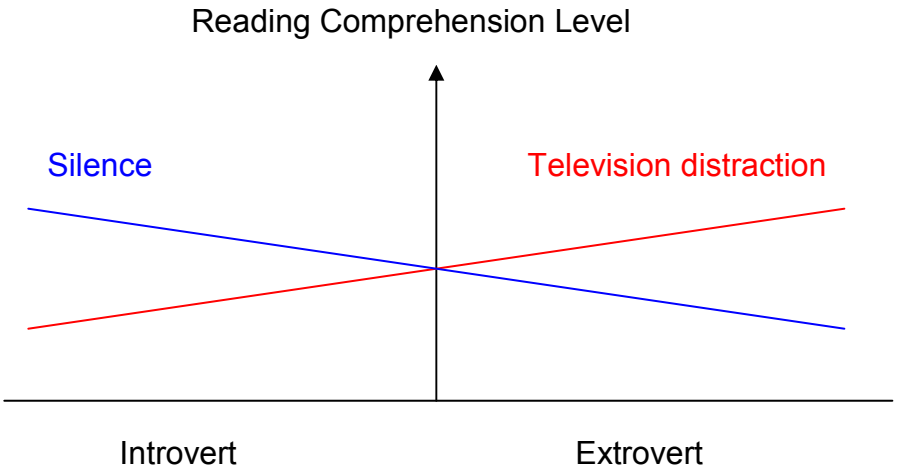

Figure 4: Distraction and personality type

To cater for a learning environment full of mixed personalities, it would seem that less complex music (i.e. simple music with a low information load) would be the best 'fit' and most appropriate choice for BM. It may be that due to the diversity of personality types in the classroom, not all students will benefit directly from the BM, but they may gain from reduced classroom distractions as a flow on from the students' whose study patterns have improved directly as a result of BM.

3. Human response to music

…music has come to be considered as lying on a continuum from
highly stimulating and invigorating to soothing or calming
-Gaston, Hallam and Price (1998).

The range of human reaction to music is due mainly to the constituents of the music itself. The uniqueness of the individual determines that there will be different responses based on events and environmental conditions, but on the whole, music's emotional message is received remarkably consistently across cultures.

In the past 25 years, many studies have been undertaken in an attempt to isolate the musical factors which elicit particular responses and behaviours. As we have seen from cognitive learning theory, music listening exerts an information load on the listener. Tempo, tonality, texture, volume, form and melodic range all have variables which determine information load and hence arousal degree on the listener.

I. Tempo

According to Dalla Bella, Peretz et al. (2001), there is a natural human tendency to associate tempo with emotional judgement. With her team of researchers, Dalla Bella found that children were able to make correct emotional judgements in terms of happy/sad music by the age of five. It takes another 3-5 years, she claims, before tonality is similarly used to determine emotional judgement from music. Dalla Bella refers to other studies which support this notion that tempo sensitivity precedes mode sensitivity in human development.

It has been shown (Brodsky 2005) that listeners find some tempos more enjoyable than others and can notice discreet differences in pace, and remember rhythmic speed over a long period of time.

Slow tempi have always been associated with tranquil, sentimental, solemn and sad (Hevner 1935), and fast –exhilarating and joyous. Many studies including Furnham and Allass (1999) have determined that fast music induces greater arousal levels than slow music. A possible explanation for this could be that there are extra musical events to be processed by the listener in a given time frame. Hence, faster music is perceived to be more complex.

Most BM falls in the range of 60 and 120 beats per minute (bpm) (Kellaris and Kent 1993) with a favoured range of between 70-110bpm.

Recent research (Husain, Thompson et al. 2002) has suggested that tempo changes are more closely associated with arousal rather than emotion. Rhythms evoke physical responses. The pulse component of rhythm carries us along and engages us in foot tapping, finger clicking, head nodding and dancing.

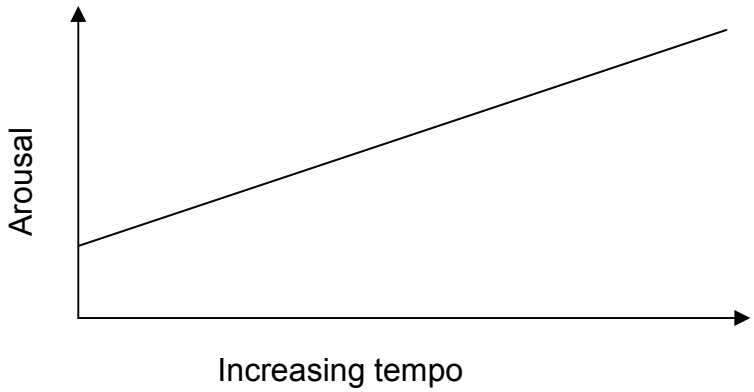

Figure 5: tempo and arousal

II. Tonality

Tonality or modality, as it is sometimes called, refers to the musical scale, or set of notes in which the music is based upon. Whilst there are many scales or modes in music worldwide, in western music the two most common are major and minor. Tonality is often instantly recognisable in its emotional valence of 'happy' or 'sad'. Like many educators, I have regularly performed action research on children and with few exceptions they correctly associate major with 'happy' and minor with 'sad'. As Webster and Weir (2005) concluded, this has been found consistently and Dalla Bella, Peretz et al. (2001; Webster and Weir (2005) found that this sensitivity is fully developed by about the age of six to eight years.

Tonality can also be referred to as consonant and dissonant which is defined as pleasant, acceptable sounding music as opposed to harsh, unpleasant music. Consonant music can be either major or minor, whereas dissonant music is usually unexpected and unfamiliar combinations of notes. In terms of information load, consonant music exerts the lesser.

Although the above gives us an appropriate understanding of human response to tonality for the purpose of this paper, any in-depth discussion regarding emotional attachment to the modes would delve deeper than the simple major/minor and happy/sad associations. Classical Greece understood each mode to have its own ethos. For example, according to Lloyd (1968), Plato associated the Dorian mode with masculine qualities and the Lydian with feminine.

III. Texture

Texture can refer to the thickness of the musical presentation as well as the juxtaposition of musical entries. The simplest texture –monophonic, refers to a single melody either by itself or played by many in unison. Homophonic music adds vertical support –chords to this, whilst polyphonic texture as the name implies is contrapuntal in nature. As one would expect, monophonic exerts the least information load, followed in order by homophonic then polyphonic. Simply harmonised melodies (like those of the rococo period) evoke positive emotions whereas complex harmonies evoke negative emotions (Gabrielsson & Lindstrom in Webster and Weir (2005)). Texture also refers to vocal or non-vocal (instrumental) music. Many researchers have found that vocal music (not wordless vocalises, but music with sung words), is considerably more disruptive than instrumental music. Salamé and Baddeley (1989) found this to be the case in a memory task involving visually presented material. This was confirmed by Hallam and Price (1998) and further supported by Furnham and Allass (1999) who concluded that the most distracting BM is fast, familiar vocal music known by, chosen, and liked by the listener. Further studies by Lesiuk (2005), Pring and Walker (1994) and again Hallam and Price (1998) have confirmed the higher listening load resulting from vocal music. Interestingly, instrumental arrangements of songs have about the same effect as if the words were being sung, possibly due to the visuo-spatial analysis of the implied word association.

IV. Volume, Form and Melodic range

As for **volume, form and melodic range**, results have run along expected lines. Narrow dynamic range, repetitive forms and narrow pitch range all result in easier processing (Pelletier 2004). Ascending melodic lines are associated with happiness, descending with sadness (Gerken in Webster and Weir (2005)).

V. Pitch

There is some interesting but yet inconclusive study in regard to our emotional and cognitive response to **Pitch**. Some researchers such as Savan (1996, 1998) believe that the co-ordination centre of the brain may be stimulated through bombardment of particular frequencies. Using a premise that the music of Mozart makes use of these high frequencies more than many other composer, Savan carried out experiments in her science classroom to ascertain whether aural stimulation at high frequencies (using mainly the music by Mozart) might help children with special needs. In her assessment, the response to the music was marked and highly successful. Amongst other things, she reported some students' under-estimating time perception, reportedly feeling physically better, and showing improved altruistic behaviours in class. Savan (1998), a science teacher, physiologist and biochemist, acknowledged that a number of explanations could be responsible for this, but presents her theory that certain frequencies release endorphins in the brain, which in turn have positive effects on blood pressure, adrenalin and corticosteroids. This physiological change, she says, results in calmer and more positive student behaviour.

Note that the use of the music of Mozart by Savan is not to be confused with the well chronicled 'Mozart Effect' claimed by Rauscher and Shaw in 1993.

Commercially based sound therapy companies such as the 'Samonas' movement and 'Advanced Brain Technologies' make a number of claims regarding the benefits of their auditory programs. They have in common:

1. Attributing philosophy to Dr. Alfred Tomatis, a French E.N.T specialist from the 1940's
2. A simplistic claim that high frequency sounds energize the brain

3. Little or no research documentation or explanation to back up their claims

VI. Combination effects

Some research has concentrated on the combined effects of these elements. In particular, Webster and Weir (2005) found that major and minor modes had different tempo thresholds for arousal effectiveness. That is, harmonised minor music at 72bpm produced the saddest response whilst non-harmonised major music at 144bpm produced the happiest response. This is supported by the Yerkes-Dodson law of arousal and performance in that music faster than 144bpm began to lose its effectiveness, but when in the minor mode, the level of arousal continued to rise.

VII. Response variation

Despite the general trends in responding to the emotional content within music, we can expect some variation in response based on memory (personal experiences) and personality type. We remember emotionally charged events:

> An impression may be so exciting emotionally as almost to leave a scar upon the cerebral tissues…
>
> James (1890)

And it could be argued that conversely the events we remember influence our emotional response to music. Given that younger children have had less opportunity to associate music with events, possibly they can more accurately perceive innate music-emotion intention. Here we have two areas ripe for further investigation.

The other plausible explanation has already been alluded to; that of personality type (introvert/extrovert continuum) as posited by Furnham and Allass (1999). They argue that people react differently to musical stimulation due to individual arousal levels depending on their personality profile. This is supported in the recent study on "Personality and Musical Preferences" (Kopacz 2005).

4. Research into the use of background music

I. Health

> an air like Home sweet home…will sensibly soothe the (sick)
>
> Nightingale (1860)

Florence Nightingale was aware of the contribution of music to health but at that time in history, live music –with the exception of singing, was too expensive to be seriously considered (p.57).

There have been many and various studies into the effect of BM on health, mostly centred on stress reduction. In health terms, stress refers to anxiety, fear or tension which results in physiological arousal (Pelletier 2004).

According to Cheek, Bradley et al. (2003) stress reduction and management programs are in abundance (p.204). Music therapy can be considered an expressive therapy which addresses stress by opening avenues of self-realisation in the discussion of the symbolism found in music. In his study on well-being in later life, Hays (2005) believes that music should be regarded as a branch of preventative medicine as the provision of music can provide "identity, stimulation, well-being and motivation" for the elderly (p.29).

The most common stress reduction outcome appears to be achieving a lowering of heart rate and blood pressure. Fagerlonn (2005) says that heart

rate remains a reliable mental stress indicator (p.1) and that "listening to music is an established and well known method to reduce stress" (p.6). Whilst many people subjectively report stress reduction outcomes from listening to certain types of music, Knight and Riccard (2001) claim physiological proof that music is an effective anxiolytic treatment. In Savan's action research in 1996, as well as observing behavioural change in the classroom she measured significant physiological changes attributed to the use of relaxing music in her classes. The results showed drops in systolic and diastolic blood pressure, pulse rate and temperature.

The use of music to reduce stress is well documented. A recent meta-analysis (Pelletier 2004) of 22 studies found that all yielded positive results. These studies –carried out from 1977-2003, were based on passive music listening as the intervention, and stress-decrease was based on heart-rate measurement and to a lesser degree self-report and observation.
Pelletier's results revealed:

- Greater stress-reduction benefits for subjects under 18 years of age (p.205)
- More significant results when the selection of BM was based on research rather than personal choice (p.206)
- More effective results with musically educated people (p.208)

In a study on the effectiveness of music therapy techniques in treating 51 teachers suffering from stress (Cheek, Bradley et al. 2003), significant benefits were found. Music listening, sharing and discussion was deemed to open avenues of personal and emotional exploration which facilitated empathy and communication within a group setting. The advantages of this process are

- no real musical expertise required by group leader
- applicable to adolescent students as well as adults
- inexpensive materials

The positive health effects of regular exercise are commonly accepted. Wininger and Pargman (2003) state that enjoyment is an important factor in maintaining an exercise program (p.57). Furthermore, they found that the most significant factor influencing exercise enjoyment is music. Through other studies (p.59) they purport appropriate 'exercise' music (which is highly dependant on the right tempo and volume (p.70)) to decrease feelings of fatigue and depression (from Lee, 1989) and to lower levels of perceived exertion (in Steptoe and Cox, 1988). Dubai based physical trainer Ed Truari obtains specially designed workout-music packages from a New Zealand based company. Each song in the package is tailored to the exercise routine, the key features being high-information load such as fast tempi, loud volume and the inclusion of vocals (Truari 2006).

II. Consumerism

Jensen (1998) says that music (through the emotions) can "drive the threesome of attention, meaning and memory", and that "listening to music is both cognitively and emotionally arousing". This has been discussed in some detail already, but marketing researchers and consumer response might equally quip 'music can drive your marketing dollar further'.

These days it is rare to find a supermarket that does not play BM. Many of us understand the objectives behind this music: keep the customer in a pleasant mood and in a frame of mind to want to spend longer time in the environment. Music enhances the environment through pleasure and stimulation (Coloma and Kleiner 2005), and it is these two determinants that affect consumer behaviour. This is the result of extensive research and investigation; the industry spends millions of dollars on music with the understanding that it will assist with sales (Kellaris, Cox et al. (1993).

Caldwell and Hibbert (2002) found that patrons spent longer in a restaurant with slow-tempo music playing, providing that they enjoyed the music. Consequently, patrons spent 24% more on food and (mostly) beverages with slow-tempo background music. This of course is the premise behind supermarket music. The music is almost exclusively instrumental, major key at about 70-80 beats per minute. The longer patrons linger and browse, the more they spend (Milliman 1982).

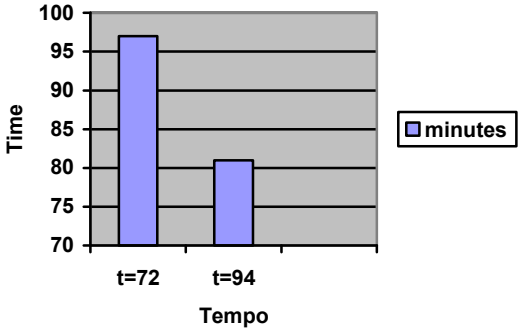

Figure 6: Adapted from Caldwell and Hibbert (2002)

Can the education sector manage to extract anything out of this research or do we simply pass marketing research off as immoral emotional manipulation without educational application?

The premise of most consumer-music research is that music manipulates our emotional state and creates a sense of well-being -or an illusion of. It can powerfully associate with our memories; it can be attached to products to enhance perception of quality and it can encourage us to linger or hurry.

Jacob (2006) cites a number of studies which claim that music can be associated with product and hence affect product selection. These include Yalch and Spangenberg (1990) and North et al (1999), who both determined that different styles of BM led customers to buy more expensive products. Associating music with message must be done with caution (Hahn and Hwang 1999) as certain types of music such as fast

music and unfamiliar music make greater demands on cognition and overload the listener. They also found an optimal level of tempo that maximises the message processing of customers which is dependant on the information load of the message. In short: light message –faster music, heavy message –slower music. This is consistent with our earlier discussion on levels of arousal and cognition in the Yerkes-Dodson law.

Organisations wishing to improve customer satisfaction look for any means possible to create positive illusions. For example, a study in the use of music in dense and crowded environments (Eroglu, Machleit et al. 2005) found that slow-tempo music can relieve the tension of crowding, but the choice of music should not be too cognitively dissonant from the reality. For example, it would seem bizarre to have a particularly slow piece of music playing at a densely attended sporting event. The 'fit' would create a sense of cognitive dissonance. The best solution would be to find a happy medium between the two extremes.

Crowded environments as well as open-empty environments can be stressful for some children. Conceivably BM could be used to create the desired illusion and provide a more comfortable atmosphere.

Perhaps the greatest use of BM in the consumer world is in the world of movies. Rarely is a film without musical accompaniment, the makers having an implicit acknowledgement of the power of BM in telling a story and creating an experience.

III. Work-place

There have been few studies on the deliberate use of BM in the work environment. One of these, a study of personal head set use by employees during work (Oldham, Cummings et al. 1995) found significant improvements in performance and a feeling of personal well-being for

those who chose to listen to music. This in turn improves work performance because mood states are directly linked with performance indicators such as absenteeism, job satisfaction and helping behaviour (p.549). Consistent with cognitive processing theories the study also determined that BM became detrimental to performance as the complexity of the job requirement increased.

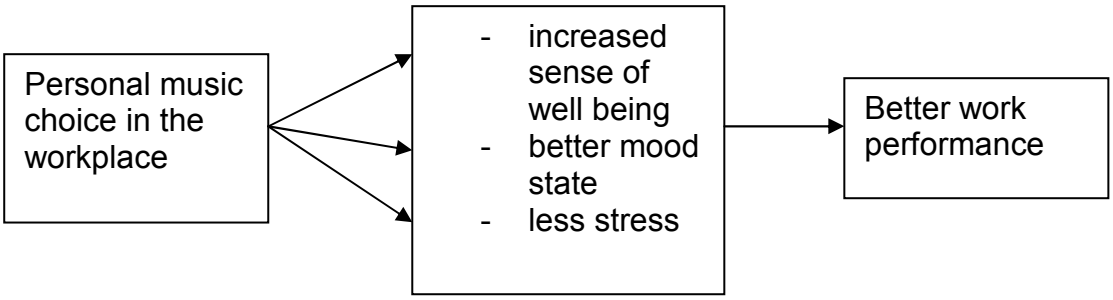

Figure 7: work place advantages in using BM

Another work-place/BM study supports these results. Music therapy specialist Lesiuk (2005) found that BM in the work place reduced anxiety and stress. In self-reporting surveys, employees from an information technology firm in an open concept work environment pre-reported the most stressful parts of their job and after working with background music for an unspecified period of time delivered feedback on their experience. First they listed the main work stress situations:

- office noise (distraction)
- keeping up with the workload, and
- dealing with clients

Is this any different to the classroom environment? Distraction, workload and communication assertiveness afflict schools as much as workplaces.

The most common positive responses from employees in Lesiuk's study in relation to having BM were:

- (BM) shuts out distractions
- immersed in my own world, more productive
- put me in a positive frame of mind, better mood
- general feeling of well being
- energising, especially after lunch
- calming before a large task, stay focussed for longer
- made time go by fast
- made me work quicker
- good for repetitive programming tasks
- helped my creativity

Respondents were also asked to list the negative aspects of having BM in their workplace. Interestingly, the negative reports (which were far outweighed by the positive reports) can be explained and solved through common sense and the research findings presented thus far. My comments from this basis are in italics.

- the same music over and over again
  increase the length of the play list
- the music is too close using headsets
  an alternative to headsets is the computer speaker
- complex music not good for difficult tasks
  as per research. Find low-load music or turn it off.
- vocals were distracting
  they demand more cognitive resources
- office communication difficult when people had headsets on
  use the computer speaker rather than headsets
- the first day took adjustment time
  Savan (1996) found this in schools, also

- classical stuff made me sleepy
  choose appropriate stimulation load, especially after lunch
- large dynamic ranges were distracting
  as per research
- hard rock and opera distracting
  vocals, fast tempi and sudden dynamic changes exert a large cognitive load

IV. Education

The majority of research studies into the use of BM in schools are looking for these outcomes:

1. Can BM improve classroom behaviour and atmosphere, and
2. Can BM improve the quality and/or quantity of work done in the classroom?

These two questions form the crux of this investigation. It is probable but not conclusive, that any improvement in (1) can result in (2). As one would expect, many of the studies examined provide findings for both these questions.

Leung and Fung (2005), in a study on facilities' improvement in Hong Kong primary schools, determined that sound was an important consideration in the optimal learning environment. They challenge the age old notion regarding quiet-classroom efficiency quoting Knirk (1987) "background noise (like music) with a level of about 35 decibels can maximize alertness, allow relaxation, improve classroom ambience, aid learning, and improve academic performance" (p.587).

Non-music teachers such as Ebert (2006) and Savan (1996, 1999) use background music as a behavioural and self control tool. Savan used the BM of Mozart for a 5-month period having it on the whole time during

science lessons with special-need children. She described the transformation in classroom behaviour as 'amazing'. Ebert also uses the music of Mozart in class and finds it "calms the students when played at the right level". He turns the music off if the classroom noise level rises and hence uses it as a subtle but effective non-verbal messaging tool: "when they notice the background music is gone they become quiet again".

The principal of Jumeirah College, Dubai chooses current popular music as a school song (with a limited shelf life) for motivational purposes and to promote school core values. He also uses that same music and other pieces of BM in corridors between lessons as a 'gap-filler' and atmosphere maker (Turner 2006). Whilst he does not systematically evaluate behavioural response, Turner strongly believes in the power of music to move people for the better.

Hallam and Price (1998) conducted BM experiments with a group of behaviourally challenged children and found that once the students had adjusted to the novelty of music in the classroom, there was a general decrease in hostility and a greater level of co-operation among the students. Hallam described these students as 'stimulus-seeking' and 'hyperactive', and reported that they still talked in class but they "talked **while** working rather than **instead** of working"! (p.90)
In 2002, the same researchers conducted experiments with more typically behaved students aged 10-12 years, comparing the effect of BM in maths class, on a memory task, and its effect on altruistic behaviour. The study found that calming music significantly improved maths work-rate, but only marginally improved rates of accuracy. Further, aggressive and arousing music lowered performance in the memory task and had a negative effect on student altruistic behaviour. However, Fogelson (1973) found that the reading performance of 8th grade students was adversely affected with BM. This affected higher ability students even more so.

In teaching music listening skills to year 8 students, one music teacher (Cooling 2006) presents musical works in a formal and background context. Following formal listening and analysis lessons on selected repertoire, Cooling plays the studied music in a background context as the students do simple written and artistic exercises related to the lesson. From her experience, Cooling has found that this mixture of visual art and music enhances student reflection and allows the students to contemplate the lesson of the day. Whilst classroom silence is a condition of this activity, Cooling has little trouble with students adhering to the 'no-talking during music' rule –"even with naughty classes!"

The positive student behaviour outcome is indicative of the success of Cooling's approach. The extra-musical benefits from this exercise are significant. In a world where mass media dictate the pace of events to unsuspecting children, here they are given an opportunity for reflection in a creative setting filled with music, art (drawing, colouring in etc), and no hurried deadlines. The students also practise how to behave in a non-verbal setting and delay their impulses to talk to each other. Also, the students gain a richer aural experience from the music. Whereas the culture of contemporary music sometimes allows participatory noise and talking during performance, the complexity of classical (in the sense of western European) music does not.

This last point relates to previous references including Hallam's (2002) discussion of the process of cognition in that the more complex the intellectual task, the simpler the BM needs to be. I contend that the converse is also true: that complex musical listening requires a free mind only engaged with (at the most) simple tasks. Cooling indicates an understanding of this principal, insisting of her students a level of personal quietness to allow their young minds to grasp a level of aural complexity greater than what has been previously experienced thus far in their lives.

A study of the use of music by elementary school counsellors in Virginia (Bixler 2001) revealed strong existing beliefs among counsellors that music had the potential to play a powerful role in their work, mainly in reducing stress and anxiety, and in encouraging self expression; in other words, promoting emotional health. Interestingly, these counsellors reported inadequate or non-existent training in the use of music as a counselling tool, and expressed a desire to get training if it was available. Whilst this study overwhelmingly advocated the benefits of music in counselling situations, there was very little description on the actual music activities undertaken.

Bixler presented a perplexing matter. The U.S National Advisory Mental Health Council (1990) has estimated that between 15% and 22% of school children suffer from mental health issues. Given the common knowledge that mental and psychiatric institutions have been using music therapy for years in mood and behaviour modification, why has it (and is it) being ignored as a resource in schools?

Student well-being is also a theme in the use of music at the University of Massachusetts Dartmouth (Barber and Barber 2005). Acknowledging the stress accompanying the transition from secondary to tertiary education, the "Jazz for Success" program uses smooth jazz as BM during orientation lectures on college life to first-year students. Their research suggests that students relax more with BM music, which reduces negative emotions. The University of Massachusetts Dartmouth seek to implement musical intervention wherever possible to "restore, maintain, and improve emotional, physical, physiological, spiritual health and well being" (ibid, p.5).

A unique educational program entitled "Boys Business" (Smith 2004) adopts learning **in** music to bond and engage Northern Territory boys from the middle school years. The program involves more than listening alone – singing songs is integral, but the premise is that the sharing of music can

enhance bonding and fellowship in boys from diverse social and cultural backgrounds. The program outcomes are not intentionally musical but designed to address “oral and emotional literacy” (p.1) and in this regard has been judged an outstanding success.

5. The problem with music selection in prior research

Unfortunately, there is a problem with many research investigations into the effects of BM on human behaviour and response, and that is in the selection of the music for the research.

It is speculative to contend that difference in human response is governed by musical genre, yet time and again, research has treated the selection of musical examples with an ignorance and casualness bordering on contempt for the complexities of music.

As is discussed in section 3 of this paper, it is the individual constituents of music and their unique combinations which affect response, not a summarising label (genre). For example, Davidson and Powell (1986) used ‘easy listening’ music for their experiments, and described it as having “a melodic melody line”, consonant chords, a “non-percussive” beat, traditional and lush orchestration predominantly strings and wind (p.30). This clumsy attempt to describe a musical genre has excluded discussion regarding other important music constituents such as tempo and volume and never quantifies what a ‘melodic’ melody is, or ‘non-percussive’ beat is. Furnham and Allass (1999) rightly say that “(describing music by genre) does nothing to indicate the exact characteristics…in stimulation or distraction” (pg 30). There is so much musical variety within genres such as classical and jazz, that it is essential –particularly for research - to define music in terms of its component constituents and characteristics.

Despite this acknowledgement by Furnham and Allass, they fall into the same trap and worse. In their 1999 study on musical distraction, they used a panel of six 'experts' to select music. However, the music was limited to only three 'contemporary' pieces, and their definition of a music expert was minimum grade 5 theory. Grade 5 theory is a standard reached largely by school children, entails no study on the function of music and could hardly be considered in any way expert. In the final discussion on their experiments, they admit their music selection may have been too narrow for this study. This limits the usefulness of their findings.

Likewise Kellaris and Kent (1992) embark on an experiment to ascertain the effect of music on temporal perceptions. Music selection compromises his findings because

1. He does not prescribe a conventional definition or application of 'atonal' music
2. His use of original 'pop' style does not describe the musical constituents
3. Youth-orientated retail music has a very particular commercial function* which Kellaris doesn't explain, and I argue against his claim that this 'youth music' is appropriate for the 20-40yr age bracket of his subjects.
4. His listening condition was forced exposure as opposed to background listening. Active listening and BM are not the same. His methodology does not appear congruent with the aim of the study.

*In youth retail settings, BM is often played to reinforce a sub-culture, and keep parents out of the shop.

In their "Jazz for Success" program at University of Massachusetts Dartmouth, Barber and Barber (2005) settled on a 'smooth jazz' format believing the musical constituents (soft, melodic, cool, unobtrusive, slick, polished and relaxing) could help ease the stress and anxiety often

encountered by first-year university students. This at least has implied musical structures. Smooth jazz is a jazz subset of low listening-load constituents such as slow to moderate tempi, narrow pitch and volume range and simple textures.

Hallam and Price (1998) selected music based on previous scholarly recommendations, and then further tested appropriateness with a separate group of student responses to the effects of the music. In this study, the selection of music went through a more rigorous process.

In reviewing investigations into the general effects of background music, Oldham, Cummings et al. (1995) suggest that a failure of research is to find genre superiority in music. This is not a failure; the wrong question is being asked. People don't respond to genre, they respond to tempo, modality, texture, melodic direction, pitch, harmony, timbre and dynamic control. Appropriate combinations of these music constituents for a desired behavioural result are present in folk, classical, country, pop and jazz music.

In business, Areni (2003) says "(the) use of atmospheric music is still…dominated by managerial intuition rather than scientific evidence" (p.162). Similarly, it does seem peculiar how little credence has been given to using musical expertise in the selection of music for research purposes. These examples demonstrate that many researchers' musical choices are based on intuition and personal preference rather than expert advice, an observation that could lead to further original enquiry

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6. Discussion and conclusion

I. Summary

In conclusion, research drawing from manifold disciplines confirms that BM does affect human behaviour and response.

Can the use of BM enhance a learning environment? Yes. But this will be dependant on its judicious use and facilitation, and that means educators will need to be equipped with fundamental knowledge of music psychology.

A summary of the positive effects of BM as determined through research in education, health, consumerism and the work-place is listed below, given that some descriptions are much the same but from different perspectives.

BM can

1. affect mood state
2. alter perception of time and space
3. affect physiological change
4. reduce stress and anxiety
5. enhance relaxation
6. cause arousal
7. motivate
8. be associated with product
9. enhance message reception
10. reduce noise distraction
11. aid concentration
12. aid memorisation
13. increase on task performance
14. enhance creativity
15. increase the enjoyment of mental and physical activity

Does music listening make us smarter? Since the now famous spatial reasoning experiments using the music of Mozart by Frances Rauscher (1993), this question is still being debated. From the studies and findings in this review, it would appear that music listening in itself does not directly make us smarter, but that its effects are all about arousal. This arousal enhances levels of on task performance and readiness to engage in short-term learning projects.

The educator/teacher/facilitator/user needs to be aware that

1. listening to music carries with it a cognitive processing load
2. the diversity of different music styles cause different psychological effects
3. music is suitable or unsuitable for use as BM depending on its constituents
4. tempo, tonality and volume are the three constituents which require the most scrutiny

II. Global goals of education

"The basic purpose of education is to bring individuals closer to the goal of optimal use of talent and enjoyment of life" (Gagne and Briggs 1979). Re-phrasing Gagne and Briggs, if educators can make learning easier, more successful and more enjoyable, then we should. A report from the OECD (2002) states that one in six students hate school (not to be confused with hating learning). An important ingredient of a healthy childhood is **enjoyment**, lack of which can result in stress. This stress interferes with brain circuitry and builds up hormone levels all making learning more difficult (Chandler 2006).

BM **can** assist in making education easier, more successful and more enjoyable. If we achieve this, then we head towards another important

educational goal: to develop a love of learning which will remain with students for a lifetime (Webb 2001). BM can contribute to a quality education which addresses the unique abilities of each student, and contains a "positive emotional experience" (ibid). The acknowledgement of individual learning, and the well-being of each student is central to South Australian education policy in their future directions document (DECS 2005).

III. Applying BM to the learning environment

But let us consider the learning environment; it is not just restricted to the classroom, it is all around us. Every interaction is a potential learning situation, and this happens in

- the classroom
- the school corridor
- the library
- the schoolyard
- the canteen
- the gymnasium
- the home

Any attempt by me to suggest a range of possible applications for the use of BM in the learning environment will soon be augmented by creative minds and some team brain-storming. Also, educators should be encouraged to engage in their own action research to discover what works for their students and their particular circumstances. However, I list some starting points below and for the benefit of summary, repeat some ideas already utilised and acknowledged in previous studies listed in this paper.

- **Student congregation at the beginning and end of the school day**
  - Cheerful music that has momentum. Perhaps moderately fast baroque movements.
- **The general classroom**
  - Music to match the cognitive task demand in order to appropriate arousal levels required for optimal learning.
- **The teaching of history or any emotionally charged events**
  - Music to support negative or positive historical facts - see pg. 9.
- **Physical education**
  - The use of music to increase fitness work-rate, lower exertion perception and enhance enjoyment (see pg. 22). I have witnessed this on a whole school basis in Qingdao, China – morning exercise for 1500 on the school oval with very loud and fast music.
- **Sporting contests**
  - Sports psychology increasingly uses music to motivate athletes. Some schools already use music in this way.
- **Moving students between lessons and after breaks**
  - March music (120 bpm, duple meter) to keep the students moving.
- **The library/private study**
  - Students' to be educated on the effects of musical listening on arousal and hence choose 'study' music accordingly. A library of appropriate study music to be retained and made available.
- **Pre and post school assembly**
  - Music to set an appropriate ambience, and to encourage movement with a minimum of fuss.
- **Celebrating achievement**

- In the assembly (or other) setting where student achievements require due reward.

- **The canteen line**
  - Music to alter waiting perception and encourage patience.
- **The school dining room**
  - Music to encourage conversation and appropriate behaviour.
- **Reception telephone on hold systems**
  - Music to alter waiting perception and to promote the school ethos. If possible, the use of music recorded by students.
- **Reception waiting area**
  - Again, music to alter waiting perception and encourage positive reflection.
- **Strengthen school vision statements**
  - When opportunities arise, repeating a musical piece which conveys school ethos, or choosing a song with words representative of school philosophy.
- **Withdrawal room**
  - Some schools operate a withdrawal room system; a form of punishment where the offending student is solitary in a quiet room for the purpose of self-reflection. Music can be used to enhance the introspection process.
- **Counselling**
  - Music for reducing stress and anxiety, and encouraging self-expression (see pg.30).

The quality of home life and the quality of relationships that children have with significant adults affects children's well-being and hence their learning (Webb 2001). BM can be used in the home to open up lines of communication, promote morning alertness and readiness, assist in household chores and make dining experiences more pleasant and social.

IV. The future

As the growth projections predict (Lo 2005), the ubiquitous portable music player is here to stay. This issue of 'ipod' use in schools is presently discussed and debated in educational circles, with teachers searching for understanding and consequently forming policy. We need to base new policies from an informed position.

Students want to learn. The successful learning which leads to 'flow' is one of life's great joys. With teenagers spending an average of 3-hours per day listening to music (Hallam, Price et al. 2002) we have a duty to educate parents and their children as to the effects and implications of listening to music during study.

Just as the learning environment is greater than the classroom, so is instruction greater than teaching alone. The savvy educator knows that a high performance learning environment is representationally rich, that students learn in different ways and through the strength of their senses. To engage the learner means to understand his/her unique learning profile. Learning is an individual acquisition. Music can motivate and inspire learning, encourage reflection, reveal the affect. "Achievers in life use inspiration and motivation to overcome barriers" (Webb 2001).

I believe that the greatest benefit in the integration of music in learning environments is through the enhancement of emotional intelligence. This newly considered area of educational importance is yet to be fully embraced by educators, but with increasing numbers of educational institutions embracing the emotional and social well-being of students as a priority, it warrants high status. The 21st Century worker requires new competencies based around emotional intelligence. Technical skills are not enough, life skills are required (Microsoft 2003). If BM can play a part in facilitating critical thinking skills, creative problem solving and more

effective interpersonal communication, then it has a place in a contextually rich learning environment. Music, the most emotive of the arts, awakens in us our emotional self.

Can music listening deliver to us more intangible benefits of great value such as a moral code?

Beethoven thought so: "I should despise a world which does not understand that music is a higher revelation than all wisdom and philosophy."

Plato thought so: "Music is a moral law. It gives soul to the universe, wings to the mind, flight to the imagination, and charm and gaiety to life and to everything."

The Unknown Poet thought so: "Music speaks what cannot be expressed, soothes the mind and gives it rest, heals the heart and makes it whole, flows from heaven to the soul."

Presently, the world of neuroscience is providing great impetus for new understandings on the affect and nature of music.

"New findings and technical breakthroughs are often accomplished only by bridging the gap between completely different disciplines…" (Koizumi 2001). Are we on the cusp of new learning areas in music-science, music psychology or music and EQ? Should new units in these areas be developed for the school curriculum?

Neuroscience is rapidly enhancing our understanding of how the brain works, and how the senses affect brain operation. These studies are debunking old understandings. For example, music is no longer considered a right-brain activity but a whole brain activity (Reimer 2004); and Lehr

(1998) “Music more fully involves brain functions in both hemispheres than any other activity that researchers studied”. Again, “Nothing activates as many areas of the brain as music…both hemispheres light up like a pinball machine” (Hodges 2006).

Perhaps this explains why music seems to be such an integrating benefactor within the human condition. Music is an emotional, intellectual, spiritual and physical activity that engages the whole brain. The human is naturally musical and hence capable of responding to music. With new understandings emerging from this array of multi-disciplinary study on the positive effects of music listening on our total well-being, the future of music in education looks bright.

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