

# Impact of Music on Brainwave

李韋德、高富建

E-mail: 381813@mail.dyu.edu.tw

## ABSTRACT

Human behaviors are mainly controlled by ideas, which are called brain wave. Our brains transfer these brainwaves throughout our bodies so as to control our behaviors and thinking. Nowadays, scientists divide brainwaves with different frequencies into four frequency bands of brainwave like (Delta), (Theta), (Alpha) and (Beta) from low frequency to high frequency. Each frequency band of brainwave has different significance and characteristic. This paper is mainly to discuss the influence of music on brainwave and the influence of different input methods on brainwave. In this research, the influence of music on brainwave is mainly to discuss, under music environment with different melodies, brainwave difference occurs when learners carry out logical reasoning. The experiment is carried out in such a manner that we analyze changes in characteristic band energy of brainwave when a learner is reasoning logically under the piano music environment of different melodies, including pop music, new age music, classical music and romantic music. The objective of this study is to effectively improve the learning efficiency of learners by analyzing influences of different music on learning brainwaves. With regard to the study on influences of hand input and keyboard input on brainwaves, it is mainly to discuss which character input method is helpful to logical thinking. At present time, keyboard input has gradually substituted hand input, but about whether the change in character input methods would result in learning difference, this research will implement comparison and analysis from difference between brainwaves caused by different input methods.

Keywords : Cognitive Neuroscience、EEG、Learning Energy Index

## Table of Contents

封面內頁 簽名頁 中文摘要 iii ABSTRACT iv 致謝 v 目錄 vi 圖目錄 viii 表目錄 ix 第一章 緒論 1 1.1前言 1 1.2研究動機 2 1.3 研究目的 2 1.4論文結構 3 第二章 腦波與應用 4 2.1認知神經科學簡介 4 2.2腦神經科學簡介 4 2.2.1 大腦的構造 5 2.2.2神經細胞 8 2.3腦波簡介 10 2.3.1腦波圖 10 2.3.2 腦波分類 11 2.4腦波量測 12 2.5腦波訊號的干擾 14 2.6腦波的應用 15 2.6.1音樂對於學習的腦波應用 15 2.6.2遊戲的腦波應用 15 第三章 EEG量測模組設計 17 3.1腦波量測 17 3.2腦波量測系統方塊圖 18 3.2.1腦波擷取電路 20 3.2.2 USB-6009資料擷取卡 24 3.3 LabVIEW腦波擷取介面 26 第四章 系統實作與分析 27 4.1系統架構與分析 27 4.2腦波訊號的擷取方法 29 4.2.1 腦波訊號分析介面 30 4.2.2 腦波快速傅立葉轉換(FFT) 31 4.2.3 事件關聯貫數值(ERCoh) 31 4.2.4 腦波學習能量指標(LEI) 32 4.2.5不同曲風音樂對於邏輯思考腦波的影響分析 33 4.2.6手寫與鍵盤輸入對於學習腦波量測 34 4.3腦波特徵頻帶能量分析 34 4.3.1聆聽不同音樂對於學習腦波的影響分析 34 4.3.2手寫與鍵盤輸入分析 41 第五章 結論 45 參考文獻 46

## REFERENCES

- [1] 本文章參考自:淺談認知神經科學 國立嘉義大學家庭研究所網站文章 [http://blog.xuite.net/kc6191/study/34892383初識認知神經科學\(Cognitive+Neuroscience\)](http://blog.xuite.net/kc6191/study/34892383初識認知神經科學(Cognitive+Neuroscience))。
- [2] 湯雅雯, 『Design and Implementation of an EEG Measurement System and the Nonlinear Analysis of EEG Signal』, 國立成功大學碩士論文, 民國94年。
- [3] [oneyeaenglish.com/2012/04/17/人類大腦構造和功能/](http://oneyeaenglish.com/2012/04/17/人類大腦構造和功能/)。
- [4] Neil Fraser, The Biological Neuron. <http://vv.carleton.ca/~neil/neural/neuron-a.html>。
- [5] Ya-Wen Tang, Design and Implementation of an EEG Measurement System and the Nonlinear Analysis of EEG Signal, Department of Electrical Engineering National Cheng Kung University Tainan, Taiwan, R.O.C, July 21, 2005.
- [6] 台北榮民總醫院 整合性腦功能研究室 <http://ibru.vghtpe.gov.tw/chinese/eeg.htm>。
- [7] 王智弘, “The Program Design of EEG Analysis for e-Learning”, 私立大葉大學碩士論文, 民國100年1月。
- [8] 王秀園, 腦子學習知多少? <http://blog.tchcvs.tc.edu.tw/b21026/51>。
- [9] 國立清華大學生命科學系神經系統簡介 <http://life.nthu.edu.tw/~g864264/Neuroscience/neuron/brain.htm>。
- [10] 關尚勇, 林吉和, “破解腦電波”, 藝軒圖書出版社, 24-30頁, 民國91年。
- [11] 洪蘭。真的有「莫札特效應」嗎?。康健雜誌, 1999年, 第12期。
- [12] Lisa Zyga (2008). 'Mind Gaming' Could Enter Market This Year. Only Perception.

[http://only-perception.blogspot.tw/2008/03/blog-post\\_8986.html](http://only-perception.blogspot.tw/2008/03/blog-post_8986.html).