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Congenital Amusia among Young Adolescents in Kuching, Sarawak

Master of Arts

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Faculty of Applied and Creative Arts
Universiti Malaysia Sarawak
2020

2020

Congenital Amusia Among Young Adolescents in Kuching, Sarawak

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A thesis submitted

In fulfilment of the requirements for the degree of Master of Arts

(Music)

Faculty of Applied and Creative Arts
UNIVERSITI MALAYSIA SARAWAK
2020

DECLARATION

This thesis was composed by myself, the work contained herein is my own. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date: 27 July 2020

ACKNOWLEDGEMENT

My sincere thanks to my supervisor, Dr. Thia Sock Siang for the guidance, encouragement and support she has provided, with great magnanimity and kindness throughout my candidature. I am also grateful for her help in my lack of the Bahasa Melayu language. I also wish to thank her for her advice and patience during the preparation of this degree application with the university prior to arriving the country.

I am also thankful to Mr. Mazdan Bin Ali Amaran from the Faculty of Applied and Creative Arts, for his guidance in the usage of the SPSS statistical software for the purpose of the research analysis. Also, not forgetting a note of appreciation for the staff of Faculty of Applied and Creative Arts, Centre for Graduate Studies and IAD Unimas, for their assistance during the tenure of my study. I also wish to thank Universiti Malaysia Sarawak (UNIMAS) for their MyRA Special grant F03/SpGS/1409/16/10 funding in support of this research. Also, a note of thanks to the secondary schools that participated in the survey, in no specific order namely, Batu Kawa Min Lit Secondary School, SMK Bau, SMK DPHA Gapor, SMK Green Road, SMK Jalan Arang, SMK Matang Hilir, SMK Seri Setia, SMK Siburan, SMK St. Mary, SMK St. Teresa, SMK Sungai Maong and SMK Tun Abdul Razak.

Lastly, a heartfelt thanks to my family and friends for their infinite support, well wishes and abundance of joy with their surprise visits during my stay away from home. A special thanks to my beloved Jason, whose unconditional love and continual support gave me strength and kept me going, enabling this thesis to come to fruition.

ABSTRACT

Congenital amusia is a lifelong neurogenetic deficit characterized by the impairment of music processing. This musical disorder was commonly known as tone-deafness in the western culture. The lack of this core musical system in the human brain concerns ~4% of the general population according to a single test study from 1980. A study in 2017 based on a larger sample population, however, presents a prevalence of congenital amusia of 1.5%. The purpose of this study was aimed to investigate the occurrence of congenital amusia among young adolescents aged 13 and 14 years in Kuching, Sarawak. The results contribute new knowledge on possible musical disorder among young adolescents across different ethnicities. On the basis of a test instrument, known as the Montreal Battery of Evaluation of Amusia (MBEA), and a self-assessment questionnaire, the study compared the prevalence of congenital amusia between both age groups as well as tonal language, Chinese, and non-tonal languages namely, Malay, English, Iban and Bidayuh. The impact on the types of first languages was also studied based on the aforementioned five languages. The predictors of the MBEA test scores were also established using a set of questionnaire measuring musical experience, musical habits and musical difficulties performed on a Likert scale. The results presented a 3% prevalence of congenital amusia among this group of 500 participants with young adolescents, aged 13 years old, commanding a higher proportion of 2.2%. A statistically significant difference was seen in the comparison of the tonal Chinese language and the non-tonal English and Iban language groups. The analysis of the first languages projected a significant difference in the Iban, Bidayuh and Chinese languages. The variables in the three predictors were analysed with factor loadings and regressed with the participants' test scores. Results indicate that musical habits accounted for a higher weightage as the most

significant predictor of the MBEA scores, followed by musical difficulties and musical experience. Hence, the findings served as a basis for comparison with further studies across ethnic groups and possibly as a potential intervention to compensate musical difficulties during the earlier stage of adolescence.

Keywords: Congenital amusia, tone deafness, neurogenetic deficit, young adolescents, ethnicities

Congenital Amusia dalam Kalangan Remaja Muda di Kuching, Sarawak

ABSTRAK

Amusia kongenital adalah defisit neurogenetik sepanjang hayat yang dicirikan sebagai kemerosotan pemprosesan muzik. Gangguan muzik ini biasanya dikenali sebagai kelemitan nada dalam budaya barat. Kekurangan sistem muzik teras di dalam otak manusia adalah ~ 4% daripada populasi umum mengikut satu kajian ujian tunggal dari tahun 1980. Walau bagaimanapun, kajian pada tahun 2017, berdasarkan populasi sampel yang lebih besar, membentangkan prevalensi amusia kongenital sebanyak 1.5%. Matlamat kajian ini bertujuan untuk mengkaji kejadian amusia kongenital di kalangan remaja berusia 13 dan 14 tahun di Kuching, Sarawak. Hasilnya akan menyumbang kepada pengetahuan baharu mengenai gangguan muzik yang mungkin berlaku dalam kalangan remaja muda antara etnik yang berlainan. Berdasarkan instrumen ujian, yang dikenali sebagai Montreal Battery of Evaluation of Amusia (MBEA), *dan borang soal selidik, kajian ini membandingkan prevalensi amusia kongenital antara kedua-dua kumpulan umur serta bahasa tona Cina dan bahasa bukan tona iaitu Melayu, Inggeris, Iban dan Bidayuh. Impak pada jenis bahasa pertama juga dikaji berdasarkan lima bahasa yang disebutkan di atas. Prediktif skor ujian MBEA juga ditetapkan menggunakan satu set soal selidik untuk mengukur pengalaman muzik, tabiat muzik dan kesukaran dalam muzik yang dilakukan pada skala Likert. Hasilnya membentangkan prevalensi 3% amusia kongenital dalam kalangan kumpulan ini, 500 peserta dengan remaja berusia 13 tahun menguasai peratusan 2.2% yang lebih tinggi. Perbezaan statistik yang signifikan dilihat dalam perbandingan antara bahasa tona Cina dan bahasa bukan tona Inggeris dan Iban. Analisis bahasa pertama memperlihatkan*

perbezaan yang signifikan dalam bahasa Iban, Bidayuh dan Cina. Pemboleh ubah dalam ketiga-tiga ramalan telah dianalisis dengan beban faktor dan regresi dalam skor ujian peserta. Keputusan menunjukkan bahawa tabiat muzik menyumbang wajaran yang lebih tinggi sebagai prediktor paling penting dalam skor MBEA, diikuti oleh kesukaran dalam muzik dan pengalaman muzik. Justeru itu, penemuan ini menjadi asas untuk perbandingan dengan kajian lanjut di seluruh kumpulan etnik dan intervensi berpotensi untuk mengimbangi kesukaran muzik semasa peringkat awal remaja.

Kata kunci: *Amusia kongenital, pekak nada, defisit neurogenetik, remaja muda, etnik*

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
CDF	Cumulative Distribution Factor
DF	Degree of Freedom
EPA	Exploratory Factor Analysis
IQ	Intelligence Quotient
KMO	Kaiser-Meyer-Olkin
LEAP-Q	Language Experience and Proficiency Questionnaire
MAP	Gordon's Musical Aptitude Profile
MBEA	Montreal Battery of Evaluation of Amusia
MRI	Magnetic Resonance Imaging
Q-Q	Quantile-Quantile
RR	Relative Risk
SIG	Significance
SMK	Sekolah Menengah Kebangsaan
SPSS	Statistical Package for the Social Sciences
STD	Standard

CHAPTER 1

INTRODUCTION

1.1 Introduction

The study of musical perception, a cognitive ability, has spanned over decades. It is believed that music engagement is a fundamental human trait as that of a language. There are, however, instances, where individuals are deprived of this innate ability to perceive and produce music (Peretz, 2008; Peretz et al., 2008). These individuals, known as amusics, are said to have congenital amusia or more commonly known as tone-deafness, note-deafness or tune-deafness (Peretz, 2001, 2008; Peretz et al., 2008). Another form of amusia is known as acquired amusia, which usually occurs following accidental brain injury (Levitin & Tirovolas, 2009; Peretz, 2008). This research, however, shall focus on congenital amusia.

According to the government's fact page, the official website of Majlis Bandaraya Kuching Selatan ("Sarawak: Facts and Figures," 2012) and The Borneo Post online article ("Malays edge past Chinese in Sarawak," 2014), Kuching is the most populated city in Sarawak, Malaysia, and has the largest number of diverse ethnic groups. Hence, among the culturally diverse population, the Malay, Chinese, Iban and Bidayuh ethnic groups as well as speakers with English language as their first language, were decided upon as the target of observation in this research. Although the English language is one of the major languages ("Sarawak: Facts and Figures," 2012), there is a lack of English native speakers in the lower secondary of the local schools. Therefore, in this study, participants of the English language can be native speakers or other races with English as their first language. The sample population shall involve a total of 500 young adolescents with a random selection of 100 participants, non gender specific between 13 and 14 years old, from each ethnic group.

1.2 Background

Music has an undeniable universal power to simulate emotions in humans. The strong connection between music and emotion is somewhat similar to the closely linked concept of scent and memory. As to how a particular scent conjures recollection, music evokes vicarious emotions in listeners. Neuroscience studies on functional brain imaging on music and emotion show that music can influence the brain structures involving emotions and hence, a potential implication in the treatment of psychiatric and neurological disorders (Koelsch, 2014, 2015). Music can also be regarded as an engaging, multisensory social activity that is an important adaptive function relating to the fulfilment of basic communication and social attachment (Koelsch, 2014; Overy & Molnar-Szakacs, 2009).

The genetic factors involving the inability to engage music has no known association with difficulty in speech understanding (Peretz & Vuvan, 2017). Hence, it intrigues research to uncover the missing link between the various cognitive domains. Approach attempting to understand music and its emotional effects on amusics has been developed to identify this underlying constituent of the brain (Stewart, von Kriegstein, Warren & Griffiths, 2006). Their study believed that clinical disorders can be methodically engaged even though the vast diversity of the human brain components constitute a challenge in devising a more comprehensive approach. The neuroscience of musical disorder is extensive with numerous researches derived from different perspectives combining theories and methodologies (Peretz, Schlaug & Cuddy, 2008). Thus, it is said that research on the correlations of this neurological disorder and musicality has advanced greatly with increased interest over the past decades (Gingras, Honing, Peretz, Trainor & Fisher, 2015; Hyde, Zatorre & Peretz, 2011).

1.3 Statement of Problem

Since birth, the human race is able to distinguish music from speech be it their genetic heterogeneity (Brandt, Gebrian & Slevc, 2012). It is also implied that both music and speech are fundamental features that became distinct through progressive acquisition of the knowledge as the ability continues to refine and mature. The innate human cognition of music, however, does not appear to occur naturally for some. This inability, known as tone-deafness at birth, thus raised the question on the possible loss of positive psychological effects that can be derived from music appreciation. Studies of the impact of music on behaviours tend to indicate the functionality of music in everyday life that take shapes subconsciously and commands an individual's way of thinking (Chamorro-Premuzic & Furnham, 2007; Lonsdale & North, 2011). The lack of this ability deprives individuals the benefits of an overall well-being such as mood elevation, stress reduction and strengthening performance in memory and learning capability (Hallam, Price & Katsarou, 2010; North, Hargreaves & Hargreaves, 2004; North, Hargreaves & O'Neill, 2000). It is thus believed that the detection of congenital amusia, as early in one's growth and development stage, would benefit significantly with the knowledge to address the condition in order to effect a more diverse opportunity for possibly better learning outcomes.

1.4 Purpose of Study

Although there has been a substantial number of researches in relation to congenital amusia, very few studies have been conducted in the Asian context especially among a population that consists of individuals from a vast diversity of ethnicities, races and languages. The studies, by far, involves comparisons among major ethnic groups such as the English and the Chinese. There is a possibility that the lack of related studies in minor ethnic

groups is due to the unawareness of such musical condition. The purpose of this research, thus is to identify and examine the prevalence of this musical disability in young adolescents across ethnic groups.

1.5 Scope of Study

It is a known belief that music has various psychological and social functioning influence on humans at different developmental stages (Hargreaves, 1986; North & Hargreaves, 2008). Studies like those of Fuhrmann, Knoll and Blakemore (2015) and Knoll et al. (2016) as well as Wekerle, Waechter, Leung and Leonard (2007) suggested that the adolescent stage presents a window of opportunity in brain development to effect positive changes. The substantial complexity during this maturity period in life involves not only the rapid physical growth but also the capability to analyse new information and competency to manage cognitive, social and emotional changes (Hall, 1904). Thus, considering the numerous possibilities in music and brain development with direct association with basic human needs, it is crucial to detect amusia in adolescents in hopes to provide a viable recourse to ameliorate such musical condition. This 'second window of opportunity' will serve as an opening to readily acquire new teachings that could have otherwise gone unnoticed during the childhood stage.

According to the American Psychological Association (2002), the definition of adolescent stage comprises not only the chronological age range but also the progress of development into adulthood by individuals. It can start as early as age 9 with the earlier onset of puberty for some and end as late as age 21 for late bloomers. Hence, the age range is often devised in accordance to the scope of the studies. It is also mentioned in their study that the globally recognised age group of adolescents is generally between 10 to 18 years old. More

studies on adolescence by psychologists Hall (1904) and Flavell (1963) further exhibit the importance of early adolescent development, categorising it as a distinctive period of growth that has captured the interest of many for more than a century. Hence, the scope of this research revolved around age 13 and 14 years old participants. It involves the investigation on the plausible association of tonal and non-tonal languages as well as the impact on the types of first languages among this age group. In addition, there is also an ascertainment on the types of musical predictors of this condition. This would further establish the constituent components, exploring factors that determine participants' musical belief, experiences, influences and mindset.

1.6 Research Questions

The following questions direct the development of this research.

Research Question 1: What is the prevalence of congenital amusia among young adolescents using the MBEA test battery?

Research Question 2: Is there a difference in the occurrence of congenital amusia between speakers of tonal language and non-tonal languages?

Research Question 3: Do the different types of first languages play a part in determining a prevalence of congenital amusia?

Research Question 4: Are the three musical predictors namely, musical experience, musical habits and musical difficulties, predictors of the MBEA tests?

1.7 Research Objectives

In view of the above research questions, the objectives revolve around the probability of amusic individuals in a different ethnic group as compared to previous studies. Using the MBEA test instrument and an extensive self-assessment questionnaire, this research aims to reveal the prevalence of musical disorder among young adolescents aged between 13 and 14 years old.

The study on the impacts of tonal and non-tonal languages would further indicate if a perceptible difference of this musical condition between both language groups is visible. This awareness could assist in future studies on specific branch of linguistics associate to musical disorders.

Following the analysis of first languages, it is set to identify the existence of any correlation between the different languages and the musical disorder tests, exploring possibilities that may relate to congenital amusia. Since speech and music are as part of the cognitive domain, as mentioned in the earlier section, the findings would furnish an understanding of the relationship, if any.

The last research objective to examine the characteristics of various musical components strives to recognise the diversity of factors that could determine the outcome of the musical tests. This would assist in formulating recommendations on appropriate predictors in conjunction with the test battery for detecting the condition.

1.8 Significance of Study

The researcher ascribes the significance of this study to the probability of detecting a musical disorder condition, known as congenital amusia, in hopes to influence brain development through earlier intervention to ameliorate such difficulties. The information