

IMPROVING SOCIAL RESPONSIVENESS OF CHILDREN WITH AUTISM
SPECTRUM DISORDER THROUGH NEURO-PHYSICAL EXERCISE

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To my beloved father, mother and daughter

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ABSTRACT

Research on autism has always been conducted intensively among researchers around the world as this complicated childhood disorder is at the alarming stage due to the increasing prevalence rate every year. Among the impairments exhibited in children with autism, social responsiveness is one of the core deficits. Ability to socialize is an important function one should possess as people need to socialize and be accepted by the community for higher achievement. The purpose of this study is to identify the effectiveness of neuro-physical exercise intervention for children with autism to improve the five constructs of social responsiveness namely, social awareness, social communication, social cognition, social motivation and autistic mannerism. Neuro-exercise and physical-exercise were integrated in intervention group by using concurrent embedded design. Qualitative data was collected through parents' semi-structured interview and observation on children in the intervention group. Quantitative data was collected through parents' and teachers' responses in Social Responsiveness Scale (SRS). Comparison was made between intervention (n=4) and non-intervention (n=4) group. Results showed overall improvement of all the five constructs of social responsiveness. The findings showed improvement in core elements was first identified in social awareness, followed by social motivation and social cognition. From the analysis, the existing social responsiveness was re-categorized. Findings from this study enabled parents to use suitable intervention program for their child at home. In addition, this study also assisted teacher to be more effective in adopting suitable teaching strategy to improve the social responsiveness of children with autism.

ABSTRAK

Kajian tentang autisme telah dijalankan secara intensif dalam kalangan penyelidik di serata dunia memandangkan jenis kecalaruan kanak-kanak yang rumit ini berada pada tahap yang membimbangkan berikutan peningkatan kadar prevalens setiap tahun. Antara kelemahan yang ditunjukkan oleh kanak-kanak autisme, responsif sosial merupakan salah satu defisit utama. Kebolehan bersosial dengan orang lain merupakan fungsi penting yang perlu dimiliki seseorang kerana manusia perlu bersosial dan diterima oleh komuniti untuk memperoleh pencapaian yang lebih tinggi. Tujuan utama kajian ini adalah untuk mengenal pasti keberkesanan intervensi latihan neuro-fizikal terhadap kanak-kanak autisme untuk membaiki lima konstruk responsif sosial iaitu kesedaran sosial, komunikasi sosial, kognisi sosial, motivasi sosial, dan tingkah laku autisme. Latihan neuro dan fizikal telah diintegrasikan ke dalam kumpulan intervensi dengan menggunakan reka bentuk penyerapan serentak. Data kualitatif dikumpul melalui temu bual separuh struktur dengan ibu bapa dan pemerhatian atas kanak-kanak dalam kumpulan intervensi. Data kuantitatif dikumpul melalui respons ibu bapa dan guru dalam *Social Responsiveness Scale* (SRS). Perbandingan dijalankan antara kumpulan intervensi (n=4) dengan kumpulan bukan intervensi (n=4). Dapatan menunjukkan peningkatan keseluruhan dalam semua lima konstruk responsif sosial. Dapatan ini menunjukkan peningkatan dalam elemen utama mula dikenal pasti dalam kesedaran sosial, diikuti dengan motivasi sosial dan kognisi sosial. Daripada analisis, responsif sosial yang sedia ada telah dikategorikan semula. Dapatan kajian ini membolehkan ibu bapa menggunakan program intervensi yang sesuai di rumah bagi anak-anak mereka. Tambahan pula, kajian ini juga membantu guru-guru menjadi lebih efektif dalam menggunakan strategi pengajaran yang sesuai untuk meningkatkan responsif sosial kanak-kanak autisme.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Autism spectrum disorder (ASD) and autism are both general terms for a group of complex disorders of brain development. These disorders appear in the early years of a child, usually during the first three years of their lives. Autism is characterized by difficulties in social interaction, verbal and nonverbal communication and repetitive behaviors. Deficits in social interaction and reciprocal social relationships are two of the most profound impairments in children with Autism Spectrum Disorder (ASD) (Schultz, 2005). With the May 2013 publication of the DSM-5 diagnostic manual, all autism disorders were merged into one umbrella diagnosis of ASD. Previously, they were recognized as distinct subtypes, including autistic disorder, childhood disintegrative disorder, pervasive developmental disorder-not otherwise specified (PDD-NOS) and Asperger syndrome. Autism is a “spectrum disorder” that affects children differently and to varying degrees. In general, they are often called autism.

Children with autism varied from each other, the degree of their autism ranges from mild to severe, thus even when children were diagnosed with autism, their behaviours can be different from each other (Gupta & Singhal, 2009). Some children with autism may display impairment in language development and experience difficulty to interact with others; while others may have challenges to following instruction during table task. Kanner includes five attributes as the dysfunctions of

individuals with autism (Hendriks-Jansen, 1997), namely (1) Inaptitude to respond to other people and needs to be left alone; (2) Strong desire for consistency; (3) Delay in verbal imitation; (4) Over or under-sensitivity to external stimulation; and (5) Lack of imaginative play and excessive repetitive, stereotypical actions such as rocking body, flicking finger and flapping arm irregularly. Deficits in social interaction and reciprocal social relationships are two of the most profound impairments in children with Autism Spectrum Disorder (ASD) (Schultz, 2005).

Being a disorder without known etiology, Autism is often associated to lack of appropriate eye contact, monotonous facial expression, limited social interaction, delay communication, and restricted repetitive behaviour. Some parents of children with autistic behaviour may find their child enjoy being isolated and confused with their inability to form emotional bonding, and wish for some practical solutions of bridging the gap between them (Richard, et al., 2000). There is evidence in some cases where interaction between people with ASD and other individuals and their social sphere in general, can be meaningful, real and even active. The absence or insufficient social contact, along with other practical challenges and behaviour, are recognizably some of the main challenges among people with autism and their immediate families.

Another important feature of ASD is their strong desire for sameness, in another words, they are rigid in term of thinking and behaviour. According to Dr. Temple Grandin, rigidity in both behavior and thinking is a major characteristic of people with autism and asperger (Grandin, 2011). Thus, it might be very challenging to change their behavior into a more appropriate behavior in current social setting. Back in year 1979, Dr Lorna Wing and Dr Judy Gould had described ASD as lifelong 'triad of impairments'. Such impairments affect the ability of individual to communicate, socialize, forming relationship, imaginative play and understand about the peoples and world surrounded them (Wing & Gould, 1979).

Special educators teaching children with ASD often find it challenging as it was difficult to get their response and most of the time children with ASD was seen confining in their own surroundings, thus unable to interact with others. It posed

difficulty for the teacher for classroom curriculum planning. Teachers found it challenges as social interaction with others was part of the important skills for the child to be integrated in the community. Furthermore, it might be very challenging to cope with multiple aspects of the child as teaching children with ASD required comprehensive knowledge and skills. Teachers needed to understand how to manage their challenging behavior or emotion during critical situation, individual planning and support were needed and teachers needed to understand the use of transition during the class. However, most of the teachers might not be trained in this areas especially in mainstream school in Malaysia, thus all the challenges can hinder the education and opportunity of the child with ASD.

There are several theories of autism to explain the cognitive and social complexity of ASD (Hill and Frith, 2003). Of these the one that has the distinct similarities with emotional processing theories is Baron-Cohen's 'mindblindness' hypothesis. The other famous theory is learning theory which focus on important of fundamental skill. Different theories would lead to different intervention plan on educational and psychological needs of children with ASD. In view of these, this study looked into identifying a more effective intervention strategy to assist children with ASD.

Numerous type of intervention program are available over the past few decades for children with ASD. Applied Behavioural Analysis (ABA) program is one of the well-established and widely used program focusing on the behavioural and cognitive development. Son-rise program developed by Barry Neil Kaufman and his wife highlighted the important of positive reinforcement (Kaufman and Kaufman, 1995). Relationship Development Intervention (RDI) created by Dr Steven Gutstein developed a therapeutic approach for caregivers focused on social skill. The 'Developmental, Individual difference, Relationship-based (DIR/Floortime) Model developed by Dr Greenspan identified the need to improve social, emotional and intellectual ability of the individual with ASD (Greenspan, 2008). Sensory Integration training as developed by Dr Ayres continued to study on the sensory needs of the individual with ASD, a lot of deep brushing, stimulating methods were used to improve the sensory experience of individual. (Ayres, 1972).

Neurofeedback is another form of therapy that has gained wide popularity in the last few years. Research on ASD shows that neurofeedback (EEG biofeedback) can remediate anomalies in brain functioning, it can reduce the symptom of autism and improve in their overall functional ability. This evidence identified another possible treatment, and this brings hope for a more effective behavioural, psycho-physiological intervention moderating the severity of autistic child (Press, 2008).

Guy McCormack, a Chief of Occupational Therapy at the University of Missouri, suggested that “the ultimate target is to lay down new neural pathways to improve the focus and attention span, enhance social interaction, improved sleep and appetite (University of Missouri, 2008).” Neurofeedback can be utilized to help autistic students to direct their brains to better focus in mainstream classrooms by training their brains to construct alternative neural pathways for cognitive growth and development. If this is possible, more significant improvement can be obtained and it can reduce the financial burden of family, at the same time able to improve the children within shorter time frame.

This chapter provides an overview of the background of the study, followed by the statement of problem, objective and research question of the study. In addition to it, this chapter discussed on the theoretical framework and designs an appropriate conceptual framework to be used throughout the study. The chapter identified the limitation of the study as well as the scope of the study. Key terminology used in this study are being identified at the end of the chapter.

1.2 Background of Study

According to the latest statistic by Autism Research Centre in United States, 1 in 68 children now are affected by Autism (Autism Research Institute, 2014). In Malaysia, out of 625 children, one will be diagnosed as autism (Chew, 2008). According to Dr Hasnah Toran, senior lecturer in Early Intervention, Autism and Assessment from Universiti Kebangsaan Malaysia’s Education Faculty, the situation in Malaysia could be closer to that of the US given by recent researches although it

seemed that the prevalence rate in Malaysia is much lower than in US. However, such discrepancy may be due to the difference in research protocols adopted and the awareness of the symptoms. In many Asian countries including Malaysia, there is no formal registration for the number of children with Autism (See, 2012) as such disorder is still not being classified in independent category, rather it is still being the umbrella term of learning disabilities (MOE, 2012). However, the research done by National Autism Society of Malaysia (NASOM) has shown the increment of intake by about 30% (Cheong, 2009).

Social responsiveness is one of the essential skills that children needed to possess as it contributes to the positive well-being and good social interaction of individual. Social interaction is important as children can establish higher self-esteem and more effective team player (Office of Education, 2014). Children with good social responsiveness are better in social communication, social awareness and they are more motivated to join the social group. The synergy created in the group can contribute to the better idea and contribution to the world. Furthermore, good social responsiveness allowed children to respond accurately to the surroundings and it can contribute to the positive mindset in the later stage of their life. It can affect future educational and vocational opportunities as well. However, being a child with ASD, such abilities are restricted due to their nature of impairment especially in three areas : social communication, interaction and narrow interest. As such, their development in social responsiveness is restricted and this can cause severe negative impact to be developed into a high self-esteem and independent individual.

ASD is a least-understood disorder in Malaysia, due to the lack of sufficient education and standardized assessment test for screening and diagnosing purpose. Malaysia's Ministry of Health (MOH) identified that ASD cases are on the rise, in tandem with the international prevalence rate (Nettleton, 2008). However, not all the cases are being detected at the early age, most of them were detected much later during the childhood or after attending preschool. Malaysia Ministry of Education introduced a primary 1 Literacy and Numeracy Screening test (Linus) in year 2009, such test existed with the purpose to identify the less capable students in term of academic for further diagnosis, this allowed more opportunity for children with Autism to be detected, however it is often quite late for children to be diagnosed at the age of 7.

Early intervention and treatment during early years of life and preschool years can reduce the trait characteristics of ASD, however lack of sufficient knowledge and standardized screening test can hinder the process of intervention. One of the common signs of children with Autism Spectrum Disorder is their failure to respond promptly to their names. Further, they have difficulty understanding facial expression and social cues such as tone of voice. Thus, meaningful social interaction is an uphill task for these children.

There are a variety of programs or interventions available to improve the social responsiveness of children with autism, including Applied Behavioural Analysis (ABA), Son-Rise Program, DIR/Floortime model, Relationship Development Intervention (RDI), sensory integration therapy, biomedical intervention, gluten-free casein-free diets and auditory integration therapy. The list keeps growing, however the types of treatments can generally be categorized into psychoeducation or behavioural approach; psychopharmacological approach and Complementary and alternative approach (Centers For Disease Control and Prevention, 2012). American Academy of Pediatrics and the National Research Council suggested the benefits of psychoeducation approach ABA, DIR Floortime, Speech Therapy and PECS able to provide a more structural direction in helping children with ASDs (National Research Council, 2001). Research on alternative approach including sensory integration therapy has shown satisfying result as well.

The 'Developmental, Individual Difference, Relationship-based (DIR/Floortime) Model' is a structured programme that helps practitioners include professional, parents and educators to assess and identify intervention program suitable to the challenges and strengths of children with ASD and children with special needs (Greenspan, 2008). Sensory integration involves the effectiveness of the central nervous system (CNS) to receive and organize sensory feedback from the body and the environment in order to make appropriate adaptive responses (Ermer & Dunn, 1998). Some of the methods used for sensory integration training include deep brushing; swings to stimulate vestibular input; textures for sense of touch; ball for coordination; scooter boards for balancing; weighted vests and other clothing. The intensity of the stimulation will vary depending on the needs of the child. Dr. Jean Ayres suggested that by retraining the ability of individual to integrate information from the senses into an organized whole

through a carefully controlled sensory diet, some developmental disabilities could be improved or even cured (Shaw, 2002). It is possible that by training the sensory integration of individual, children will gain more competency in social interaction with friends (Jung, KE; Lee, HJ; Lee, YS; Cheong et al., 2006).

Special education needs policy is to integrate students with special needs into mainstream education, this is known as inclusive education. Currently, there are about 768 integration program in Malaysia national school (Faridah, 2012). To be able to integrate children with special needs into normal education, basic ability to socialize with others, ability to response to other, the awareness towards surroundings and others are important. Children with ASD are noted with severe difficulty in social interaction, thus the existing curriculum in national school focusing on writing, reading and calculation are insufficient to improve children with ASD, instead children with ASD have to be taught in different way and the main ability to be taught is the social responsiveness.

Evidently, there is an apparent lack of comprehensive research focusing on a combination or integrating of different intervention programme to improve children with ASD. Every autism intervention treatment program has its strength as such, there is no standard, universally accepted treatment for all autism cases. (Canadian Paediatric Society, 2004). For that reason, very often a variety of treatment approaches are grouped together to complement each other for treatment of autism. Due to the complexity of the ASD, thus there is still no 'the best intervention or method' to improve children with ASD. Instead, multi-dimensional and professional approach are the criterion to the effective intervention plan.

Research has reviewed that each intervention plan has its advantages and disadvantages, ABA methods of intervention can be effective to improve the behavior of the children, however it can be very costly and parents have to be heavily involved. Sensory integration can be effective to integrate or organize the sensory input appropriately by the brain, however critiques on this intervention include lack of research to support its effectiveness. RDI aimed to increase motivation and social

interest, however it can be challenging as there are insufficient structured elements during the intervention.

In view of this conundrum, this research is to design a new intervention protocol by integrating physical and neuro-exercise to improve the social responsiveness of children with ASD. Physical exercise referred to bodily movement produced by skeletal muscles which required energy (Sarah, 2013). Numerous researches has identified the effectiveness of physical exercise to help children to develop important skills including empathy and leadership, this can influence social behavior (Nauert, 2010). Physical exercise acts at physiological level which in turn can influence the release and uptake of neurotransmitter in the brain. Thus, it can influence feeling and social connections as well as interpersonal relationship. Whereas, the rationale of integrating these two therapies was because mirror neuron has been identified as one of the important area which can improve the social behaviour of children with ASD (Jaffe, 2007). Brain activity which was consistent with active mirror neurons has been found in premotor and supplementary cortex of the human brains. Furthermore, it has been found in primary somatosensory cortex and the inferior parietal cortex. These areas were mainly related to motor movement. Thus, it has been hypothesized that motor movement can be improved by exercise and ultimately, mirror neuron function can be improved through exercise programme. Thus, by focusing on the exercise for neuro and phsycial, it is hypothesize that this intervention can be effective to improve social responsiveness of children with ASD.

In general, this research explored the possibility of integrating neuro- and phsycial exercise to improve the social responsiveness of children with ASD. In this research, the social responsiveness can be measured in five (5) elements: social awareness, social cognition, social communication, social motivation and autistic mannerism.

1.3 Statement of Problem

Children with ASD are often characterized by deficits in social responsiveness which is a vital aspect of social skills. The treatment of social responsiveness remains

one of the most challenging areas in meeting the needs of children with autism. Researchers, practitioners, educators and parents have tried a variety of strategies and intervention programmes for teaching social responsiveness. However, there is no single solution fulfilling both psychological and neurological needs of individual with ASD.

There are plenty researches focusing on how to improve social interaction of children with ASD, most researches rely on using 'trial and error' method such as using play intervention therapy for children to improve their social interaction (Linda, Tara, & Charles, 2005). Utilizing social stories intervention therapy to improve communication skills in children with Autism Spectrum Disorder (Adams, Gouvousis, Vanlue, & Waldron, 2004). Embedded music therapy to support young children with autism (Kern & Aldridge, 2006) and behavior therapy to improve communication and behavioral functioning by Watson J. All of the above-mentioned intervention programs might not yield uniform result due to the heterogenous characteristics of children with ASD. Furthermore, most of the therapies do not use scientific method to measure the result during the process, thus it might be difficult to relate the improvement of children to the therapy. There are special education classes in many government schools and a few special schools for students with special needs but there are limited government-owned centres around for children with special educational needs (SEN) or for parents to seek advice. Schools with special education classes provide special education but there is hardly any special intervention programs specially designed to enhance any skills for SEN in special education classes. Therefore it is common for the parents to refer their children to private entities. The private sectors in Malaysia providing home and centre-based behavioral therapy include Early Autism Project Malaysia Sdn Bhd and Autism Link Sdn Bhd. While there is no national school cater for children with autism, most of the autism cases were supported by NGOs or private sector. However, parents may have to pay a high fee to get any intervention services for their children.

In Malaysia, Ministry of Education (MOE) is responsible to ensure the provision of educational programmes such as remedial programmes for students who are deemed as 'at-risk' in learning and students with special needs such as hearing or vision loss, Down Syndrome, mild autism, attention deficit hyperactive disorder and

other specific learning difficulties. However, such arrangement is only focus on educational program, less focus was channelled to therapy programme. As stated in Vygotsky's theory, collaboration is an important elements in education. Achievement of more learning outcome can be enhanced by interaction with more abled peers or mentor (Parke & Locke, 2003). Thus, when children with autism interact with more abled peers or mentor such as caregiver or teachers, they can be more effective in learning greater social skill. However, this is not possible in the educational and economical-context of Malaysia. Another aspect of educational outcome is the ability of the child to be independent in community, thus caregiver needs to provide sufficient opportunity for the child to learn to carry out the tasks independently. Being the closest person to the child, opportunity should be given for the child to model and imitate the behaviour. Therefore, Parents and probably teachers are important persons to children with autism. This study looked into the effectiveness of the intervention programme which in turn enabled parents and teachers to adopt such intervention for more significant improvement of the children.

Autism is a medical development disorder which has been well studied and researched worldwide, yet, there is no known complete solution to alleviate the sufferers' deficient social response. Since autism is not theoretically a disease, there is no single so-called cure which can work best to heal a person diagnosed with autism. The best treatment invariably is one which meets all the needs of intervention requirement for the autistic individual. Among all the dysfunctions, it is hypothesized that increasing social awareness, social cognition, social communication, social motivation and reducing autistic mannerisms were essential for children with autism, since social response played an important role for individual to 'survive' in the community. This study aims to develop an effective intervention protocol to improve the social responsiveness of the children with autism.

1.4 Research Objectives

No single treatment is effective in treating the children with autism and due to the several weaknesses and insufficient in the current practice, the researcher

integrated both the neuro- and physical exercise to achieve better result in social responsiveness of children with ASD. The following are objectives of this study:

- 1.4.1 To identify the effects of intervention on social responsiveness of the subjects
- 1.4.2 To evaluate the Social Responsiveness Scale (SRS) of the subjects through teachers' rating before and after the intervention.
- 1.4.3 To evaluate the Social Responsiveness Scale (SRS) of the subjects through parents' rating before and after intervention.
- 1.4.4 To design a new intervention protocol by integrating neuro- and physical exercise into the intervention group to improve the social responsiveness of children with ASD and to validate the relationships of combining both physical and neurological intervention.

1.5 Research Questions

This study covers both physical and neurological aspects to improve social responsiveness of children with autism spectrum disorder. The study will answer the following research questions:

- 1.5.1 How has the intervention affected the social responsiveness of the subjects before and after the intervention?
 - (a) How has the intervention affected the social awareness of the subject?
 - (b) How has the intervention affected of social cognition of the subject?
 - (c) How has the intervention affected social communication of the subject?
 - (d) How has the intervention affected the social motivation of the subject?
 - (e) How has the intervention affected the autistic mannerism of the subject?

1.5.2 (a) What is the mean score of SRS parents' rating before and after the intervention program?

(c) What is the mean score of SRS teachers' rating before and after the intervention program?

1.5.3 What are the SRS total raw score and t-score of the subjects through teachers' rating before and after the intervention?

1.5.4 What are the SRS total raw score and t-score of the subjects through parents' rating before and after the intervention?

1.6 Significance of the Study

This study is of utmost importance to the field of special education. This combined intervention is estimated to produce significant result as it covered both the sensory and neurological aspects of the child. Children with autism may sometimes be unable to receive audio input when their visual senses are preoccupied. This is a typical situation where they cannot receive information by using more than one sense simultaneously (Iarocci & J., 2006). Thus, by training the audio, visual and motor aspect of children with ASD, significant positive result is expected.

In addition to it, this study is also significant to the stakeholders of a child with ASD; they include the child's parents, therapist, educator as well as the community the child lives in.

1.6.1 The parents

Improving children with ASD can be a lengthy and costly process, according to a study from the Harvard School in year 2010, cost of medical, therapy, education and others for individual of ASD can be as much as \$72,000 a year. For those with mild and average ASD, the cost is about \$67,000 per year. Overall, the cost of taking

care of an individual with ASD for his/her lifetime can cost as high as \$3.2 million (Konrad, 2010). In Malaysia, the average monthly household income is RM5,000 in year 2012 (Bernama, 2013), after deduction of monthly expenses, education expenses, loan and other commitment, the cost of autism treatment can be very burdening to the family. Often, this has reduced the opportunity of the children to receive the most appropriate treatment at early stage.

By understanding the social responsiveness of their child with ASD and learn about the various ways which can be incorporated at home to improve their child's social response, it is possible to improve the child within shorter time. This study will also serve as a guideline to parents to help their child to improve in a more systematic and comprehensive manner. In addition to it, it is aim to reduce the financial burden of family as the integrated model is more time effectively.

1.6.2 The therapist

This study is important to therapist as they will understand how the therapy can be effective to assist children with ASD. Furthermore, therapist can enhance their knowledge on how to apply necessary skills and methods to improve the training. This study also provides a comprehensive guideline to therapist during the session with children with ASD.

1.6.3 The educators

Educator will be able to make better arrangement in a classroom setting. Furthermore, they will have better understanding on how to play a role as well as assisting children with ASD to improve their social response in a different setting. Educators can also understand how the children can apply their trainings in the school setting.

1.6.4 The community

Every one of us needed to be accepted in the community. To be accepted, it is critical to educate the community regarding the different behaviour of children with autism spectrum disorder so that children will not be labeled wrongly. This study will also enable children with autism spectrum disorder to develop proper social skills and behaviour so that they can fit into the community better.

In additional to it, numerous researches from other countries focused on a single treatment on Autism. Thus the intervention program in this study is train the children in intervention group to enhance their ability in social responsiveness ability. Researcher believes that by integrating neurofeedback therapy into sensory integration training, children with Autism Spectrum Disorder will be able to response better in social setting.

1.7 Scope of Study

This study was carried out in a private special education centre which provides special education and therapy services to children with Autism, Attention Deficit Hyperactive Disorder, Down Syndrome, Learning Difficulties and other different types of developmental delay disorders.

The centre was formed in the year 2002 and is situated in Johor Jaya. It is a place for special needs children to learn to live happier and build up capabilities useful for their lives. The services provided by HappyLand include physical, educational and therapeutic program. The physical program is based on the principle of occupational therapy while the educational program focuses on Individual Education Plan (IEP) to narrow the gap between their abilities and developmental milestones. The other therapy program provided by the Centre are neurofeedback therapy and hydro-aroma therapy. A total of 8 children aged between 4-6 years old were involved in this study.

This concurrent embedded design is to identify the effectiveness of the neuro- and physical exercise to improve social responsiveness of the subjects with ASD. The research looked into five constructs of social responsiveness, namely social awareness, social cognition, social communication, social motivation and autistic mannerism.

1.8 Delimitation of the Study

The researcher encountered several limitations in this study. The first was related to the human subjects of this study. There were a number of considerations when selecting the human subjects: (i) the subjects must be children aged between 4-6 years old, currently or previously pursuing therapy and training in HappyLand Special Edu Centre ; (ii) the subjects must be diagnosed as Autism Spectrum Disorder by using Childhood Autism Rating Scale, Second Edition (CARS2), with no other co-morbidities; (iii) the subjects must scored between 30-36 (mild to moderate symptoms of ASD) in the CARS; (iv) the number of human subjects in this study had to be relatively small due to the nature of this study which requires the researcher and three assistants to personally hold small groups and one-to-one instructional in these intensive intervention program. (v) co-operation of the parents at home was essential to ensure the effectiveness of this program. With these constraints, the researcher had to discuss with the parents involved before deciding the suitability of the human subjects.

The second limitation was not all factors related to social interaction were included in this study. Besides that, the researcher did not consider if the parents had arranged additional intervention programme for the human subjects. Family income and social status were not taken into consideration in this study as well since all the subjects come from urban areas and they were quite homogeneous in their family background.

The third limitation of this study was the complexity of the research, as opinion on human behavior especially social interaction with others can be very subjective. There could be a lot of non-related governing factors that affect the behaviour of subjects during the interaction. Thus, to reduce such difficulties, different choices of assessment tools were selected. The researcher used three types of assessment tools:

questionnaires with parents, direct observation during the intervention programme and well established instruments. The instruments are Social Responsiveness Scale (SRS), Childhood Autism Rating Scale (CARS2); and CARS2 covered both parent questionnaires (CARS-QPC) and standard test for children (CARS-ST). The study covered both qualitative and quantitative methods. Thus, the assessment tools actually serve as an evaluation tool as well as a tracking tool to monitor the progress of the subjects over time by comparing their social interaction skills before and after the intervention.

The fourth limitation concerned the language used during the interview sessions with the parents. All the diagnostic tools were written in English. As most of the parents were unable to understand English, the researcher had to translate them into the Chinese language before sharing the questionnaires with them.

1.9 Theoretical Framework

Learning happened anytime and anywhere. We can learn technical skill, we can learn concrete or abstract concept, we can learn to speak or learn to interact with others. In this research, the researcher highlighted the important issue related to socialization, to everyone of us, it is also an important learning process as one can be separated from living in a group thus social interaction and responsiveness were essential. Three theoretical approaches were utilized in this study. The first was the social development theory (SDT) by Lev Vygotsky (1978); the second was based on the social learning theory of Albert Bandura (1977); and the third approach was the Simon Baron Cohen's Theory of Mind (2011).

Vygotsky (1978) strongly advocates that social interaction is critical in the development of children's cognitive ability. Vygotsky stated in his book 'Mind in Society' that every function in the child's development appears at social level first thus interaction between peoples (interpsychological) was first learnt. Then, it will be internalized within the child (intrapsychological), this is on individual level. This generalizes to voluntary attention, ability to use logical memory and to the understand

concepts (Vygotsky, 1978). According to Vygotsky, the development will happen after learning takes place, thus learning precedes development.

In this research, the intervention consisted of two important domains: physical and neurological. The function of environment is important as stated by Vygotsky thus creating a great environment shall be provided to provide social opportunity for the children with ASD. Physical exercise provides great opportunity for children to interact with the environment. Dr Jean Ayres (1978) identified the existence of relationship how individual behave and respond after the receiving of physical input (Schultz, 2005; Beth, et al., 2011).

The purpose of physical exercise in this research is to stimulate children with ASD to respond and gain more awareness to the incoming sensation and guides the way they act on the environment, it is helpful to reduce their stereotypical behaviors as well (Crollick, Mancil, & Stopka, 2006). By improving the interaction ability of children with ASD in social level, it is hypothesized that they will gain more ability on individual level. Vygotsky's theory suggested that consciousness is the end product of socialization, for example when children learnt to speak the first word or point to the objects, the purpose is for communication. After they learnt to speak, or adult reacted to their gesture, it became a meaningful movement that connects the child with others (Vygotsky, 1978).

Another aspect of Vygotsky's theory suggested the important of "Zone of Proximal Development (ZPD) in cognitive development of individual. ZPD stated that children will first imitate the adult's behaviour or actions, and gradually builds up his own ability to do certain tasks without any assistance. During the intervention, therapist will minimize the distraction from the surroundings while prompting the child to actively participate in the activity. Physical exercise focused on motor skill training, thus lot of behavioral imitation needed and the therapist will play the role as co-pilot whom will provide instructions and assist the child to build up the ability. Vygotsky's theory, Albert Bandura's social learning theory and Lave's situated learning theory were complementing to each other. Social learning theory hypothesized that people learnt through observation, imitation and modeling (Figure 1.1). In 1961, Bandura conducted an experiment known as the "Bobo doll" studies

where Bandura has proven that the child learn and imitate the behaviours they have observed directly in other peoples (Bandura, 1961).

The social learning theory emphasizes on the importance of observation and imitation. Base on this presumption, the researcher incorporated a lot of activities based on imitation and observation. In this research, the intervention was designed to capture the attention of children with ASD and by being exposed to various interesting activities as children responded better to visual cues (Suszynski, 2010). Great opportunity will be provided for children with ASD to imitate and desired behavior. This theory is the extension of behavioural modification, based on the concept of operant conditioning (Lovaas, 1987). This theory hypothesized that the behavior of the children with Autism can be shaped, modified and changed by using reinforcement, punishment and extinction.

Vygotsky's theory emphasizes on cognitive development of individual based on social contributions. However children with ASD enjoyed being alone and their responses towards others and surroundings can be very selective. Corbett & Abdullah (2005) identified that children with ASD avoid face to face interaction and prefer visual stimuli (Corbett & Abdullah, 2005); getting them to involve and imitate can be very challenging to both the researcher and subjects. Thus in this study, 'Theory of Mind' by Simon Baron Cohen (Figure 1.1) was used as one of the key theoretical framework to further understand the neurological needs of the children with ASD.

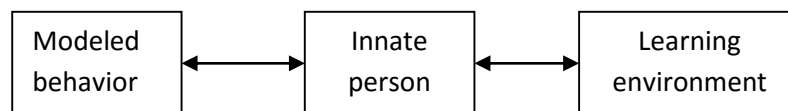


Figure 1.1: Social Learning Theory

In 2001, Simon Baron-Cohen wrote a research paper which describes Theory of Mind (TOM) as the ability to infer and understand the different mental states of individual such as beliefs, desires, intentions, imagination and emotions. Good theory of mind enabled individual to reflect on the contents of own and other's minds" (Baron-

Cohen, 2001). Meaningful communication and a sense of closeness are foreign to individuals who suffer from Autism, Asperger, Mindblindness, or a lack of Theory of Mind. These social barriers often lead to a lack of empathy from the individual. Baron-Cohen, Leslie and Frith (1985), postulated that autistic children have difficulty with second order representation based on the work they have done. Second order representation is the ability to impute another individual with the ability to have intentions and beliefs.

‘Theory of Mind’ stated that individual was unable to imagine what other were thinking by observing the behavior of others (Tew, 2007). According to this theory, ASD individuals are believed to have trouble understanding the minds of others spontaneously. However, individuals with autism are not necessarily beyond comprehension of the mental states of others – it merely meant that they have to explicitly work it out instead of the knowledge being processed implicitly by others. Followers of ‘Theory of Mind’ focused on teaching the basic concepts, communication and adaptive functioning of the individual, as those skills were pre-requisite for higher level of learning associated with deficits in theory of mind. It is imperative for parents and special educators to apprehend and appreciate how children with ASD experience their environment, the people and objects within it. There are potential sensory differences in perception, processing and responses among children of ASD (Bogdashina, 2003). It is also important to note that not all children are affected in the same way or to the same extent. So, many children of ASD are capable of learning within mainstream environments, just that some children may require a more tailored setting (DfEE, 2005).

Theory of Mind (TOM) provides a critical framework to the researcher to understand TOM is the precondition for the understanding of social environment and for engaging in social competent behaviour (Muris, et. Al 1999). Number of Researches have identified majority of individuals with Autism are mind-blind (Frith, Rieffe 2000). They show that children with ASD are unable to attribute mental states such as dreaming, thinking, believing and wanting to do something. Thus, theory of mind is the key to social skill and it has served as one of the theoretical framework in this paper. Neuro-exercise was incorporated to improve the brain executive function

of the children with ASD. It involves exercising the brainwave, research has identified that the brainwave is strongly related to several executive function of the child and it explained how and why we read others mind and feel empathy for them (Rizzolati, et al., 2009). Thus, it is hypothesized that by exercising the correct brainwave and body physical movement, social responsiveness of the subjects can be enhanced.

1.10 Conceptual Framework

The conceptual framework proposed to be applied in this study is shown in figure 1.4 below. The conceptual framework is based on the three theoretical framework identified in section 1.9.

CARS2 will be used as a filtering tool to identify the subjects in this paper. Children aged between 4 to 6 and scored a T-score of 20 to 40 in CARS2-ST will be selected as subjects. After the filtering process, they will be grouped randomly into intervention and non-intervention groups. The non-intervention group only receives standard treatment (physical exercise training), the intervention group will receive the integrating of both neuro- and physical exercise training.

All the interventions are conducted on a 3-month basis, a total of 3 hours per week will be incorporated for the intervention group. All selected subjects will be going through a pre-test to determine their social responsiveness before the commencement of intervention. The pre-test is based on the Social Responsiveness Scale (SRS) developed by John N. Constantino, MD and observation checklist as well as semi-structured interview designed by the researcher.

SRS is a 65-item rating scale which measures the severity of autism spectrum symptoms as if they occur in natural social settings. It provides a clear picture of a child's social impairments, assessing social awareness, social information processing, capacity for reciprocal social communication, social anxiety/avoidance, and autistic preoccupations and traits. SRS is selected to be used in this paper because unlike other instruments, SRS measures impairment on a quantitative scale across a wide range of

severity which is consistent with recent research indicating that autism is best conceptualized as a spectrum condition. It is appropriate because even mild degrees of impairment can have significant adverse effects on social functioning. SRS is used in the post-test as well to evaluate if the subjects have improved after going through the intervention programme. If no improvement is registered, the subject will be reverted back to another round of 3-month intervention.

Both physical and social environment have vital influence in the social responsiveness of children with ASD. This paper investigates if the play atmosphere adopted in the experiment plays a significant role in improving the responsiveness of the children with ASD when receiving stimuli from the researcher. The ability to imitate and observe is an innate trait of a normal child; yet this ability is grossly lacking in children with ASD; thus a conscious effort to create close rapport with the children and providing a conducive relax environment with the help of a variety of ball and equipments and the video of the subjects during intervention are crucial in this intervention model.

When the subjects were provided with more and clear feedback, such as verbally or non-verbally reinforce the appropriate behavior, such behavior will be likely to repeat. When the subjects were being praised for doing the right tasks, she/he will be reinforced, thus physical exercise can be interesting and attractive to the subjects as it will stimulate their response, interaction, body coordination ability. To have a clear understanding of the neurological changes of the subjects, the technology of neurofeedback was employed where children with ASD were often describe as lack of the ability to empathize other and to understand social cues. It was highly related to the 'mirror-neuron' function in the brain. Thus neurofeedback will provide a clear picture on the brainwave movement of the subjects, when certain activities produce higher alpha wave, such activities will be repeated. Neurofeedback therapy focuses on activating the SMR wave of the subjects to improve the executive functions of the brain. A lot of research have identified different brainwave function have close functional relationship across cognitive, affective and behavioral contexts suggesting that they are fundamental to awareness and response (Melford, N., Critchley, H.D. 2010).

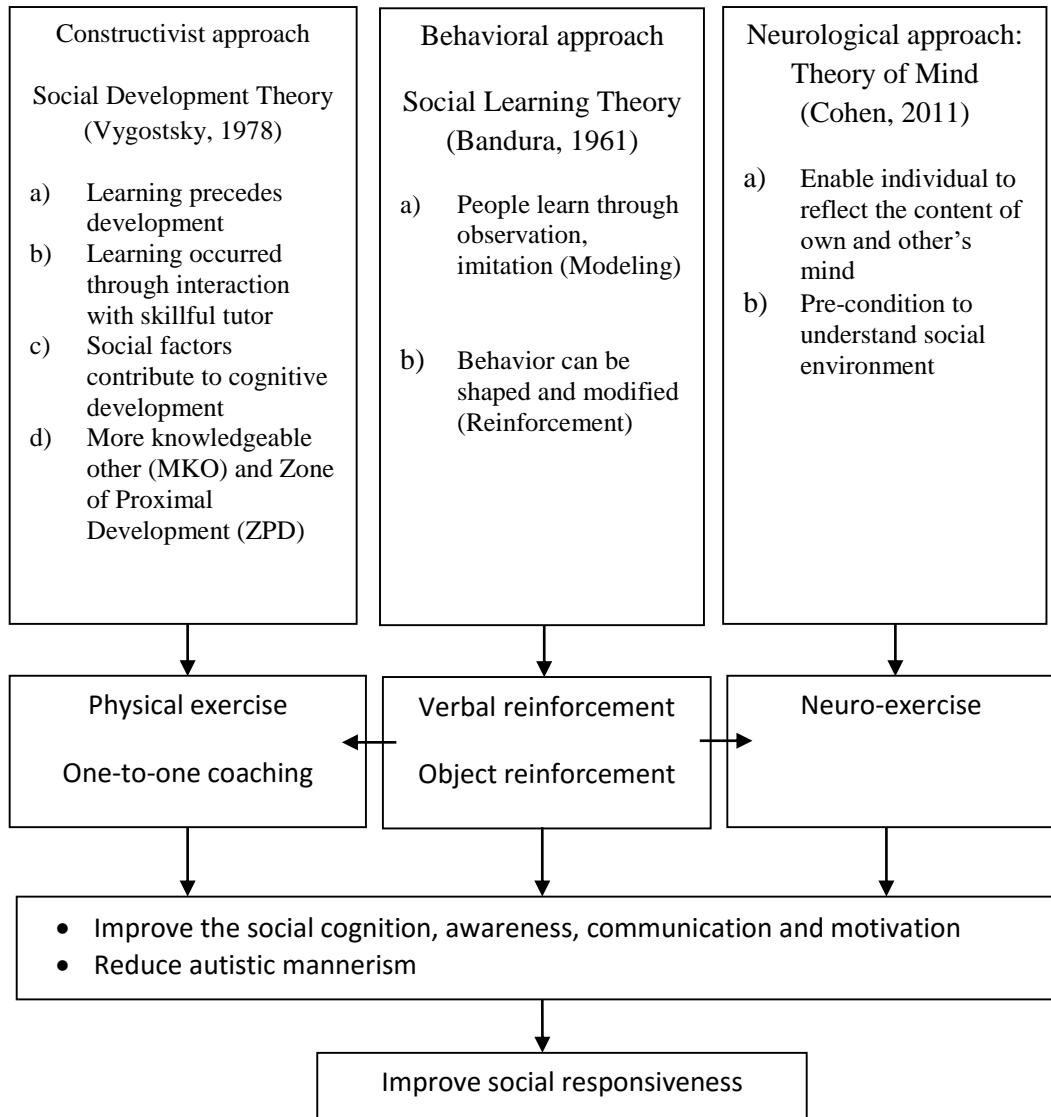


Figure 1.2: Theoretical Framework

Early EEG researchers who examined the brainwaves of autistic patients found an abnormal EEG signature which was different from ADD's EEG signature. They observed that ADD patients did not produce enough Beta (fast) Wave activities. On the contrary, most individual with ASD produced too much Beta activities which caused their brains to be over- focusing. This over stimulation of the brain is partly responsible for many known ASD behaviors such as excessive fascination with certain objects, obsessions with things, repetitive routine or always engaged in self-stimulating behaviours. They are too focused on themselves thus affecting their social interaction with others ("Neurofeedback - New Treatment Approach," n.d.). On the other hand, brainwave researches had identified that mirror neuron dysfunctions might be another causes of autism, especially in their social isolation behavior (Dingfelder,

2005). Mirror neuron is a type of brainwave normally found in the pre-cortex area (University of California, San Diego, 2005).

According to a research conducted by Dr. Michael Linden, a pioneer in Autism Spectrum Disorder treatment program in USA, ASD can be diagnosed by using the brain mapping technology (QEEG Map); and can be improved by using Neurofeedback. Dr. Linden identified 4 subtypes of autism, including autism which displayed high beta, thus caused them to be over-focused and over-aroused; the second type is related to the seizure pattern; the third is the high delta and theta ratio and the last type is the low frequency between voltage and metabolic. Those abnormal brain activities were attributed to the difficulties in their normal development in social interaction (Butnik, 2005). Research has shown that brain dysfunctions in multiple brain regions could be closely related to symptoms of ASD (Allen Press, 2008). Functional neuroimaging and electroencephalography research have shown related the abnormal neural connectivity to individual with autism. The brains of individuals with ASD show areas of both excessive high and deficient connectivity. To put it in simpler form, certain areas of their brains are active and chatting excessively with themselves, while other relevant regions fail to communicate normally (Allen Press, 2008).

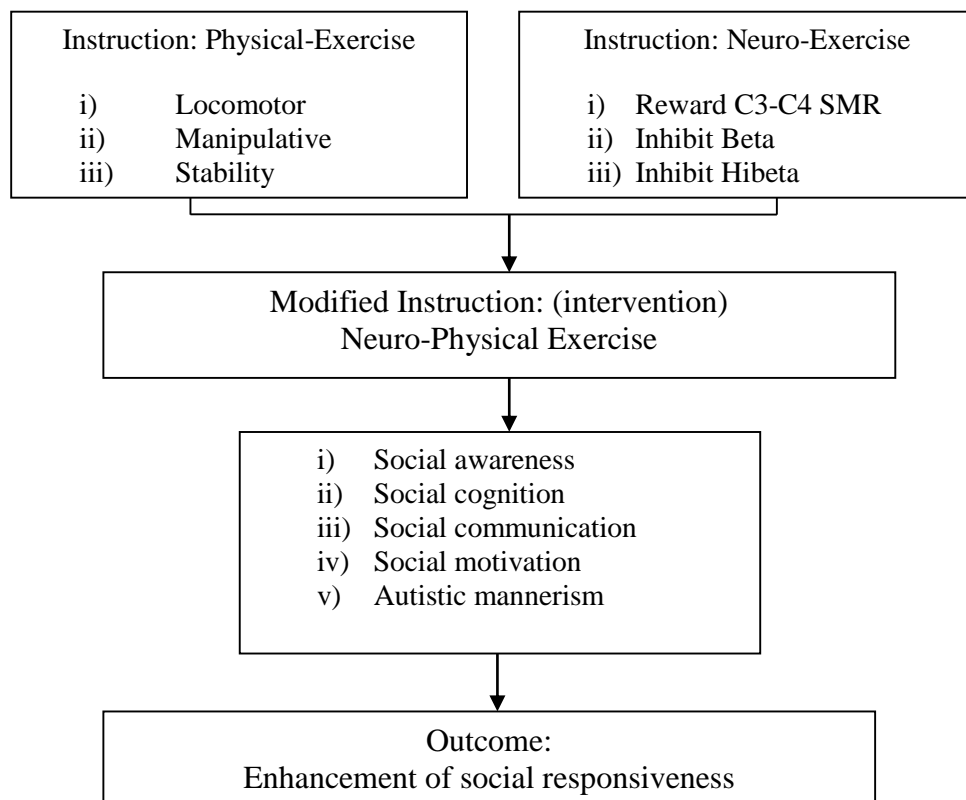


Figure 1.3: Conceptual Frameworks

1.11 Definition of Terminology

This section included the definition of the terminology from the literature and identified the operational definition used in this study.

1.11.1 Autism Spectrum Disorder

Autism Spectrum Disorder (ASD) is a lifelong, complex neurological disorder that affects development, especially significant in the area of communication and social interaction. According to fifth edition of Diagnostic Statistical Manual (DSM-V), individual must have exhibited the symptoms of deficits in communication and social interaction starting in early childhood, furthermore it must detriment enough to affect the daily function of the child (DSM-V, 2014). According to Centers for Disease Control and Prevention (CDC), ASD is a group of developmental disabilities that can cause significant social, communication and behavioral challenges. American Psychological Association (APA) defined ASD as the most severe developmental disability that cause impairment in social interaction, both verbal and non-verbal communication of the person (Kazdin, 2000). To be classified under the spectrum of this disorder, according to the diagnostic criteria of ASD, individual has to show impairment in social use of communication, which resulted in the impairment in effective communication and social participation.

In this study, Autism Spectrum Disorder (ASD) refers to the neurological disorder which has affected development of individual especially in the area of awareness, understanding of others; desire to be included in social setting, communication with others and displaying of autistic mannerism.

1.11.2 Neuro-exercise

Neuro-exercise is known as the exercise done to the brain to stimulate more neuron connection for the brain-healing process and ultimately to improve the well-being of individual (McGovern, 2005). In certain books and researches, the term

neuro-exercise is used interchangeably with neurofeedback. In this study, neuro-exercise referred to a brainwave exercise with the use of brain-training machine to improve the brainwave function of the subjects, with the objective to improve the awareness, understanding, communication, motivation of individual in social setting as well as the reduction of autistic mannerism.

1.11.3 Physical-exercise

Physical exercise is the planned, structured and repetitive physical activity with the objective of improving or maintaining the physical fitness of individual. In this study, the definition of physical-exercise is referring to a structured play plan utilizing therapeutic equipment such as the sensory gym ball, small ball, trampoline and occupational related fine motor tools, for the improvement of the physical ability of the subjects.

1.11.4 Neuro-Physical exercise

Neuro-Physical exercise is a special term used in this study, it is referring to the intervention program designed by integrating both the neuro- and physical exercise for the subjects in intervention group. Lists of 10 physical exercises are designed, the video of the subjects during the physical exercise was taken, it will be used during the neuro-exercise. For neuro-exercise session, focus will be on training the beta brainwave of the subjects, by inhibiting the theta activation and enhancing beta activation. The purpose of the neuro-physical exercise is to cater for both the neurological and physical needs of the subjects for better improvement in their behavior in social setting.

1.11.5 Social responsiveness

Social responsiveness is a specific term used to refer to the ability of the individual to respond, engage and reciprocate in a social setting. The term social responsiveness used in this research is derived from 'Social Responsiveness Scale' (SRS), it is an instrument used to measure the social ability of the individual and to

identify any deficits faced in social ability. In this study, the term social responsiveness always related to 5 elements: social awareness, social cognition, social communication, social motivation and autistic mannerism.

1.11.6 Social awareness

‘Awareness’ referred to the ability to feel, perceive, be conscious of thoughts, emotions, events, peoples or objects (Merriam-Webster, 2012). Social awareness is also a common understand one possesses about a social movement and changes. Social awareness is one of the elements in social responsiveness. The operational definition in this research of social awareness is the ability to be aware of toy sharing during group activities, awareness of taking turn during the structured activities as well as socially aware of the rules during the group play.

1.11.7 Social cognition

"Social cognition is a conceptual and empirical approach to understanding social psychological topics by investigating the cognitive underpinnings of whatever social phenomenon is being studied" (Hamilton, 2005). Social cognition is the ability of individual to process social information to make sense of the hidden message. In this study, social recognition is referred to the innate ability of the subejcts to perceive, interpret social cues including ability to compromise during turn-taking, ability to respond to the facial expression of others, ability to understand the situation others are facing.

1.11.8 Social communication

Communication is the process of conveying information or ideas from the sender to the targeted recipients (Douglas, 2003). Social communication referred to the ability to convey the information or ideas to another person in social setting. Communication included verbal and non-verbal communication. Social communication in this study referred to the ability of the subjects to initiate a

conversation or greeting; ability to respond to 'Wh' questions; ability to answer to simple social question (name, age, favourite food); ability to request for toys verbally or non-verbally.

1.11.9 Social motivation

Social motivation referred to the incentive or drive resulting from a social influence (Mosby's Medical Dictionary, 2009). It is the motivation level that keeps one continue to show interest to join social group; it is also a motivation and influences provided by the peers in social group that keeps one to pursue its objective. In this study, the social motivation referred to the interest of the subjects to take part during social activity. The sub-elements in social motivation included the reciprocal willingness when being approached; interest to follow peers; engagement level of the subjects during the circle time.

1.11.10 Autistic mannerism

Formal definition of autism has identified that one of the trait characteristics of autism is the repetitive, stereotypical behavior, which often cause constant rituals such as repetition and compulsive in their activities. The autistic mannerism exhibited by children with ASD included hand flapping, body rocking, self-injuries behavior, spinning, constant jumping and others. In this study, the term 'autistic mannerism' is used to refer to the numerous peculiar behavior including the above mentioned mannerism as well as the emotional attachment, strong personal interest, parrot fashioning, self-talking behavior and self-stimulating behavior.

1.12 Summary

The advancement of medicine has made it possible to cure infections; to combat osteoarthritis; to overcome disabilities and to delay aging. Yet, autism remains

largely a mystery to date. Most researchers around the world do not know the cause of it and have no evidence on the best treatment for them. This chapter discusses the social deficiency of children with ASD. Social development is an implicit process in the development of a normal child; however, to a child with ASD, this process does not come naturally. Thus it is a skill which needs to be imparted conscientiously to children with ASD. This chapter also focuses on the objectives, research questions, rationale as well as the theoretical and conceptual frameworks of the research. Hypothesis is formulated and this chapter aims to provide a basic understanding as a foundation to the entire paper. To contribute to the field of ASD, continuous research and experiments are important process, this research is significant as it looked into two dimension of the disorder, targeting the two main areas namely physical and neurological aspect with the hypothesis that it can provide more effective result for social responsiveness of the children with ASD.

To gain better understanding of the impact of intervention on social responsiveness of children with ASD, the researcher adopts a multiple case study approach, focuses on studying and comparing several cases before and after intervention in a single research study (Stake, 1995). This study allowed researcher to understand and analyze each subjects in details, and enabled researcher to understand the heterogeneous nature of the children with ASD.

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