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THE EFFECT OF BIOFEEDBACK THERAPY FOR AUTISTIC SPECTRUM DISORDER (ASD)

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Abstract
Biofeedback has been reported to reduce symptoms of autism spectrum disorders (ASD) in several studies. Children affected by autism spectrum disorder (ASD) often have impairment of social interaction and demonstrate difficulty with emotional communication, display of posture and facial expression, with recognized relationships between postural control mechanisms and cognitive functions. Beside standard biomedical interventions and psychopharmacological treatments, there is increasing interest in the use of alternative non-invasive treatments such as biofeedback that could potentially modulate brain activity resulting in behavioral modification.
Biofeedback therapy is a form of alternative medicine that involves measuring a patient's quantifiable bodily functions such as sweat gland activity, skin temperature, blood pressure, heart rate and muscle tension, conveying the information to the patient in real time, this will arise the patient's awareness and conscious control of their unconscious physiological activities**.** The purpose of this paper is to assess the effectiveness of biofeedback as a method of treatment of the core symptoms of ASD.
Keywords: Biofeedback, Autistic Spectrum Disorder

Introduction

Developmental disabilities are lifelong disorders that are often characterized by problems related to the functioning of the brain or senses and include genetic disorders that affect cognition, behaviour and multiple body systems (Hsiao, 2013).

It has been estimated that about 10% of children experience developmental disabilities requiring access to the health care system and need extensive care giving (Zablotsky & Black, 2015), requiring a number of services and treatments to address both behavioural and developmental challenges, often throughout childhood and into adult years (Malhotra, Khan & Bhatia, 2012).

Autistic spectrum disorder (ASD) has shown dramatic increase in prevalence over worldwide (Coben & Padolsky, 2008), in which indicates a general deficit in cognitive function that emerges during childhood; developmental disabilities present in the developmental period and are characterized by limitations in socio-adaptive functioning and intellectual abilities (Malhotra, Khan & Bhatia, 2012).

American Psychiatric Association (APA) defines Autistic Spectrum Disorder (ASD) as a class of neurodevelopmental disorder that are characterized by complex, persistent, and variable deficits in social communication, social interaction and restricted repetitive patterns of behaviours, interests and activities (APA, 2013).

ADS characterized by a withdrawal of the child into the self and into a fantasy world of his or her creation, the child with autistic spectrum disorder has markedly abnormal or impaired development in social interaction and communication, markedly restriction of activities and interests which considered bizarre (Townsend, 2015).

Centres for Disease and Prevention (CDC) reports that approximately one in every 68 children has ASD, around five times more popular among boys than among girls (CDC, 2014), the prevalence of ASD in the United States to be about 11.3 per 1,000 (Townsend, 2015). ASD is reported to occur in all ethnic, racial, and socioeconomic groups (CDC, 2014); onset of the disorder occurs in early childhood and in most cases it runs a chronic course with symptoms persisting into adulthood (Townsend, 2015).

The total costs per year for children with ASD in the United States were estimated to be between $ 11.5 billion to $ 60.9 billion, this significant economic burden represents a variety of direct and indirect costs from medical care to special education to lost parental productivity (Lavelle & Weinstein, 2014).

Biofeedback therapy is a form of alternative medicine that involves measuring a patient's quantifiable bodily functions such as sweat gland activity, skin temperature, blood pressure, heart rate and muscle tension, conveying the information to the patient in real time, this will arise the patient's awareness and conscious control of their unconscious physiological activities (Burger, 2009).

Biofeedback therapy designed to alleviate a particular symptoms of illness, the patient is taught to recognise and then effectively use the physiologic cues associated with less than optimal physiologic system functioning by making behavioural changes and restore optimal physiological system functioning for the given circumstances (Burger, 2009).

Three types of Biofeedback techniques that are available are; Electromyography (EMG) which measures muscular tension; Thermal biofeedback measures the skin temperature and the Neuro- feedback or electroencephalography (EEG) which measures brain wave activity (Kouijzer, Schie & Moor, 2013).

The purpose of this paper is to asses the effectiveness of biofeedback as a method of treatment of the core symptoms of ASD.

Significance

Autistic Spectrum Disorder (ASD) is a serious illness that impacts the quality of life of children and their families; so further studies are needed to evaluate the effectiveness of biofeedback therapy for children with ASD to improve quality of life for patient and family, health and performance.

Literature Review

Introduction

Autistic Spectrum Disorder (ASD) can be categorized as part of a spectrum of heterogenous disorder, characterized by a range of abilities and levels of severity (Coben & Padolsky,

2008). The common feature is qualitative impairment in social and communication domains and imaginative development, the triad symptoms including impaired communication, social skills and imaginative development (Coben & Padolsky, 2008).

Children with ASD may never develop patterns of typical speech; their speech may be inflexible and unresponsiveness to the context, speech may be limited to echolalia or narrow topics of specialized knowledge (Coben & Ricca, 2013), communicative impairment includes non verbal cues such as eye contact, facial expression and gesture while social behaviours are characterized by lack of interaction, play lacks cooperation and imagination is narrowly focused on repetitive activities (Coben & Ricca, 2013).

Executive deficits associated with ASD attributed to frontal lobe dysfunction resulting in preservation and the inability to shift attention, weak central coherence attributed to individuals with autism to explain patient's superior ability to attend to details, also weak central coherence predicts the tendency of people with autism to have deficits in understanding global systems or the relation between the parts and the whole (Coben & Padolsky, 2008).

Recent researches suggest that ASD associated with functional disconnectivity between brain regions, there is evidence for abnormality in the functional connectivity of the medial temporal lobe (Coben & Ricca, 2013). Abnormalities were founded in the functional integration of the amygdale and parahippocampal gyrus; these points need therapeutic interventions that address ASD as a neurodevelopmental and brain disorder (Coben & Ricca, 2013).

Biofeedback is a mind-body therapy utilizing electronic instruments to assiat patients gain awareness and control over psycho physiological processes (Yucha & Montgomery, 2008), biofeedback instruments measure muscle activity, skin temperature, electrodermal activity, respiration, heart rate, blood pressure, brain electrical activity, and brain blood flow (Kouijzer, Schie & Moor, 2013).

Biofeedback is used by physicians, psychologists, nurses, counsellors, physical therapists, occupational therapists and others, it is guide the patient to facilitate the learning of voluntary control over mind and body, and take active role in maintaining higher level mind-body wellness and personal health (Kouijzer, Schie & Moor, 2013).

Emphasize training patients to gain awareness, self-regulate, increase control over their brains, nervous system and bodies and improve flexibility in physiologic responding, the positive effects of feedback training enhance health, performance and learning (Kouijzer, Schie & Moor, 2013).

The aim of this review of literature is to present several studies to evaluate the effectiveness of biofeedback therapy in treating children with Autistic Spectrum Disorder (ASD).

Related Studies

Beginning of Biofeedback Therapy

Biofeedback evolved out of early in the 1940's; in the 1950's and 1960's researchers from different fields studied various applications of feedback mechanisms to modify physiological functions in animals and humans (Siever, 2008).

Kimmel, Neal Miller and David Shapiro were among the first psychologists using operant conditioning models to further biofeedback research, and in the late 1960's the term biofeedback was first used to describe this type of therapy (Siever, 2008).

In 1969, researchers joined together to form the Biofeedback Research Society renamed the Association for Applied Psychophysiology and Biofeedback to promote

communication, study and application of biofeedback in the United States (Siever, 2008).

Preparations for Biofeedback Therapy

Before begin biofeedback therapy informed consent should obtained from the patient or family, then check the therapist's credentials, experience and certification, the biofeedback trainer must have technical skill, an understanding of basic anatomy and physiology, knowledge of various conditions and familiarity with computer hardware and software (Kouijzer, Schie & Moor, 2013).

The American Psychological Association views biofeedback as a proficiency area, master's and doctoral level training programs are available through a variety of sources, and certification is available through the Biofeedback Certification Institute of America (Kouijzer, Schie & Moor, 2013).

Also, find out the cost of treatment and whether the insurance covers it, establishing a foundation of trust and confidence in the health care professional is an important component of biofeedback training (Cohen & Mckeon, 2009).

An initial consultation will be carried to record medical history, biofeedback goals and treatment background, the procedure will be clarified to provide a clear understanding of how and why the training will be helpful, the individual will be shown the equipments and told where they will be placed and how they work (Kouijzer, Schie & Moor, 2013).

Before electrodes are sited on the body, the skin surface must be prepared by using alcohol pads to remove makeup, oils and dead skin cells that may interfere with the biofeedback signal (Cohen & Mckeon, 2009).

Treatment Protocols

Electrodes paste applied to the sensor or a small adhesive pad is used to adhere the sensor to the skin, heart rate, temperature and monitors placed on the fingertip with a Velcro or elastic band (Coben & Padolsky, 2008).

Burger (2009) conclude that the protocol of each biofeedback treatment is identical and involved the following; first, the patient is asked to label on a scale ranging from zero to ten, how calm he feels, with zero being the most calm and ten being the most anxious.

Next, the patient used stress dots which measure stress based on a colour scale, assigned to hand temperature, this took about five minutes and through breathing and relaxation techniques the patient is supposed to learn how to decrease stress and relax (Burger, 2009).

After that, the patient use a tool called RESP-RATE which use a unique breathing exercises and a monitor that measures breaths per minute, this tool enables the patient to slow his breathing rate from the normal range of 14 to 18 breaths per minute to the therapeutic pattern of fewer than 10 breaths per minute with prolonged exhalation, the patient uses this tool for ten minutes (Burger, 2009).

The patient then used the digital thermometer, helps manage stress by displaying hand temperature during biofeedback training, and this tool works via a sensor which is placed on the dominant finger of the nondominant hand (Burger, 2009).

For the next 30 minutes, the patient played biofeedback games using biofeedback software made by Somatic Vision, called Inner Tube and Particle Editor uses a new biofeedback hardware device that measures skin conductance level (SCL) and heart rate variability to adapt to changing circumstances through sensors that are gently attached to three fingers (Burger, 2009).

The measurements are registered through the hardware and feedback to the patient through biofeedback activities on the computer screen; these biofeedback games are prepaed to maintain the patient's attention and promote the ability to use biofeedback skills, while producing physiological measurements that are recorded and compared throughout the treatment (Burger, 2009).

The final component of each session is ten minutes of meditation guided by a biofeedback meditation audio CD, the patient also practice biofeedback and breathing skills with this CD with the assistance of his parent once a day for ten minutes (Burger, 2009).

Biofeedback session range from 45 minutes to 90 minutes, it is appropriate for children who are able to sit and follow instructions generally five years of age and older (Yucha & Montgomery, 2008).

Eight to twenty sessions are the length of treatment when there is good patient adherence; follow-up sessions are arranged at three, six and nine months after the end of treatment (Yucha & Montgomery, 2008).

The setting in which biofeedback training takes place can vary, sometimes the clinician, patient and equipments are in the same room and sometimes the client may sit in comfortable seating in a semi-dark, quiet room while the clinician is in another room with the equipment, in this arrangement the clinician and client communicate using an intercom (Yucha & Montgomery, 2008).

Fees vary among professions whether psychologist, physician, master's level counsellor, nurse, social worker, physical or occupational therapist and between geographical regions, fees range from $50 to $200 per hour (Yucha & Montgomery, 2008).

Summary of Literature Review

Biofeedback has shown efficacy for a wide variety of developmental disorders including autistic spectrum disorder, researchers suggest that biofeedback is an effective therapy for reducing the core symptoms in children with autistic spectrum disorder (Coben, Arns & Kouijzer, 2011).

It is a therapy that teach the patient to regulate his or her brain activity to work in a new more efficient way through the use of operant conditioning paradigms, this involve providing a patient with visual and auditory feedback for particular neural behaviours (Monastra & George, 2009).

Walker, Kozlouski and Lawson (2007) presented evidence demonstrating the ability of biofeedback therapy to successfully train neural functioning to more normal states and demonstrating reductions in pathological symptoms.

Biofeedback therapy is effective in improving attention, executive functioning, language and visuo-spatial processing in autistic patient and change the autistic brain to work in novel and more efficient ways (Coben, Sherlin, Hudspeth & Mckeon, 2009).

This therapy can lead to long lasting effects; continuing improvement even after the treatment is stopped and no evidence of producing unwanted side effects in children with autistic spectrum disorder (Coben et al., 2009).

Recommendations / Implications

Further researches on methods of developing effective biofeedback protocols especially for children with autistic spectrum disorder are needed; Support and participate in researches related to biofeedback therapy and participate in continuing professional education sessions for children with ASD.

Establish a foundation of trust and confidence in the health care professional is

an important component of biofeedback therapy; Provide standardized recommendations to support patient and family for effective outcomes, regular counselling sessions, follow up, intensive training programs for professional practice and specialty centres are needed.

Ensure provision of best practices through the participation in the development of screening, assessment tools and interventions that are focused on functional outcomes related to patients with ASD; Promote collaboration among practitioners, educators, researchers and policy makers to advance evidence, knowledge and capacity in providing ASD assessment and interventions.

Summary

Children with autism has very unique characteristics, care of them often is stressful for parents, so it is important to address the needs, professional relationships and stresses of their families. Also, quality of life, family satisfaction, family relationships, community living, employment and health functioning are affected, so early detection and intervention are very important.

Biofeedback is the ideal approach for patients seeking complementary and alternative medicine (CAM) therapies, because it gives the patient active role in his or her own health care; involve a holistic emphasis on body, mind and spirit; is non- invasive and elicit the body's own healing response.

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