International Journal of Technical Research and Applications e-ISSN: 2320-8163,
www.ijtra.com Special Issue 10 (Nov-Dec 2014), PP. 49-52

NEURO-TECHNOLOGY -COMMUNITY INTEGRATED REHABILITATION (CIR) MODEL

Norsiah Fauzan, Siti Naqiah Shahidan
Faculty of Cognitive Science and Human Development
University of Malaysia Sarawak
nursiahfauzan@gmail.com

Abstract— Community Integrated Behavioral Model (CIR) is one facet of special needs children's rehabilitation and generally includes a number of approaches that allows individuals with different disabilities to benefit from further rehabilitation process. The proposed CIR model includes the Neurobehavioral programs (NBR) with emphasis on brain training and comprehensive holistic program for the children and Parents' counseling services to help with the parents' stress in handling the children's' difficulties and behavioral problems. Awareness programs on the importance of tackling the neurobehavioral problems using neurotechnology is vital to help children with different disability and varying intellectual disorders and behavioral problems such as hyperactivity, down syndrome, intellectual disability, autism spectrum disorder etc.

Index Terms—Neurotechnology community, Neurofeedback.

I. Introduction

Development in the field of Neuroscience has made a substantial impact on the emergence of neurotechnology products. Over the years, various neurotechnologies has been developed to explore more about the mysteries of human brain. It has led to the development and creation of neurofeedback (NFT), quantitative electroencephalogram (Qeeg), magnetic resonance imaging (MRI), functional magnetic resonance imaging (FMRI) and etc. However public awareness about the existence of this technology, particularly among Malaysians is still at low levels compared with other developing country. In developed country, neurotechnology are widely used in helping children with various neurological disorders such as Autism Spectrum Disorder (ASD), Autism Deficit Hyperactivity Disorder (ADHD), epilepsy, learning disability and etc. In neurofeedback training, participants learn how to alter their own brainwave pattern, producing more normal output. The technique has been successfully used to help people suffering from migraines, sleep problem, anxiety, depression, traimatic brain injury, epilepsy, autism and ADHD. Earlier research revealed that neurofeedback prove to be effective treatment in individual with attention deficits and hyperactivity and those wih neurological disorders compared to medication. Neurofeedback has shown to enhance neuro regulation and metabolic function. Children with autism and Autistic Spectrum Disorder who completed neurofeedback training attained a 26% average reduction in the total ATEC rated autism symptoms in contrast to 3% for the control group. Parents reported improvement in socialization, vocalization, anxiety, schoolwork, tantrums, and sleep while the control group had minimal changes in these domains [3]. Neurofeedback has no adverse side effects while psychopharmacological interventions, as well as certain vitamin/mineral supplementation and secretin are associated with side effects. In addition, the therapeutic treatment outcomes of neurofeedback training are maintained over time and do not reverse after treatment is withdrawn (Linden, Habib, & Radojevic, 1995) as in drug therapy, diet therapy, and supplementation with vitamins, minerals, and enzymes. Besides, research findings indicated that effects from the medication show temporary response for the autistic children and those having ADD/ADHD. The results are more consistent and permanent than the other traditional therapies.

Community Integrated Rehabilitation (CIR) Model promotes community involvement with parents and professional with a hope for the children with learning and neurological disorders to function and leads a normal life. Children with autism, ADHD or down snydrome need to be integrated and trained with Neurotechnology and Cognitive Behavioural Therapy (CBT) to learn how to self regulate their brain wave and improve their functioning and behavior As reported by UNICEF Malaysia on 2012 there are 445,006 person with disabilities registered in Malaysia, which represent 1.5% of the population. Ministry of Education (MOE) statistics on the number of children with disabilities in the special needs education systems for the 2013 enrollment is estimated approximately 54 000 which remains at 1 percent of the total number of the students enrolled. These statistics excluded the with disabilities registered in private education institutions. Out of that number 65.38% children registered under learning disabilities. By the end of July 2014, Sarawak State of Education Department reported that 1,281 secondary students studied in Special Integrated Education Programme in Sarawak, while for primary school, there are about 2, 218 students enrolled for this programme all over Sarawak. This can be proove that learning disabilities and neurological problems became the major threat to the nation in the production of healthy and excellent future generations.

II. BACKGROUND OF THE STUDY

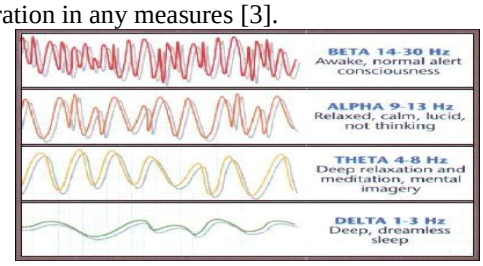
The first case study conducted in UNIMAS with 13 years old girl with ADD/ADHD in 2009 shows remarkable improvement on her mood swing, emotions and social behaviour. This is followed by various case studies and community services for the other children who came voluntarily to the Psycho/counseling laboratory. About twelve final year project students were trained as brain trainer to assist with brain training for children with various neurological disorders such as Asperger's syndrome, Down syndrome and West syndrome in 2010-2011. In 2012, most of the trained brain trainers graduated and a brain trainer from Kuching Autism Association were trained to assist with a group of 39 participants diagnosed as having symptoms of autism by medical doctor and psychologists. The community service was carried out at Kuching Autism Association successfully with cooperation from the parents and teachers. With the setting up of brain training centre, the community (teachers, caregivers, professionals) will benefit from the acquisition of knowledge and skills in brain training (Neurofeedback training) to be applied for the rehabilitation of the targeted group (Mild Cognitive impairment, Alzheimer's, Autism and related neurological disorders).

III. DEFINITION OF TERMS

A. Neurotechnology

From the perspective of cognitive science, neurotechnology is defined as i) technical and computational tools that measure and analyze chemical and electrical signals in the nervous system to identify the properties of nervous activity, understanding how the brain works and diagnose pathological conditons or control external devices (neuroprostheses and brain machine interfaces), and ii) technical tools to interact with the nervous system to change its activity, for example to restore brain regulation using neurofeedback (However from the medical perspective, neurotechnology could be seen as any artifical means to interact with the workings of the brain. [2]. Neurotechnology enhances the brain's ability to have the capacity to produce more energy or excess useful brain states when the situation dictates.

Neurofeedback is a specialty field within Neurotechnology, which is devoted to training people to gain control over electro-physiological processes in the human brain. Neurofeedback activities in the field of child and adolescent psychiatry started about 30 years ago by Lubar & Shouse in 1976. In neurofeedback training, self-regulation of specific aspects of electrical brain activity is acquired by means of immediate feedback and positive reinforcement [3]. These applications could be done by training learners to alter their brainwaves. Historically, there are four types of brainwaves identified according to their frequency or bandwidth, delta (0.5-4 Hertz), theta (4-8 Hertz), alpha (8-12 Hertz), SMR (12-15 Hertz) and beta (15-20+ Hertz), differing according to their frequency. Each person has an individual pattern of brainwave activity, but there are certain "signatures" of brainwave frequencies that are associated with specific symptoms or dysfunction. Previous research on two complex children with learning disabilities (LD), ADHD, social deficits, mood disorders and pervasive development disorder (PDV) conclude that neurofeedback was a successful treatment whose improvement surpassed the gains made with previous therapies. One of the children improved on most featured of the Symptoms Assessment 45 (SA-45) with no deterioration in any measures [3].



B. Neurological Disorders/Learning Disabilities

Malaysia's Persons with Disabilities (PWD) Act states that person with disabilities "include those who have long term physical, mental, intellectual or sensory impairments which in interaction with various barriers may hinder their full and effective participation in society". However, the ministry of Woman, Family and Community Development (MWFCD) has specific categories of disabilities for the purpose of registering persons with disabilities. One of the categories is learning difficulties. Learning difficulties mean intellectual capabilities that do not confirm with biological ages. Those who fall into these categories are Late Global Development, Down syndrome, intellectual disabilities, Autism, ADHD and specifics learning difficulties such as dyslexia, dyscalculia and dysgraphia [1]. In 2000, U.S Department of Education Office of Special Education Programs defines the concept of learning disabilities as specific learning disabilities (SLD). SLD is the 'central concept to specific learning disability is disorders of learning and cognition which are intrinsic to individual, specific disorders that affect only a narrow range of academic and performances outcomes and not due primarily to other conditions such as mental retardation or behavioral disturbances. the definition of learning disabilities differs from country to country.

C. Community Integration Rehabilitation (CIR) Approaches

In Malaysia, Community Based Rehabilitation (CBR) centers are available throughout the country. Established by Department of Social Welfare (DSW) Malaysia, CBR is a one stop center for person with disabilities and is intended to provide services such as diagnosis, rehabilitation, treatment, special education and vocational training. However, none of the center provided rehabilitation with neuro-technology. The efficacy of neurofeedback on ASD children cannot be denied with the numerous numbers of researches on providing evidence on the efficacy of neurofeedback as an alternative rehabilitation. For instances, recent researches [1] on rehabilitation in ASD using neurofeedback with Auditory Integration Training (AIT) showed remarkable improvement on 8 years old autistic boy. The boy received 40 sessions of NFT, 45 min/day, and 3 days a week and also 20 sessions of AIT. Results showed a substantial decline in autistic behavior and improvement in speech and language indexes and subscales of language competency. These finding provide evidence for the use of neurofeedback as a component of effective intervention in children with ASD.

CIR model was widely used all over the world in many purposes such as for Traumatic Brain Injury (TBI) and mental health [2] used CIR model for the purposed of Traumatic Brain Injury (TBI). Roles from the parents, teachers, caregivers and the professional are consider. Previous research [2] define CIR model for Traumatic Brain Injury (TBI) as one facet of post-acute brain injury rehabilitation that includes a number of approach that allow individual with TBI to benefit from further rehabilitation after medical stability is establish and initial acute (in hospital) and initial acute rehabilitation is completed. This model includes neurobehavioral programs, comprehensive holistic programs and home based programs.

IV. PROCEDURES

A. Setting

For the beginning, Neuro-technology CIR model will be adapted into two (2) selected organizations, Kuching Autism Associations (KAA) and *Persatuan Kanak-kanak Terencat Akal (PERKATA).* Twenty (20) communities consist of the parents, caregivers and teachers will be participating and training by the experts by using this model.

Framework of the CIR model

Implementation of Neuro-technology CIR model has been divided into three (3) phases

Phase 1

- Organizing the first awareness program on Neuro-technology among the society
- The target group are publics especially, parent or the caregivers with special children and teachers from special schools.
- The objective is to create awareness on the efficacy of neuro-technology in helping children with learning

difficulties and neurological disorders in improving their cognitive, social and behavioral skills.

Phase 2

- Training of Brain Trainers (ToBT)
- The first group joining this program is 10 teachers form Kuching Autism Association (KAA)
- They need to complete six (6) learning units on Neurofeedback and counseling approach for special children.

Phase 3

- After completed their learning module, they will be attached with the organization
- They need to complete 30 sessions of brain training for the special children while being monitored by certified practitioners.
- After completing all the requirements, they will be given certificate of attending Training the Brain Trainers program.

V. DISCUSSIONS

A. Approaches to the CIR model

Neuro-technology CIR model was developed to help the children with learning difficulties and intellectual disorders to improve their cognitive, behavioural and social abilities. This can be achieved with the active involvement from the community of parents, teachers, caregivers and professionals help. This models includes a number of approaches that allows individuals with different disabilities to benefit from further rehabilitation process. The proposed CIR model includes the Neurobehavioral programs (NBR) with emphasis on brain training using technology of neurofeedback with additional of Parents' counseling services to help with the parents' stress in handling the children's' difficulties and behavioral problems. The main purpose of this model is ultimately the provision of proposed professional and social support leading to improvement in the quality of life for children with learning difficulties and intellectual disorders and also the affected families. Other objective includes the awareness and dissemination of knowledge regarding cognitive neuroscience, counselling services and the application drugs free neurofeedback training in the community. Instead of that, to setting up the neuro-technology training centre as one stop center in providing rehabilitation for the special children.

The delineation of this model has closely followed the framework proposed by Trudel, M. T., Nidiffer, D. F., Barth, T. J. on their Community Integrated Brain Injury Rehabilitation programmed. This programmed consists of neurobehavioral programs, residential programs, comprehensive holistic (day treatment) program and home based program. Comprehensive day treatment CIR model consist of various approach with neuropsychological focus. These include intervention target awareness, cognitive function, social and vocational skills through community provided by interdisciplinary team. As for our model, we focused more on neurobehavioral programs with neuro technology and counseling approach for the parents and caregivers to achieve our targets. The proposed neuro-technology CIR model consists of awareness programs, training of brain trainers and attachment of the brain trainers into the chosen organizations. The objective of the awareness programme is to create awareness among the Malaysians especially those with special children or dealing with special children on importance of having knowledge about learning difficulties and intellectual disorders among children. Besides, the main objectives also to introduce neuro-technology as an alternative rehabilitation for children with special needs. This is very important as Malaysians have very poor knowledge in neuro technology compared with others developing countries. This awareness programs targeted for the parents, caregivers, teachers and those professional in the field of psychologists or therapists.

The center of this model is Training of Brain Trainers (ToBT) programme. ToBT was developed to train targeted community in handling neuro-technology especially neurofeedback. For this program, the learning module was developed from the basic introduction to the neurofeedback, brain anatomy, protocol guidelines until the participants able to handle the training by their self. Besides knowledge in neurofeedback, the participants also will be exposed on the counseling approach on handling special children and knowledge in mental health by the certified counselors from University of Malaysia Sarawak (UNIMAS). There are six (6) learning units that the participants have to complete before proceed to the next level. As the learning module has been completed, all the participants must complete 30 sessions of brain training for two different cases on children with any types of learning difficulties and intellectual disorders to be able to get a certificate attending this programmed. The certified brain trainers will monitor the process of the training from time to time. Those who able to complete all the assessment will be given a certificate of attending ToBT programme. This programme is a joint collaboration with Kuching Autism Association (KAA) and *Persatuan Kanak-kanak Terencat Akal (PERKATA)* funded by Ministry of Education (MOE). For the first group, 10 teachers from Kuching Autism Association (KAA) participated in this programme.

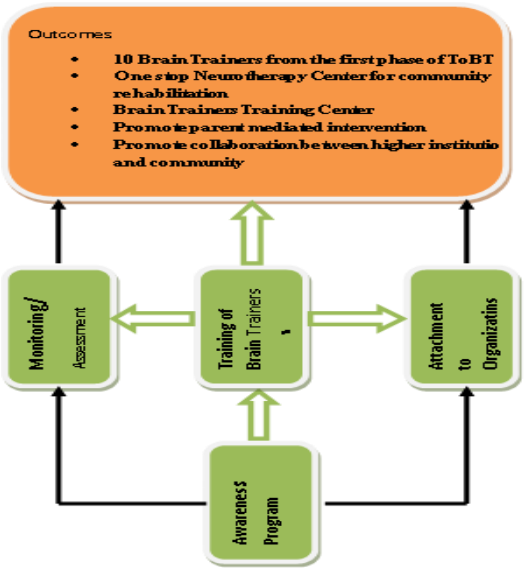


Figure 1 Neuro-Technology of CIR Model

The Role of Counseling Approach on Neuro-technology CIR Model

Rehabilitation using neuro-technology works with other approaches to increases the effectiveness of the results. One of the approaches that been use in the Neuro-technology CIR model are counseling. During ToBT, the participants will be exposed into counseling approach on the way to deal with the special children and also how to manage the stress among the parents, caregivers and the teachers that dealing with special needs. This framework was developed based on a case study on in dealing with stress among parents of disabled

children. Four participants were purposely selected from a small number of participants who attended the Neurofeedback Training (NFT) at the counseling laboratory at the Faculty of Cognitive Science and Human Development in UNIMAS. NFT were carried out since September 2010 on disabled children with various core symptoms such as hyperactivity, impulsive behavior, and attention problems. The joint collaborative effort with parents' counseling with NFT may enhance efficacy of the training and improve the quality of life of family and parents of disabled children.

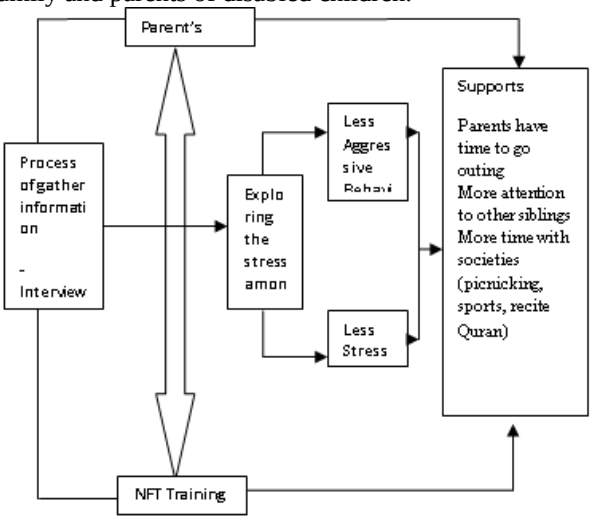


Figure 2 Neuro- Counseling Frameworks

Furthermore, research on families with children with disabilities indicates parents of children with disabilities have higher stress than parents whose children are normally developing. [6]. This is supported by the conversation with one of the parents, "*actually coping with him. Of course sometimes I'm stressed. Luckily my husband is supportive and I am full time housewife and I have house work to cope with and cooking to do…laundry to do. That is the normal procedure. So by the time he went to school I still have time to do work at home and after he came back from school the environment in house completely change".* The feedback from the parents led to the development of Neuro-counselling framework to help the children with learning difficulties and neurological disorders as well as helping their parents to handle stress.

VI. CONCLUSION

The development of Neuro-technology CIR model started with case studies on ASD and the Faculty of Cognitive Sciences in UNIMAS with parents and children coming for consultation and neuro therapy using NFT. It started in 2009 with case study of ADHD child with symptoms of hyperactivity, tantrums, and self injury. More children and parents came since then. Most parents expressed their inability to cope with the children aggressive behavior and hyperactivity resulting in stress which affects their psychological wellbeing and quality of life. In liew of this, the trainers decided to refer the parents to the counselors. After going through the counseling process, one parent stated that she was able to accept that her child is special and able to reduce the symptoms such as aggressive behavior and self injury and for the first time in her life after 10 years, she was able to go out with her husband without the presence of her child who has been unable to detached herself from her parents before.

After first awareness program in 2010, with sponsorship from RHB and PUSTAKA Negeri Sarawak, more parents and children from KAA came to the faculty to get the information regarding NFT and due to the limitation of space in physiosychology laboratory, it was decided that training of trainers were conducted with the teachers in KAA. Initially, only one teacher was trained to train the children using NFT. Therefore, NFT center was set up at KAA. 39 children trained and around 30 children successfully improved and were accepted to the integrated school. There are need to train more brain trainers and with the Knowledge Transfer Program (KTP), we hope to produce and train all the teachers in KAA on using NFT. The training started on 12th July until 27th September 2014 based on the ToBT module.. Evaluation were conducted at the end of the training to evaluate their understanding and confident to handle the children using NFT. Most participants demonstrate their understanding on the brain and its functioning and the choice of protocol to be used on the children. When asked on their ability and technicality on handling the device, they demonstrate their ability and confidence in handling the device and putting the electrode on the scalp based on the appropriate protocol. And when asked regarding the confidence, everyone expressed and displayed the confidence during the hands on session. The Neurotechnology CIR model was completed with the development of Module for the ToBT. The objective of the model was achieved and more training involving the teachers from other organization will be conducted based on the Model with KAA.

ACKNOWLEDGMENT

We are grateful to the Ministry of Education Malaysia for funding the Knowledge Transfer Program fund (KTP) Grant (GL/KTP/(F04)/2014/(06) to enable us to conduct the knowledge Transfer Program in partnership with the community, particularly Kuching Autism Association (KAA) whom we work closely relating to the training program. Appreciation goes to Faculty of cognitive Science and Human Development UNIMAS for the use of facilities in NeuroLab.

References

[1] Haddadi, P., Haghshenas, S., Rostami, R (2011). Rehabilitation in Autism Spectrum Disorder (ASD): a mixture of neurofeedback and Auditory Integration Training (AIT). *Procedia Social and Behavioral Sciences, 30(2011*), 611-614

[2] Truddel, M. T., Niddifer, F. D., Barth, T. J. (2007). Community-integrated brain injury Rehabilitation: Treatment models and challenges for civilian, military and civilian population. *Journal of Rehabilitation Research & Development, 44(7)*, 1007-1-16

[3] Nazaruddin, M. S., Ghazali, N. M., Aden, E., Fauzan, N., Bakar, M. A. A., Said, S. N. M., Ibrahim, N. H. (2011). Integrative "Neurofeedback –Parents' Counseling Framework in Dealing with Stress among Parents of Disabled Children: A Case Study. *PERKAMA International Convention*

[4] David, J. F., David, F. T., Lydia, C. F. (2005). Applied Psychophysiological and Biofeedback. *An Alternative and Efficacious Treatment for Attention Deficit Hyperactivity Disorder, 30(4).*

[5] Teoh, H. J., Cheong, S. K., Woo, P. J. (2008). Students learning disability experiences, training and services needs of secondary school teachers. The Malaysian Journal of Psychiatry, 17(2),

[6] Norsiah Fauzan (2011). Reviewing Research Evidences in Psychological research. Academic Publishing, AG & Co LAP Publishing, Germany.