聆聽音樂時腦波及心率變異性之變化

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摘要

近年來越來越多的研究者在推廣音樂應用於用於放鬆及焦慮舒緩，很多相關研究也證實了音樂的效果能夠在焦慮量表及一些生理數據上反映出來，但目前爲止，很少的研究利用腦波(EEG)和心率變異性(HRV)來驗證音樂對人類腦部活動造成的影響。本研究利用腦波和心率變異性來測量受試者在聆聽音樂過程的腦波變化，並試圖釐清音樂、腦波和心率變異性之間的關係。本研究安排 16 位大學生自願聆聽音樂並量測其腦波與心率變異性，實驗程序爲無音樂、聽古典音樂、聽搖滾音樂三種情境各三分鐘，分析及比較各情境下腦波及心率變異性各指標於各情境下的變化。 在腦波頻率能量的分析方面上，發現沒有聽音樂的情境下有最大的 Alpha 能量，再來爲聽舒緩音樂，而聽搖滾樂時的 Alpha 能量最小。而在 Gamma 方面，本研究發現不管聽何種音樂，其 Gamma 能量都比沒聽音樂大。音樂對 Gamma 的影響是相當顯著的，不管是舒緩音樂或搖滾樂皆使受試者的 Gamma 能量上昇。根據相關的研究，感官刺激及選擇性注意力都能使的個體 Gamma 能量上昇，本實驗也驗證這樣的說法。本研究也發現音樂喜好的因素會影響受試者的 Alpha 能量的強度。而不喜歡搖滾樂受試者在聽搖滾樂時所呈現的 Alpha 能量會比可接受搖滾樂的受試者弱。在心率變異性分析上，心率變異性指數顯示 Soft 音樂會引誘交感神經興奮。心率變異性的指標中，HF、HF(nu)和 SDRR 代表副交感神經的興奮狀態，而 LF、LF[nu]和 LF/HF 代表副交感神經處於抑制狀態或交感神經興奮之狀態，此外腦波 Alpha 波的出現可以代表個體處於放鬆狀態。本研究亦發現 Alpha 波能量和 LF/HF 及 LF(nu)之間成負相關，而與 HF(nu)與 SDRR 爲正相關。這點證實了這兩項測量的結果對放鬆的評估具有一致性。

Abstract

The use of music for relaxing and relieving anxiety has become increasing popular in recent years. A lot of relevant researches have shown that music has both mental and physiological effect. However, few researches make use of physiological signals to verify the influence of music on human. The aim of our study is to measure the variation of electroencephalogram (EEG) and heart rate variability (HRV) during the course of experiments in listening to music and to distinguish the relation between the music、EEG and HRV. Sixteen volunteers of university students were include in this study. Three situations (no music, soft music and rock music) were randomly ordered in the experiment procedure to prevent bias. The indicators of EEG and HRV in these situations were used to assess and compare the impact of music. In EEG analysis, we

found that the situation of no music had the biggest alpha power and listening to rock music had the smallest alpha power. In comparison of gamma band, it was revealed that listening music, no mater what music, would raise the gamma band power. According to relevant research, stimulus to the perception and selective attention caused individual's gamma power to rise. We also found that there were greater alpha powers on the people who like rock music than the people who don't like when listening to rock music. In the analysis of HRV, we have discovered that the situation of listening soft music had the increased LF/HF (comparing to rock music) or LF(nu) (comparing to no music). It indicated that listening soft music induced stronger sympathetic activities or reduced the vagal activity. Moreover, we found that alpha power of EEG showed a negative correlation to LF/HF and LF(nu) of HRV and a positive correlation to HF、HF(nu) and SDRR of HRV. This result confirmed that these two physiological measures are consistent in assessment of relaxation in listening to music.