Faculty of Cognitive Sciences and Human Development

EFFICACY OF NEUROFEEDBACK TRAINING ON SPEECH, LANGUAGE, COMMUNICATION AND BEHAVIOUR AMONG AUTISM SPECTRUM DISORDER (ASD) CHILDREN AND YOUNG ADULTS

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The project entitled 'Efficacy of Neurofeedback Training on Speech, Language, Communication and Behaviour among Autism Spectrum Disorder (ASD) Children and Young Adults' was prepared by Nurul Aina Bt Mohd Mahayuddin and submitted to the Faculty of Cognitive Sciences and Human Development in partial fulfillment of the requirements for a Bachelor of Science with Honours (Cognitive Science).

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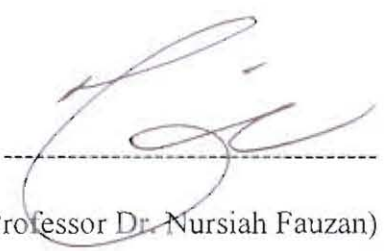

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ABSTRAK

KEBERKESANAN LATIHAN NEUROFEEDBACK PADA PERTUTURAN, BAHASA, KOMUNIKASI DAN TINGKAHLAKU DI KALANGAN KANAK-KANAK DAN REMAJA AUTISM.

Nurul Aina Bt Mohd Mahayuddin

Penyelidikan ini bertujuan untuk menilai keberkesanan latihan neurofeedback (NFT) pada pertuturan, bahasa, komunikasi dan tingkahlaku dalam kalangan kanak-kanak dan remaja Autism dengan menggunakan ATEC yang dihasilkan oleh Bernard Rimland dan Stephen M. Edelson daripada Autism Research Institute. 34 orang peserta telah dipilih daripada Persatuan Autism di Kuching, Sarawak. Kajian ini menggunakan kaedah eksperiment quasi iaitu perubahan sebelum dan selepas kajian bagi setiap peserta diperhatikan. Ia telah dijalankan sekitar 24 sesi bagi setiap kanak-kanak dan remaja Autism. Tiga jenis protokol yang telah diggunakan di dalam kajian ini ialah protocol jenis Delta, Alfa dan beta. Pemerhatian sebelum dan selepas kajian bagi setiap peserta selama enam bulan digunakan sebagai instrumen untuk mengumpul data. Kebanyakan kanak-kanak Autism dikategorikan dengan hiperaktif, echolalia, pertuturan yang berulang-ulang, pertuturan yang kurang bermaksud, perkembangan bahasa yang tidak seimbang dan lemah dalam komunikasi tanpa bunyi. Skor ATEC telah menunjukkan perubahan yang positif darpada aspek pertuturan, bahasa, komunikasi dan tingkahlaku. Ujian Statistik paired sample t-test telah menunjukkan keputusan signifikan diantara latihan neurofeedback dengan perubahan keseluruhan kanak-kanak dan remaja Autism ($t(33) = 9.122$. $p = 0.000$; $p < 0.05$). Dapatan ini menunjukkan skor ATEC sebelum dan selepas latihan bagi kanak-kanak dan remaja Autism yang telah menjalani latihan ini dengan menggunakan tiga jenis protokol yang disarankan. Selain itu, dapatan Autism simtomatologi termasuklah signifikan di antara skor weightage pertuturan. bahasa dan komunikasi sebelum dan selepas latihan ($t(33)=5.679, p=0.000$; $p < 0.05$) dan skor weightage tingkahlaku sebelum dan selepas latihan ($t(33)=2.03, p=0.000$; $p < 0.05$). Perubahan positif di dalam kajian ini boleh dikaitkan dengan hasil pengurangan kesambungan yang cergas di serebrum melalui tiga jenis protocol iaitu delta untuk menghalang frekuensi beta, dan diikuti dengan alfa untuk sesi relaksasi and beta untuk membantu kanak-kanak fokus. Kajian ini juga menggunakan bipolar sequential montage atau interhemispheric montage bagi setiap individu. Keseluruhannya, kajian ini telah menunjukkan perubahan yang memberangsangkan bagi setiap peserta yang lemah daripada aspek pertuturan, bahasa, komunikasi dan tingkahlaku.

ABSTRACT

EFFICACY OF NEUROFEEDBACK TRAINING ON SPEECH, LANGUAGE, COMMUNICATION AND BEHAVIOUR AMONG AUTISM SPECTRUM DISORDER (ASD) CHILDREN AND YOUNG ADULTS.

Nurul Aina Bt Mohd Mahayuddin

This research aims to evaluate the efficacy of neurofeedback training on their speech, language, communication and behavior among autism spectrum disorder (ASD) children and young adults using ATEC assessment. A case study (quasi-experimental) pre-post design (within subjects) study was conducted in an average of 24 sessions for ASD children. This study involved 34 participants, purposely selected from Kuching Autistic Association (KAA). The Autism Treatment Evaluation Checklist (ATEC) developed by Bernard Rimland and Stephen M. Edelson from Autism Research Institute (ARI). The three major steps in the treatment protocols used for the training were Delta, followed by Alpha and Beta training. There were series of observations for each participant before training and a series of observations after the training within six months. Most ASD children were characterized with hyperactive symptoms, echolalia, repetitive speech, less meaningful speech, uneven language development and poor non-verbal communication skills. ATEC scores showed positive improvement in term of speech, language, communication and behaviour. Paired Sample T-tests indicated statistical significant overall improvement in Autistic children ($t(33) = 9.122$, $p = 0.000$; $p < 0.05$) who received NFT using the three steps treatment protocol as indicated by ATEC scores taken before and after the training. Other major findings in core ASD symptomatology includes a significant difference in weightage scores in speech/language/communication ($t(33) = 5.679, p = 0.000$; $p < 0.05$), behavioural/health ($t(33) = 2.03, p = 0.000$; $p < 0.05$). Positive treatment outcomes could be associated with the reduced cerebral hyperconnectivity resulted from the three treatment protocols such as delta to inhibit the beta frequency, followed by Alpha training for relaxation and finally Beta protocol to help the children focus. Protocols included primarily sequential (bipolar) or interhemispheric montages individualized for each participant. This research experience is showing remarkable improvements in the participant's speech, language, communication and behaviour.

CHAPTER 1

INTRODUCTION

1.0 Introduction

According to the Health Ministry statistics, one out of 600 children in Malaysia is autistic. (Malaysian Psychiatric Association, 2010). Autism is defined as a neurodevelopmental disorder characterized by qualitative impairment in the development of social interaction and communication skills and restricted patterns of behavior and interests. Further research indicates that Autism can be categorized as part of a spectrum of heterogeneous disorders. This range of disorders is characterized by a broad range of abilities and levels of severity. Autism is one of a range of related Pervasive Disorders including: Asperger's Disorder, Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS), Childhood Disintegrative Disorder (CDD), and Rett's Disorder (Medical Research Council, 2001).

1.1 Background of study

1.1.1 What is Autism?

Autism is a brain disorder that normally affects a person's ability to communicate, form relationships with others, and respond appropriately to the environment (Child Development Institute, 2010). People with classical autism show three types of symptoms which are impaired social interaction, problems with verbal and nonverbal communication and imagination, and unusual or severely limited activities and interests (Global Neuroscience Initiative Foundation, 2010). Some people with autism are relatively high-functioning, with speech and intelligence intact. Others are mentally retarded, mute, or have serious language delays (Child Development Institute, 2010).

Some ASD child and young adults seems locked into repetitive behaviour and rigid patterns of thinking. Symptoms of autism usually appear during the first three years of childhood and continue throughout life. Although there is no cure, appropriate management may foster relatively normal development and reduce undesirable behaviours. People with autism have a normal life expectancy.

Autism affects an estimated two to 10 of every 10,000 people, depending on the diagnostic criteria used (Child Development Instituted, 2010). Most estimates that include people with similar disorders are two or three times greater. Autism strikes males about four times as often as females, and has been found throughout the world in people of all racial and social backgrounds (Child Development Instituted, 2010).

Although people with autism do not have exactly the same symptoms and deficits, they tend to share certain social, communication, motor, and sensory problems that affect their behaviour in predictable. Children with autism also take longer to learn to interpret what others are thinking and feeling. Subtle social cues-whether a smile, a wink, or a grimace-may have little meaning.

Autism varies a great deal in severity. The most severe cases are marked by extremely repetitive, unusual, self-injurious, and aggressive behaviour. This behaviour may continue over time and prove very difficult to change, posing a great challenge to those who must live with, treat, and teach these individuals. The mildest forms of autism resemble a personality disorder associated with a perceived learning disability.

Isolated in worlds of their own, people with autism appear indifferent and remote and are unable to form emotional bonds with others. Although people with this puzzling brain disorder can display a wide range of symptoms and disability, many are incapable of understanding other people's thoughts, feelings, and needs. Often, language and intelligence fail to develop fully, making communication and social relationships difficult.

1.1.2 Speech, Language and Communication of autism

Children with autism may have difficulty developing language skills and understanding what others say to them. They also may have difficulty communicating nonverbally, such as through hand gestures, eye contact, and facial expressions (NIDCD, 2010).

Not every child with an autism spectrum disorder will have a language problem some may not have problem language problem. A child's ability to communicate will vary, depending upon his or her intellectual and social development. Some children with autism may not be able to speak. Others may have rich vocabulary and be ahle to talk about specific subjects in great detail. Most children with autism have little or no problem pronouncing words. The majority, however, have difficulty using language effectively, especially when they talk to other people. Many have problems with the meaning and rhythm of words and sentences. They also may be unable to understand body language and the vocal tones.

Some infants whom later show signs of autism do coo and babble during the first 6 months of life but they soon stop those cooing and babbling. Although they may learn to communicate using sign language or special electronic equipment, they may never speak. Others may be delayed, developing language as late as age five to eight.

ASD children who do speak often use language in unusual ways. Some seem unable to combine words into meaningful sentences. Some speak only single words. Others repeat the same phrase no matter what the situation.

Some ASD children with autism are only able to mimic what they hear, a condition called echolalia. Without persistent training, echoing other people's phrases may he the only language that people with autism ever acquire. What they repeat might be a question they were just asked, or an advertisement on television. There are some patterns of language use and behaviours that are often found in children with autism.

1.1.2.1 Repetitive or rigid language

Often, children with autism whom are able to speak will say things that have no meaning or that seem out of context in conversations with others. Autism child may repeat the same word or sentence over and over again.

1.1.2.2 Narrow interests and extraordinary abilities

Some children may be able to deliver an in-depth monologue about a topic that holds their interest, even though they may not be able to carry on a two-way conversation about the same topic. Others have musical talents or an advanced ability to count and do math calculations.

1.1.2.3 Uneven language development

Many children with autism do develop some speech and language skills, but not to a normal level of ability of speech according to their age. Their progresses are usually uneven. Some children may be able to read words before 5 years of age, but they may not comprehend what they have read. They also often do not respond to the speech of others and may not respond to their own names.

1.1.2.4 Poor nonverbal conversation skills

Children with autism often are unable to use gestures such as pointing to an object to give meaning to their speech. They often avoid eye contact, which can make them seem rude, uninterested, or inattentive. Without meaningful gestures or the language to communicate, many children with autism become frustrated in their attempts to make their feelings and needs known by others. They may act out tbeir frustrations through vocal outbursts or other inappropriate behaviours.

1.1.3 Behaviours of ASD

Although children with autism usually appear physically normal and have good muscle control, odd repetitive motions may set them off from other children. A child may spend hours repeatedly flicking or flapping her fingers or rocking back and forth. Many flail their arms or walk on their toes. Some suddenly freeze in position.

Some people with autism also tend to repeat certain actions over and over. A child might spend hours lining up pretzel sticks. Some children with autism develop troublesome fixations with specific objects, which can lead to unhealthy or dangerous behaviours. For example, one child insists on carrying faeces from the bathroom into her classroom. Other behaviours are simply startling, humorous, or embarrassing to those around them.

For unexplained reasons, people with autism demand consistency in their environment. Many insist on eating the same foods, at the same time. sitting at precisely the same place at the table every day. They may get furious if a picture is tilted on the wall, or wildly upset if their toothbrush has been moved even slightly, a minor change in tbeir routine, like taking a different route to school, may be tremendously upsetting.

Scientists are exploring several possible explanations for such repetitive, obsessive behaviour. Perhaps focused behaviours help them to block out painful stimuli. Yet anotber theory is that these behaviours are linked to the senses that work well or poorly.

1.2 Problem Statement

While there is no cure for autism, traditionally behavioral treatments and medications have been the traditional options for ASD. These include Applied Behavioural Analysis (ABA) that has been widely used in many parts of the world. ABA uses a behavioural approach based on theories developed by B.F. Skinner and John B. Watson. It involves behaviour support and modification as well as discrete trial training, which is breaking down teaching objectives into the smallest unit and teaching these units one by one.

Others are Structured Teaching, Pivotal Response Training, and augmentative communication such as sign language and Pictures Exchange Communication System (PCEs). They also need speech and occupational therapy as well as sensory integration therapy.

Today, Neurofeedback or neurotherapy (EEG or brainwave biofeedback) is a vital part of the treatment plan for these children, adolescents and adults. This is not a substitute for behavioral and social treatment approaches but it works in combination with the traditional options making it more effective. Most of the treatment experience is showing remarkable improvements in the subject's attention, vocalization and behavior. Nonverbal children begin to use language, making eye contact and increase their social interaction dramatically.

The literature shows that neurofeedback can markedly reduce autistic behavioral problems and improve their sleeping patterns, performance, verbal production and socialization. In early days until 1980s, autism (mild and severe ASD) was categorized within psychotic disorders due to their poor contact with reality. In 2002, Jarusiewicz published the only controlled study documenting the

effectiveness of neurofeedback for Autism based on one outcome measure. However, the present study evaluated the efficacy of neurofeedback on Autistics children using quasi experiment with 34 children at Kuching Autistic Association (KAA).

1.2.1 Research Question

This research particularly explores about changes that take place in language, communication and behaviours of ASD person after underwent the neurofeedback training. Therefore, this research also specifically solves the following question:

- Is there any changes in ATEC's total score after neurofeedback training of ASD children and young adults?

- Is there any changes in weightage score (speech, language and communication) after neurofeedback training of ASD children and young adults?

- Is there any changes in weightage score (behaviours) after neurofeedback training of ASD children and young adults?

- Is there any significant difference between speech, language and communication post-test's weightage score by gender, age, ethnics and medication consumed after neurofeedback training of ASD children and young adults?

- Is there any significant difference between behaviour post-test's weightage score by gender, age, ethnics and medication consumed after neurofeedback training of ASD children and young adults?