

# ~~Semestrální práce OTS~~

Název

Rešeršní studie

jméno, příjmení

České vysoké učení technické  
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## Cíl rešeršní studie

Cílem studie je vyhledání abstraktů publikací souvisejících s tématem mé diplomové práce s názvem „Zpívající mozek“.

## Popis tématu diplomové práce

K vizuální informaci o aktivitách mozku měřením EEG mám paralelně vytvořit i jeho akustickou informaci. Na základě měření aktivity jednotlivých částí mozku následně provedu výběr a transformaci měřených frekvencí na slyšitelné frekvence. V širším rámci má tato práce přispět k rozšíření vědomostí o možnostech využití biofeedbacku.

## Klíčová slova

- Sound, music
- EEG, electroenphal?
- brain

biofeedback? Chcete ho, nebo ne?

## Rešeršní dotazy

Dialog. Db INSPEC

1. *Main Subject* : (music OR sound) and brain

↳ tento vyhledáte spíše delšího věku

Nalezených záznamů 10. Relevantní 1

2. *Main Subject* : (music OR sound) AND electroencephal?

↳ proč ne i EEG?  
(OR EEG)

Nalezených záznamů 10. Relevantní 3

## Reference

Ad 1)

### **Brain indices of music processing: "nonmusicians" are musical**

Koelsch, S.; Gunter, T.; Friederici, A.D.; Schroger, E.

Max Planck Inst of Cognitive Neurosci., Leipzig, Germany

*Journal of Cognitive Neuroscience*, vol.12, no.3, Page: 520-41

*Publisher: MIT Press, May 2000*

**Abstract:** Only little systematic research has examined event-related brain potentials (ERPs) elicited by the cognitive processing of music. The present study investigated how music processing is influenced by a preceding musical context, affected by the task relevance of unexpected chords, and influenced by the degree

and the probability of violation. Four experiments were conducted in which "nonmusicians" listened to chord sequences, which infrequently contained a chord violating the sound expectancy of listeners. Integration of in-key chords into the musical context was reflected as a late negative-frontal deflection in the ERPs. This negative deflection declined towards the end of a chord sequence, reflecting normal buildup of musical context. Brain waves elicited by chords with unexpected notes revealed two ERP effects: an early right-hemispheric preponderant-anterior negativity, which was taken to reflect the violation of sound expectancy; and late bilateral-frontal negativity. The late negativity was larger compared to in-key chords and taken to reflect the higher degree of integration needed for unexpected chords. The early right-anterior negativity (ERAN) was unaffected by the task relevance of unexpected chords. The amplitudes of both early and late negativities were found to be sensitive to the degree of musical expectancy induced by the preceding harmonic context, and to the probability for deviant acoustic events. The employed experimental design opens a new field for the investigation of music processing. Results strengthen the hypothesis of an implicit musical ability of the human brain. (44 References)

*Reakce mozku na neočekávané akordy, nebo noty v akordech. Vliv předcházejícího hudebního obsahu na zpracování hudby mozkiem.*

*a to je klerikální? má to něco s biofeedbackem?*

Ad 2)

**Enhanced phase synchrony in the electroencephalograph gamma band for musicians while listening to music**

Bhattacharya, J.; Petsche, H.

Austrian Acad. of Sci., Austria

*Physical Review E (Statistical, Nonlinear, and Soft Matter Physics)*, vol.64, no.1, Page: 012902/1-4

*Publisher: APS through AIP, July 2001*

**Abstract:** Multichannel electroencephalograph signals from two broad groups, 10 musicians and 10 nonmusicians, recorded in different states (in resting states or no task condition, with eyes opened and eyes closed, and with two musical tasks, listening to two different pieces of music) were studied. Degrees of phase synchrony in various frequency bands were assessed. No differences in the degree of synchronization in any frequency band were found between the two groups in resting conditions. Yet, while listening to music, significant increases of synchronization were found only in the gamma -frequency range (>30 Hz) over large cortical areas for the group of musicians. This high degree of synchronization elicited by music in the group of musicians might be due to their ability to host long-term memory representations of music and mediate access to these stored representations. (29 References)

*Zvětšená fázová synchronizace v pásmu gama (30Hz a více) u hudebníků při poslouchání hudby. Popis metody by mohl být užitečný...*

**Neuronal representation of music during musicogenic epilepsy**

Das, S.R.; Ray, G.C.

Dept. of Electr. Eng., Indian Inst. of Technol., Kanpur, India

*Conference: Proceedings of the 20th Annual International Conference of the IEEE*

*Engineering in Medicine and Biology Society. Vol.20 Biomedical Engineering Towards the Year 2000 and Beyond (Cat. No.98CH36286)*

*Part: vol.3, Page: 1657-60 vol.3*

*Editor: Chang, H.K.; Zhang, Y.T.*

*Publisher: IEEE, Piscataway, NJ, USA, 1998, 6 vol. xviii+xix+3384 Pages*

*Conference: Proceedings of the 20th Annual International Conference of the IEEE Engineering in Medicine and Biology Society. Vol.20 Biomedical Engineering Towards the Year 2000 and Beyond, Sponsor: Biomed. Div. Hong Kong Inst. Eng., Chinese Biomed. Eng. Soc, 29 Oct.-1 Nov. 1998, Hong Kong, China*

**Abstract:** It has been shown earlier that deep aesthetic appreciation of music can induce an altered state of consciousness, a phenomenon often referred to as musicogenic epilepsy. The change in EEG, during such a state, has been characterized by large number of spikes, symptomatic to epilepsy, along, with changes in background EEG. The fractal dimension of EEG was found to reduce during this (epoch) period. Morphological variations in ECG, causing a possible sympathetic burst on autonomic system (ANS), have also been reported. In the present study, the neural representation of the music, causing change in the state of mind, has been found out using a biophysically defensible model of auditory processing. This involves analysis, transduction and reduction in the cochlear mechanism generating the auditory spectrum. The latter is again taken as input to the response function (RF) of the neuron and the output of this filter is the neuronal representation of the input signal (music). This cortical representation turns out to be a ripple, i.e. near-sinusoid on the log-frequency axis, indicating a broad-based spike in the time domain. This might have deeper implications on the study of altered state of consciousness because spikes in EEG and the 'clouding' of consciousness (say during grandmal/petitmal epilepsy) are established phenomena. (15 References)

*Vcítění se do hudby může přivodit alternativní stav vědomí. Výstupní signál neuronové reprezentace hudby je v log f blízký sinusoidě (v čas. oblasti se vyskytují špičky)*

**Quantification of emotion by nonlinear analysis of the chaotic dynamics of electroencephalograms during perception of 1/f music**

Jaeseung Jeong; Moo Kwang Joung; Soo Yong Kim

Dept. of Phys., Korea Adv. Inst. of Sci. & Technol., Taejon, South Korea

*Biological Cybernetics*, vol.78, no.3, Page: 217-25

*Publisher: Springer-Verlag, March 1998*

**Abstract:** The goal of this study is to quantify and determine the way in which the emotional response to music is reflected in the electrical activities of the brain. When the power spectrum of sequences of musical notes is inversely proportional to the frequency on a log-log plot, the authors call it 1/f music. According to previous research, most listeners agree that 1/f music is much more pleasing than white ( $1/f^{\text{sup } 0/}$ ) or brown ( $1/f^{\text{sup } 2/}$ ) music. Based on these studies, the authors used nonlinear methods to investigate the chaotic dynamics of electroencephalograms (EEGs) elicited by computer-generated 1/f music, white music, and brown music. In this analysis, the authors used the correlation dimension and the largest Lyapunov exponent as measures of complexity and chaos. They developed a new method that is strikingly faster and more accurate than other algorithms for calculating the nonlinear invariant measures from limited noisy data. At the right temporal lobe, 1/f music elicited lower values of both the correlation dimension and the largest Lyapunov exponent than white or brown music. The authors observed that brains which feel more pleased show decreased chaotic electrophysiological behavior. By observing that the nonlinear invariant measures for the 1/f distribution of the rhythm with the melody kept constant are lower than those for the 1/f distribution of melody with the rhythm kept constant, the authors could conclude that the rhythm variations contribute much more to a pleasing response to music than the melody variations do. These results support the assumption that chaos plays an important role in brain function, especially emotion. (29 References)

*Rytmus má větší vliv na mozek než melodie.*

### **Shrnutí**

Snažil jsem se vyhledat články, které by se alespoň okrajově týkaly tématu mé diplomové práce. Povedlo se mi najít několik článků, které se týkají druhé části zadání, tj. využití hudby generované z EEG signálu při zkoumání možností biofeedbacku. Nejvíce mne zaujal způsob reakce mozku při hlubokém vcítění se do hudby (určitá synchronizace), což by mohlo mít v praktickém důsledku léčebný dopad.

Co se týče praktického způsobu transformace EEG signálu na hudební variace, což je první část mé diplomové práce, nepovedlo se mi nalézt žádný relevantní článek. Nalezl jsem jenom velké množství v podstatě reklamních článků o vlivu tzv. „psychowalkmanů“ které se snaží speciálními hudebními variacemi působit na mozek.

Student :

Název práce:

Verze:

Datum:

### Hodnocení rešeršní studie

formulace cíle rešerše	1,5	0-3	<input type="checkbox"/> chybějící úvod a motivace <input checked="" type="checkbox"/> jasnost formulace cíle rešerše -1,5 málo fokusace
klíčová slova	3	0-6	<input checked="" type="checkbox"/> chybějící zásadní klíčová slova <input type="checkbox"/> nedostatečná práce s analogickými termíny
volba bibliografických zdrojů	1	0-2	<input checked="" type="checkbox"/> nesprávná či nedostatečná MEDLINE, SCI
formulace rešeršních dotazů	2	0-4	<input checked="" type="checkbox"/> nedostatečné zúročení klíčových slov
kvalita jednovětných hodnocení	2	0-2	<input type="checkbox"/> nesouvisí s tématem <input type="checkbox"/> nevystihuje vazbu na téma
kvalita závěrečného hodnocení	2	0-3	<input type="checkbox"/> chybí závěry; výslovnost zřetelně <input type="checkbox"/> chybí implikace pro vlastní práci
jazyk	2	0-2	<input type="checkbox"/> gramatické chyby; <input type="checkbox"/> výrazy obecného jazyka:
CELKEM	13,5	0-22	