



Candidates must complete this page and then give this cover and their final version of the extended essay to their supervisor.

Candidate session number			
Candidate name			
School number			
School name			
Examination session (May or November)		Year	May 2013

Diploma Programme subject in which this extended essay is registered: Psychology  
(For an extended essay in the area of languages, state the language and whether it is group 1 or group 2.)

Title of the extended essay: How does music affect the cognitive ability and performance of humans, and is it a significant influence in human existence?

**Candidate's declaration**

*This declaration must be signed by the candidate; otherwise a grade may not be issued.*

The extended essay I am submitting is my own work (apart from guidance allowed by the International Baccalaureate).

I have acknowledged each use of the words, graphics or ideas of another person, whether written, oral or visual.

I am aware that the word limit for all extended essays is 4000 words and that examiners are not required to read beyond this limit.

This is the final version of my extended essay.

Candidate's signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Supervisor's report and declaration

The supervisor must complete this report, sign the declaration and then give the final version of the extended essay, with this cover attached, to the Diploma Programme coordinator.

Name of supervisor (CAPITAL letters)

Please comment, as appropriate, on the candidate's performance, the context in which the candidate undertook the research for the extended essay, any difficulties encountered and how these were overcome (see page 13 of the extended essay guide). The concluding interview (viva voce) may provide useful information. These comments can help the examiner award a level for criterion K (holistic judgment). Do not comment on any adverse personal circumstances that may have affected the candidate. If the amount of time spent with the candidate was zero, you must explain this, in particular how it was then possible to authenticate the essay as the candidate's own work. You may attach an additional sheet if there is insufficient space here.

Candidate approached me after he had received several sessions with other essay supervisor.

The piece ( 's essay) reflected thorough research on a riveting hypothesis which outlined extensive rationale.

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I have read the final version of the extended essay that will be submitted to the examiner.

To the best of my knowledge, the extended essay is the authentic work of the candidate.

I spent  hours with the candidate discussing the progress of the extended essay.

Supervisor's signature:

Date:

**Assessment form (for examiner use only)**

Criteria	Achievement level					
	Examiner 1	maximum	Examiner 2	maximum	Examiner 3	
A research question	1	2		2		
B introduction	1	2		2		
C investigation	2	4		4		
D knowledge and understanding	1	4		4		
E reasoned argument	1	4		4		
F analysis and evaluation	1	4		4		
G use of subject language	2	4		4		
H conclusion	0	2		2		
I formal presentation	1	4		4		
J abstract	1	2		2		
K holistic judgment	1	4		4		
Total out of 36	12					

# IB Extended Essay

Topic of Discussion: *How does music affect the cognitive ability and performance of humans, and is it a significant influence in human existence?*

**2013**

**Word Count: 3,057**

**Number of Pages: 15**

**Abstract:**

This report aims to focus on the merits of music; how it benefits students as well as its various psychological benefits. In addition, it will explore the history of music, and reveal its integral role in the development of humans as well as in various societies since the modern evolution of man, *homo sapien*, came into existence. Various examples of successful musicians and stories of the effects of music will be provided, as well as hard scientific data intended to show the direct, measurable effect of it on the human psyche. By the essay's end, the importance of music to education as well as general human experience will be justified and explained through the sufficient provision of evidence and analysis.

*Abstract Word Count: 120*

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## **Introduction**

The saying “education opens doors” is a commonly used, undoubtedly true saying. Education opens the mind, and if it does not completely convince someone of an idea, it at least allows them to understand and consider it. The mind is opened, and ignorance is transcended into understanding. However, American schools today often discount music as a form of effective education. While it is not quite labeled as useless, it is often considered more of a hobby or a pastime, and nothing more. It is, in other words, a distraction from more ‘useful’ studies. Children begin to drop their music classes in favor of more study time, or yet another math tutorial. But those who so quickly and thoughtlessly discount music have obviously not put a great amount of effort into studying the effects of music. There is a reason it has been around in some form or another since the dawn of man, why it has defined cultures and terrified others during times of war. Music intrinsically and naturally has a profound psychological effect on the human psyche. It taps into a part of the brain which cannot be unlocked through other means, and develops it while benefiting all other forms of study. Of course, these wild, not often discussed claims may seem ludicrous upon first suggestion; how could something so abstract and passive wield such intellectual power? However, as schools drop their musical education and children begin to discount its value, studies have been initiated to prove the previously mentioned points. And now, statistical examples, anecdotes from history, and raw, scientific evidence are coming together to finally prove the power of music, and show just how many doors only it can open.

## **Music and Success**

As a first step to introducing the idea of power in music, the notion that 'music does not positively improve academic performance' shall be discounted. As a defender of the academic power of music, the band director for Whitworth University performed a study which revealed the differences in academic performance between those in band, and those not. This particular study showed that most incoming freshmen showed up with an average Math SAT score of 600, while the Band Freshman averaged out at 615.71. In addition, he revealed the college's GPAs. The average student at Whitaker University received a 3.38 this semester, while those in the Wind Symphony, Women's Choir, Symphony Orchestra, Whitaker Choir, and Jazz Ensemble all averaged out with GPAs at least two tenths of a point higher than the norm (Strauch). Results like this, while they do not provide solid fact for how music positively impacts cognitive ability, it irrefutably shows at least a correlation to academic performance. And data like this is not isolated to this particular scenario; high schools all around America show similar results between normal students and band students. In almost all cases, band makes a positive difference (Strauch). Whether this change occurs simply because of band's difficult and disciplined regimen is hard to say, but regardless of exactly what in the brain is changed, it is difficult to argue that nothing in the brain is affected at all.

In addition to statistical correlation, there are several famous and not so famous anecdotes which tie music to intellectual aptitude. The most famous and most often used example for this phenomenon was Albert Einstein. A scientist known as much for his quirkiness as he is for his amazing theories, Einstein was in addition to everything else an accomplished violin player. While performing live was something he did not spend his time doing, it is well known that when stumped on the piecing together or comprehension of one of theories,

Einstein would stop his contemplating, and pull out the violin. Improvising for hours on end, Einstein said the music helped his mind to see the many sided theories in different lights, and piece together what was previously unfathomable (O'Donnell). In truth, there is much proof, anecdotal and scientific, that reinforces the idea that music activates a part of the brain which nothing else can. It ties together all the information one has learned through connecting it to *both* hemispheres of the brain: the creative left and the logical right. However, proof for such a phenomenon will be elaborated on later. For now, look even to political leaders and prominent public figures. It is not surprising that many regarded as the smartest are revealed to be musicians themselves. Bill Clinton, of course, was an avid saxophone player through high school, and he has said on multiple occasions that the band was an essential experience in his life (O'Donnell). In addition we have some of America's greatest geniuses, Benjamin Franklin and Bill Gates, both revealed to be musicians themselves. As previously stated, such facts do not prove the merits of music, but the obvious abundance of musicians within the realm of success and the claims of its intellectual merits among those with success only further establishes the idea of its power.

### **Music and the Brain/Body**

Now, while these statistics and anecdotes effectively open one up to the idea of the power of music, nothing better illustrates its effect on the brain better than cold, hard scientific data and findings. Apparently, not even playing the music is required to feel intellectual effects. According to The Center for New Discoveries in Learning, the potential for learning and comprehending new information can be increased a minimum of five times when exposed to Mozart's music or baroque music at sixty beats per minute. The study showed that listening to

this music at that tempo encourages the brain to study it, thus activating the left side, while simultaneously transferring this information to the right side of the brain (Anderson). Music, in fact, is shown to have a noticeable affect throughout the body in addition to the particulars on the brain. Classical music from the baroque period, for instance, slows the heartbeat and relaxes the person, allowing him to further concentrate. Apparently, such music also increases the frequency of brain waves, which is detected with an electro-encephalogram (Anderson).

The idea of something as abstract and commonplace as music affecting a person's cognitive function does at first seem astonishing. But looking at the specific changes in a person responding to music shows how deep the effects of these carefully crafted sound waves truly are. Several studies over the years have pointed to the correlation between different types of music and changes in heartrate (Chandrasekaran). Of course, this reveals that all music does not necessarily have a *positive* impact on the body and mind; it simply shows that all music can have an effect. Faster, more intense music increases tenseness and anticipation, heightening heartrates and making obvious changes in heartrate. But slower, more relaxing musics, and specifically classical music, are shown to have a calming effect on the body (Chandrasekaran). The College of Nursing at Haohsiung Medical University in Taiwan performed a study on expectant mothers, and produced results showing a drastic reduction in stress, anxiety, and depression after two weeks of listening to Brahms lullaby, music by Beethoven and Debussy, nature sounds, and traditional Chinese children's songs (Lunedì). Many anesthesiologists also claim that calming music can reduce the levels of stress-related hormones in the body, such as adrenocorticotrophic (ACTH) and prolactin (Henry). In addition, studies have been performed to display the connection between music and heightened immune systems. Michigan State

University, for instance, reported that listening to music for only fifteen minutes could increase levels of interleukin-1 (IL-1) in the blood from 12.5 to 14 percent (Jamias). Interleukins, a family of protein, are associated with blood and platelet production, lymphocyte stimulation, and cellular protection against AIDS, cancer, and other diseases (Jamias). In essence, before even diving into the specific benefits of learning music, we can identify the core relation between music and human experience in general. If simply listening to music can produce such changes in the chemical content of the body and mood of the mind, the overall effects of the study of music must have a similarly drastic effect. However, the specifics of these changes will be elaborated on later.

While the effects of music on adults has been proven through various examples, further studies have shown that sound, and specifically music, are crucial in human development even from a very early age. For example, music can stimulate the heart rate of a baby when it is still in the womb, and premature infants who listen to music gain more weight, leave the hospital earlier, and generally have a better chance for survival (Anderson). These effects are real and measurable, and point to the idea that music is a key and integral role in both human life and development. Adult musicians, in addition, are shown to exhibit more EEG (brainwave) coherence than non-musician adults, and adults who received musical training starting before the age of seven even showed an anatomical difference. In other words, the effect of music on their development was powerful enough to alter their brain on a physical level (Laurence). If music can be that powerful, to the point that anatomy is altered, how could it be so discounted by so many in the field of education? Music, like math or reading comprehension, develops parts of the brain; whether or not the student is destined to go into either field is

inconsequential. It is unimportant (Laurence). Math is often described as a mental gym, a place to train cognitive problem solving and general logic. Reading comprehension promotes intuition and creative ability, bringing different, very important world views into focus. All are important to the development of a person, and music is as ancient a study as reading and math, perhaps even more so. In all it is important, even crucial, and should be heavily considered when addressing the issue of child development within schools.

The power of music, becoming better known throughout the world, has even taken hold in the world of psychology. Music therapy is a relatively new, fast growing realm in general therapy. While incredulous sounding to some, it has shown measurable and effective results since its implementation (Music Therapy and Mental Health). Music's effect on mood and cognitive thinking, two of the very aspects general psychology addresses, are substantial and have been utilized to their full effect in this type of therapy. There is no specific format to how this therapy is performed, except of course for the fact that music plays a key and integral role in all of them. Different types of music produce different results, though the change is obvious (Music Therapy and Mental Health).

### **Music and Evolution**

The integral nature of music, in all its aspects, is heavily reinforced by the responses shown in animals. And it makes sense that animals should have a response; sound, at least, is one of the most important factors pertaining to the senses. A beautiful sight can inspire feelings of content and admiration, while the sight of a large predatory animal will inspire feelings of fear or aggression. If the perception of sight has such a large effect on human emotion and base physiological responses, why then would hearing, arguably sight's most

important counterpart, be any different in regards to the responses it creates? Consequently, it is shown to have a strong impact on all forms of creatures; the crack of lightning or the cry of a predator inspires fear, an emotion associated with animals in addition to humans, and vice versa, the sound of a bubbling creek or the mating call of a female inspires excitement or content in animals (Mapes). And while this base connection between sound and emotion is found across almost every avenue of different organisms, those capable of higher level thought processes incorporate sound and even, yes, music, as a fundamental part of their existence. Wolves, birds, whales; all these creatures create their own form of sound meant to be used as a rudimentary form of communication (Mapes). And even in human culture, is music not an indirect form of communication? Indeed, it transcends language even to this effect. For whereas language effectively communicates ideas and thoughts, music achieves exponentially more in the realm of emotion. And it is apparently so with animals; whales communicate to each other through song, and both wolves and birds use their distinctive howls or songs to mark territory or intimidate members of opposing factions or species (Mapes). It truly serves a purpose across almost every avenue of life examined, and thus we must treat it seriously as an integral part of life itself.

And even before humans were, for all intents and purposes, 'human', we were primitive and undeveloped. Modern technology did not exist, and modern forms of communication were undeveloped along with it. Even the establishment of trade or cooperation among neighboring tribes and villages was rare for a time, and interconnectedness of humans was in a stage before infancy. But even in this time period, music served an integral role it seems (Cross).

Archeological findings have shown rudimentary musical instruments constructed in societies

about 40,000 years old (Cross). This is significant, for while there was likely musical activity before the creation of said instrument, likely in the form of vocalized song, the creation of an instrument within societies likely focused on little more than survival shows its fundamental importance. Music was integral to humans and value was placed on it, which apparently has been the status quo for what is likely more than 40,000 years.

Some scientists and historians, however, have claimed music was more of a technology created by humans rather than an integral part of our evolution. In their claims, music was created by humans simply because it is pleasurable, and this is why we listen to it today (Cross). All in all, this seems to be both an illogical and contradicting idea. While not a direct stimuli provided by the world in which we live in, music acts as a milestone of intellectual development by displaying higher level forms of communication (Harvey). By the critics' logic, language would also be a 'technology' developed by humans, and in a sense, it is. But what lies behind the language: thought, ideas, opinions, language is higher cognitive function in that it represents what goes on in the human brain. And thus it is the same way with music; humans, with their mental capability compounding animalistic emotion, consequently have a wider and more in depth range of emotions. And just as language is a way in which we express thought, music is a language which expresses emotion. Yes, in a certain perspective it is indeed a technology, but it was only created to bring what we have acquired through evolution, higher level emotion and communication, into a listenable form (Harvey). And in a sense, it is also simply a condensed and precise form of sound, a phenomenon which has already been shown to have effect on a wide range of species (Mapes). Just as art can communicate emotion

through sight, music brings in emotion through an auditory medium. And this explains its presence throughout the analogues of history.

As a milestone in human evolution, music has become more and more important in the lives of humans. The significance of the effect of music was realized early on in human history, and thus it is only natural that societies integrated it into their cultures (Harvey). Leaders for instance, realizing music's effect on all people, peasants and nobles alike, used it to inspire, whether that inspiration was aimed to create violence or simple pride in a country. Its power has been seen as Godly since its wide practice, and has thus been used extensively in the realm of worship. In the Dark Ages, for example, worship was the only use of music, and it often inspired piety in church's followers at the time, a fact church leaders were keenly aware of (Cross). And thus, while music has been used for purposes of evil, good, and neutrality, the fact that it was used so extensively in our history indicates its importance in human development: not just evolutionary development as a species, but cultural development in societies.

The idea that music is an integral and important part of the human identity is reinforced by the response to music as early as infancy. Many children respond positively to positive music, and this phenomenon has even been capitalized on by major companies such as Baby Einstein, who sell products which expose children to higher level classical pieces and such (Anderson). But evidence has shown that many babies can find a beat, derive emotional pleasure from music, and in some cases identify a certain pitch. Studies have shown that every human is born with musical capabilities, and that, if capitalized on early, most can become adequate musicians (Anderson). Such capabilities reinforce the idea that music has become an inherent part of the human mind; in essence, we have evolved to adapt music as part of our

overall psyches. To discount these ideas, the connections between humans and music, the fact that we have used music as a main part of human life for the past 40,000 years, to discount such a powerful force as 'unnecessary' in comparison to reading and writing is simply a misinformed and severely limiting analysis.

### **Conclusion**

Music, in the end, does not meet one simple definition, one category of description. It is not, as many assume, a simply hobby or pastime. It is not simply an extracurricular activity imposed as an extra course secondary to those of reading and mathematics. Even further, it is not simply an enhancer of the mind or an emotional crutch in times of stress. In truth, music through the passage of time has proven to be a concept more than the sum of its collective parts. It is arguably on the same level as any other sense, affecting human existence on a daily and unpredictable basis. Those who do not understand the power of music, even, have at some point in their existence been affected by its grandiose influence either through direct interaction or by its indirect integration into all life. As our role models, history, and scientific findings prove, music is the universal language of the world, and the constant presence which has shaped our existence and perceptions since the dawn of man.

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