TECHNICAL REPORT

AUTISM SPECTRUM DISORDER RESEARCH IN MALAYSIA

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Title:

TECHNICAL REPORT AUTISM SPECTRUM DISORDER RESEARCH IN MALAYSIA

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Preface By Deputy Director
General Of Health
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Autism **Spectrum Disorder (ASD)** is a disorder of neural development characterized by impaired social interaction, verbal and non-verbal communication and restricted and repetitive behavior. The awareness of autism in Malaysia has increased in the last few years based on the number of cases reported and parents coming to seek help. There is increased awareness amongst Malaysian parents currently. Hence this calls for a comprehensive approach in the management for children with ASD.

This report is a compilation of research findings on ASD among Malaysian children aged 18 years and below. Experts from various fraternities could use this report to design new programmes and evaluate the strengths and weaknesses of existing resources.

This report has also identified gaps in ASD research among Malaysian children. There is no evidence based data on the prevalence and sociodemography of ASD in Malaysian children. It is hoped that research priorities on ASD can be identified and focused research conducted to address the problem on ASD in Malaysia.

I would like to congratulate the Institute for Public Health and members of The Technical Team for this report. Special thanks to all individuals and related agencies who have contributed towards this report publication.

Dr. Shahnaz Murad
Deputy Director-General of Health
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EXECUTIVE SUMMARY

Autism spectrum disorder (ASD) is a neurodevelopmental disorder defined by deficits in social, communicative and cognitive skills. About 1 in 68 children has been identified with autism spectrum disorder (ASD) according to estimates from Centers for Disease Control and Prevention (CDC) Autism and Developmental Disabilities Monitoring (ADDM) Network. There is increased awareness amongst Malaysian parents currently. A local survey conducted in 2005 revealed that one in every 625 Malaysian children has ASD (unpublished data, Ministry of Health). National Autism Society of Malaysia (NASOM) has reported increased intake of children with ASD in their organization.

This **Technical Report of Autism Spectrum Disorder Research in Malaysia** comprises of selected abstracts of published local journal and theses/dissertation. The objective of this report is to provide local evidence based information on children and adolescents aged 18 years and below with the diagnosis of ASD. A literature search for relevant abstracts from Google Scholar search, Clearinghouse for Research on Disability website, Medline (PubMed), Psyinfo and Cinahl limited to English and Malay language was conducted. The abstracts were divided into six main scopes (Medical, Engineering, Education, Information Technology, Psychology and Miscellaneous). The theses/dissertation abstracts were compiled by a hand search of the grey literature in the public universities around Kalng Valley.

All related agencies could utilize this report for policy making and programe planning on ASD. Future direction for research priorities on ASD can be established based on this report. It is hoped that this report will be an addition to the existing reference materials on local autism research and thus encourage and facilitate planning to improve and increase the local research in Malaysia.

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1.1 INTRODUCTION

Autism spectrum disorder (ASD) is a neurodevelopmental disorder defined by deficits in social, communicative and cognitive skills[52]. Globally the awareness of autism has increased in recent years. One in every 625 Malaysian children has ASD (unpublished data MOH 2005).

In Malaysia, the awareness of autism has increased in the last few years as evidenced by the number of cases reported and parents seeking medical attention. However, there is no compilation of local research on ASD. This would make it difficult to objectively assess the situation and to develop support systems and services for children with ASD and their families. We sought to understand the current state of research on ASD in Malaysia and identify gaps in scientific knowledge.

1.2 METHODOLOGY

This report is based on a scoping review methodological framewok by Arksey and O'Malley (2005)[12].

1.2.1 Criteria for considering studies for this report

1.2.1.1. Type of study

This report comprises a broad range of study design including cross sectional, cohort, case study, case control and qualitative study.

1.2.1.2. Participants

Children and adolescents aged 18 years and below with the diagnosis of Autism Spectrum Disorder (ASD). Most studies did not state the type and severity of the ASD.

1.2.1.3. Interventions

All types of interventions to improve psychological, medical, educational and social wellbeing of children with ASD were included.

1.2.2 Search strategy

Our search strategy for the report included: 1) Searching electronic medical and social science databases and 2) Hand search of grey literature

1.2.2.1. Electronic search

Structured method was used to search, screen and select relevant studies. The electronic search terms were (Autis* OR Pervasive developmental disorder OR Asperger's OR Rett'sOR Autistic spectrum disorder OR Childhood developmental disorder OR Childhood disintegrative disorder OR Pervasive Developmental Disorder non otherwise specified) AND (Malaysia OR Asia). The following databases were searched: Medline (PubMed), Psyinfo, Cinahl, Cochrane review database and Health Technology Assessment. The search was limited to the English and Malay language.

1.2.2.2. Hand Search grey literature

Academic institutions and related agencies were contacted for research pertaining to ASD. Once permission granted, we hand-searched the libraries (UPM, UKM, UM, Social Welfare Department) for thesis and dissertation related to ASD.

1.2.3 Selection of studies/ screening

Titles and abstracts were screened for eligibility according to the following inclusion and exclusion criteria. For the first level of screening, at least two reviewers screened titles of the citations retrieved from the electronic databases and removed all unrelated citations. The second level of screening involved reviewing the remaining abstracts and selecting the appropriate articles. Full text articles of the selected abstracts were further reviewed. When there was a conflict among the 2 reviewers at any level of the screening, a third reviewer would evaluate the article. Final decision was based on group consensus.

The selected full articles were classified into Education, Engineering, Information Technology (IT), Medical, Psychology and Miscellaneous. These articles were distributed accordingly to the various experts of the review team.

1.2.4 Data extraction

Five reviewers participated independently in the data extraction. Data was compiled into a data charting form using an Excel database.

Details of study: Author, year, title, journal, study designs, aim of study, inclusion/exclusion criteria.

Participants' characteristics: age, gender, type of autism (if available)
Intervention: If available
Outcome or result: If available

1.3 RESULTS

1.3.1 Publication year

Our search did not yield any studies prior to year 2000. However there was an increasing trend of publications since then. Majority of publications (86.0%) were from the year 2010 to 2014 (Figure 1).
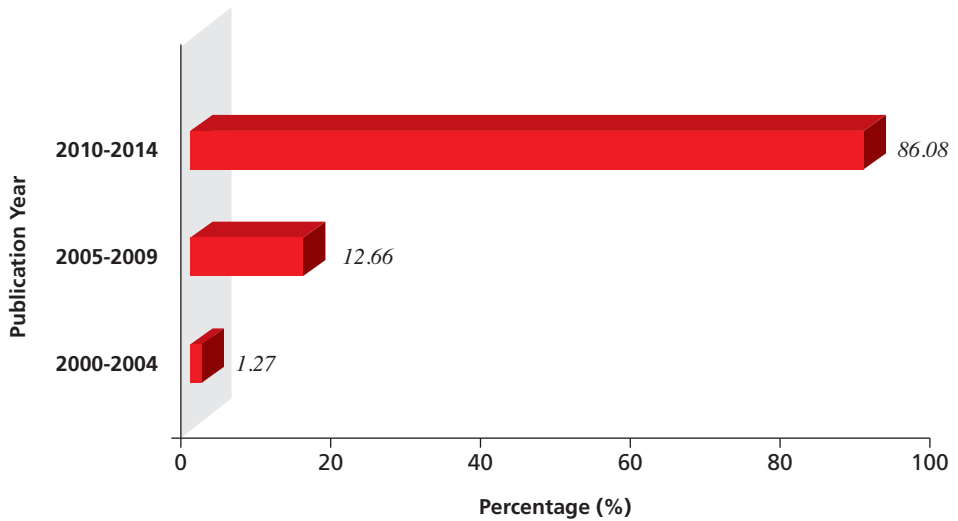
Figure 1 Percentage of papers by range of years

1.3.2   Disciplines of research

There were 79 publications retrieved whereby the medical and education papers ranked the top (48.1%, Figure 2).
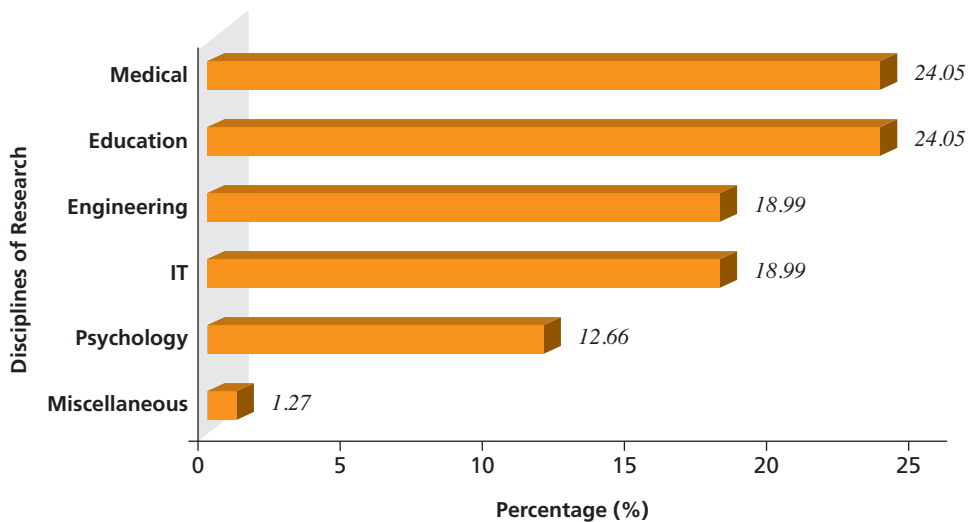
Figure 2 Percentage of papers by disciplines of research

Development of ICT software appeared to be a subject of interest amongst Information Technology researchers. Medical researchers focus was largely on intervention for children with ASD. Papers on psychology stressed on wellbeing and coping strategies for both parents and carers. Interestingly, the education researchers covered a varied spectrum of papers on educational intervention including Early Intervention Program (EIP) and teachers' knowledge. Similarly, the papers on engineering were focused equally on robot based intervention and utilizing electroencephalogram (EEG) as diagnostic tool.
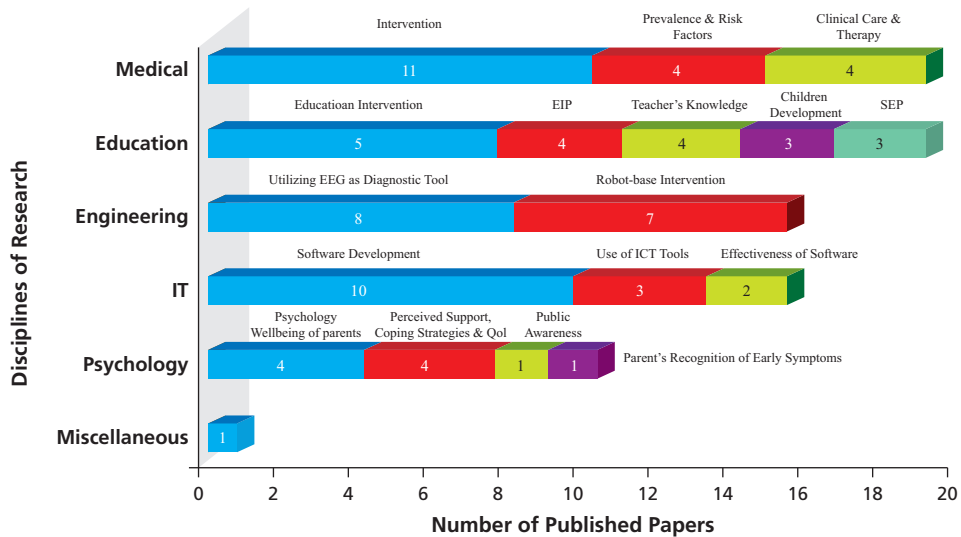
Figure 3 Number of published papers by individual disciplines of research

1.3.3   Study design

Thirty percent (24 papers) were cross sectional studies. Case study accounted for 25% (20 papers) while both case control and qualitative studies were about 11% (9 papers each) respectively (Figure 4).
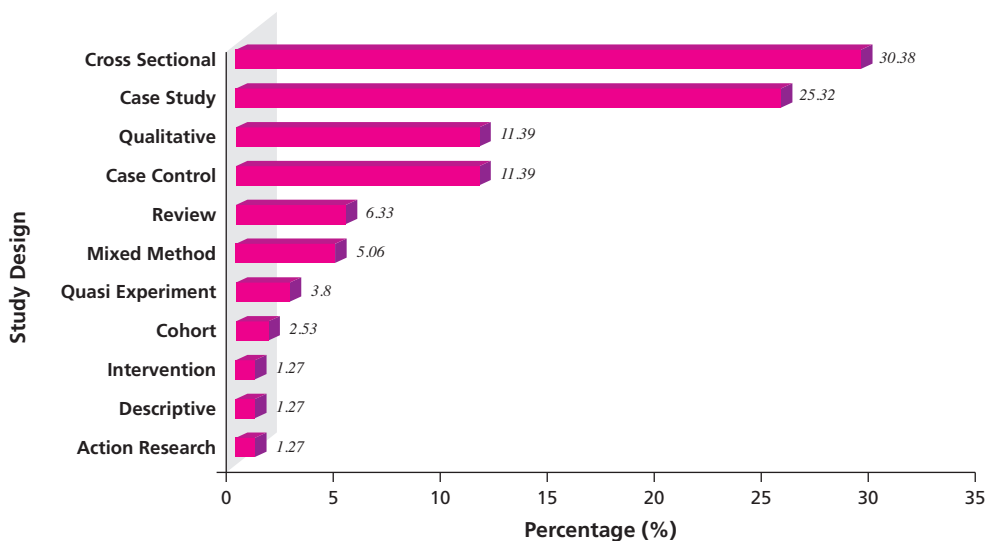
Figure 4 Percentage of papers published by study design

1.3.4 Target population

Majority of the papers were conducted on children (53%, 42 papers). Approximately 18% (14 papers) were on mixed population which comprised of multiple target groups, e.g. parents/ caregivers and children, teachers and children (Figure 5)
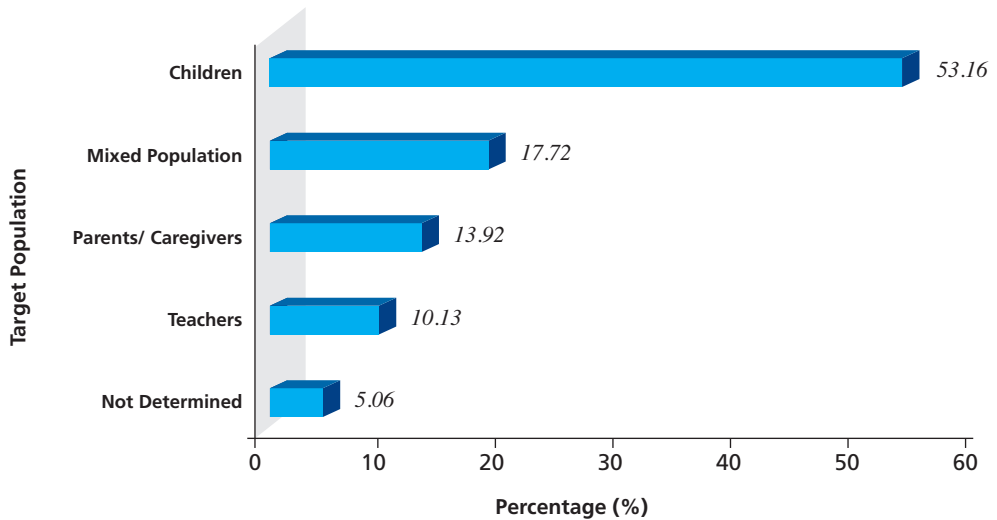
Figure 5 Percentage of papers by target population

1.3.5. Abstracts

Abstracts (Appendix 1.1 – 1.6) and data extraction tables (Appendix 2).

1.3.6 Theses/ Dissertations

Hand search of grey literature was carried out at the public universities in Klang Valley. Thirteen theses abstracts were obtained. There were six theses on education, five on allied health and two on IT respectively (Figure 6).
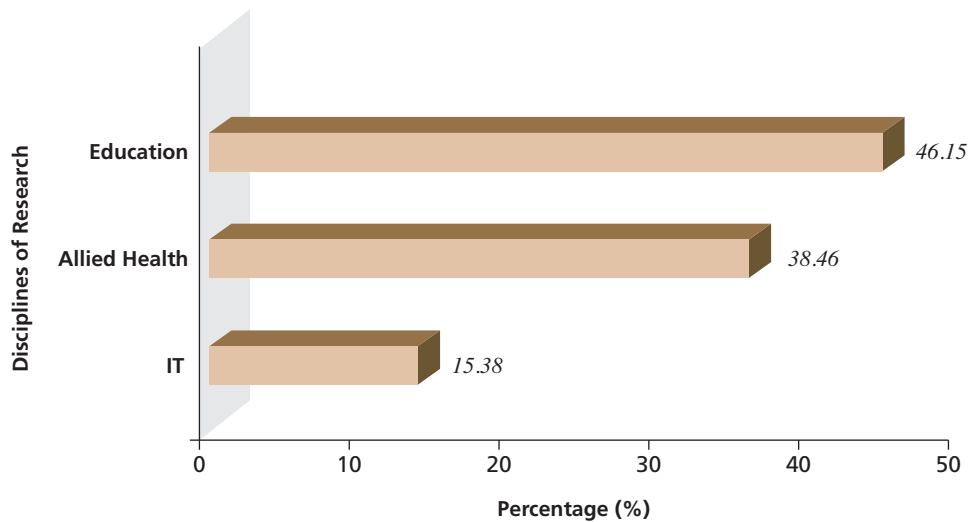
Figure 6 Percentage of theses by disciplines of research

Executive summaries of the theses are in Appendix 1.7

1.4   FINDINGS OF STUDIES

1.4.1   Education

1.4.1.1   Educational intervention

There were three papers on teaching English as a Second Language (ESL). All the three studies used qualitative method as their design. One study was conducted among ten children with ASD (Abd Rahim & Harun 2006)[2], while the other two studies were conducted among teachers (Yahya et al. 2013[a], Yahya et al. 2013b)[141,142]. The number of subjects in all the studies were small, ranging from four to ten subjects.

It is found that children with ASD were able to collaborate with peers and use the Imaginative Learning in learning ESL (Abd Rahim & Harun 2006)[2]. The two studies on sight vocabulary found that teachers used variety of practices and accommodations in teaching ESL.

Some of the practices found to promote sight vocabulary acquisition were prompting with first language, adjusting vocabulary level, providing opportunities to use words, showing expectation, giving extra attention, inviting participation and acknowledging students' effort (Yahya et al. 2013[a], Yahya et al. 2013[b]).[141,142]

A case study by Low & Lee (2011)[71] described an intervention based on speech language and communication skills of a 4 year old girl with severe autism. This intervention required a prior understanding of her behavioral patterns and learning styles so as to develop the deficient skills and use of compensatory strategies to facilitate communication. Hence, speech and communication skills will enable sustainable inclusive education for these children.

1.4.1.2 Early Intervention Program

There were two studies which discussed the parent's perspective on early intervention and identification for children with ASD. One study focussed on parents' view on strategies to change the societal perception on ASD and challenges and strategies to improve school performance. The qualitative and mixed method study involved adults who were parents to children with ASD. Study conducted by (Liew & Mohd Ali 2008)[68] involved 50 parents of children with autism aged 2-8 years old and had received early intervention program for at least 6 months whereas (Badzis & Zaini 2014)[13] investigated the perception of one mother with an ASD child on needs of early identification and intervention.

An example of an early intervention program (EIP) is the individual education plan (IEP).One study investigated the achievement rate of IEP among children attending UKM Autism Learning Laboratory. The achievement rate of learning objectives ranged from 40.0% to 85.71%.

1.4.1.3 Teacher's Knowledge

There were four studies looking into teachers' training, knowledge, perception and practices. The number of subjects for all four papers varied from 3 to 147. Majority of the participants in these studies were female teachers. Only one study mentioned the age range of 20-60 year old (Hasnah et al. 2010)[43]. Two studies (Hasnah et al. 2010, Omar et al. 2013)[43,86] were conducted among the special education teachers and another two studies (Nornadia et al. 2013, Saad et al 2013)[83],[105] included mainstream teachers. All three studies differed in their designs. Two studies used cross sectional (Hasnah et al. 2010, Saad et al. 2013)[43],[105] while the other two studies used case study (Nornadia et al. 2013)[81] and qualitative study design (Omar et al. 2010)[86] respectively.

Saad et al. (2013)[105] found that teachers had a moderate level of knowledge in special education needs. In investigating knowledge and confidence of teachers, the study found formal teachers' training was not effective with regards to understanding and teaching children with ASD. Quality of training in service was only moderate but it was better than formal training. This resulted in teachers having low confidence in teaching children with ASD (Hasnah et al. 2010)[43]. The usual teaching approach used was to reach out and attract attention of the students to help them focus. The study on teachers' perceptions (Nornadia et al. 2013)[83] showed that the teachers were not prepared to teach children with ASD in their class.

1.4.1.4 Children Development

Lim et al. (2012)[69] reported that children attending special needs education (integration programme) had different types of pencil grip during writing skills. In a pilot study involving 36 special needs children, the author observed that children with specific learning disabilities performed the best in the various types of pencil grip accounting to 8.4% for dynamic pencil grasp, 51.6% for static tripod grasp and 1.8% for the other types of pencil grasp.

The qualitative study (Vijayen 2002)[137], described the development of social skills of the 3 male students with moderate autism. Education in the school focused on academics and not sufficiently on social skills. Teachers should be trained to teach social skills to children with ASD.

The cross sectional study (Sulaiman et al. 2011)[128] examined the cognitive ability of children with learning disabilities (LD) who were involved in the community based education program. These included 59 children with ASD. They were able to identify components of a computer and to recognize and pronounce alphabets and words. However, they had problems in reading and writing.

1.4.1.5 Special Education Program

One study (Loh & Syed Yahya 2013)[70] looked into transitional needs of children with special needs from secondary school to employment and found that it included collaborative support system, job coaching, self-advocacy skills training, career guidance and transition assessment, vocational training, trained transition personnel and transition services. The process of transition should be a collaborative process between the government and non-governmental sector.

Kamaliah & Wan Aminah (2010)[58] did a study on the implementation of inclusive program for children with ASD in special education, which supported the need of good planning and monitoring. Hussin et al. (2012)[47] discussed collaboration of government and non-governmental organizations in integrating children with ASD into mainstream classes. The paper identified key features towards successful inclusion were smart collaboration, co-teaching, peer-learning, after-school coaching and experiential learning.

1.4.2 Engineering

1.4.2.1 Utilizing EEG as Diagnostic Tool

Eight relevant studies related to the use of Electroencephalogram (EEG) with Autism Spectrum Disorder (ASD) were obtained. These studies involved six children with autism from National Autistic Society of Malaysia (NASOM), 7-9 year olds (seven studies) and six typical subjects. The other study had 3-12 year olds (six normal children, three children with autism spectrum disorder and eight Down Syndrome children).

Electroencephalogram (EEG) is used to distinguish children with ASD from typically developing children during motor imitation. Children with ASD demonstrate very high intensity brain activation during motor imitation. The author concluded that EEG signals in children with ASD were helpful in the diagnostic process (Razali & Abdul Wahab 2011)[97]. Razali & Abdul Wahab's (2011)[97] research involved EEG signals which were processed using specific feature extraction method and further classified into motor learning imitation and dynamic movement. Subjects were asked to watch video stimuli that showed three different emotions which were happy, calm and sad while the final video was on a person clenching their hands (switching left and right hands) within one minute time. EEG signal analysis revealed that this method could differentiate between autism and control group up to 86.62 percent accuracy. Razali & Abdul Wahab (2011)[97] reported that EEG activation signals were far less during a motor movement in children with ASD compared to typically developing children.

Shams & Abdul Wahab (2013)[115] concluded that motor cortex activation of children with ASD differed from typically developing children. Shams & Abdul Wahab (2013)[115] concluded that the EEG signal during motor

tasks will be useful for early detection of autism. Shams & Abdul Wahab (2011)[115] revealed that for children with ASD, an approach using the principle component analysis method to extract features from EEG improved the detection of autism in subjects during a motor task than in open eyes activities. Hence the author concluded that the changes in the EEG signal during a motor task was useful for early detection of autism in the clinics.

Qidwai & Shams (2013)[95] concluded that EEG signals in children with ASD differ from typically developing children during eyes-open and eyes-closed and that EEG was helpful to establish diagnosis of ASD.

Sudirman & Safri (2010)[127] looked into EEG signal recording captured from normal and special needs children based on their visual response using Visual Evoked Potential (VEP) method. This is based on the alpha rhythm value. Typically developing children have an alpha value at the frequency of 8-12 Hz which is greater than children with autism, while children with autism have an alpha value greater than Down Syndrome children when they were exposed to visual stimuli. Sudirman & Safri 2010)[127] concluded that EEG can be utilized to record brain signal in order to monitor the level of children's visual response after undergoing eye treatment.

Othman & Abdul Wahab (2010)[90] studied the EEG signal spectrum of typically developing and children with ASD while watching emotionally related facial expressions. The emotional faces are displayed to the children for the affective states of calm, happy and sad. Result analysis revealed that the emotional dynamics of ASD children demonstrated a reversed valence compared to the typically developing children. Hence the author concluded that it was possible to detect differences in the emotional dynamics of children with autism compared to typically developing children.

1.4.2.2 Robot-based Intervention

Eight relevant studies related to robot based intervention programmes in the management of ASD were obtained. These studies involved twelve children with ASD from National Autistic Society of Malaysia (NASOM), five other children diagnosed with ASD and a single subject study.

Ismail et al. (2012)[53] studied the interaction between humanoid robot NAO and ASD children. This was recorded for both Robot-based Intervention Program (RBIP) interaction and normal classroom interaction. The authors concluded that the eye contact of the ASD child was often seen in RBIP interaction compared to normal classroom interaction. Ismail et al. (2012)[54] observed and evaluated the initial response of stereotyped behaviour in Human-Robot interaction between Humanoid Robot NAO and children with ASD during Robot-based Intervention Program (RBIP) and normal class session. The author found that ASD children with higher full scale intelligent quotient (FSIQ) responded with less stereotypic behaviour in the presence of RBIP compared to the normal human-human interaction in normal classroom session. Ismail et al. (2012)[53] determined the initial response of eye contact time between humanoid robot NAO and ASD children in Robot-based Intervention Program (RBIP) interaction and normal classroom interaction. There were 5 modules in the RBIP interaction. The study showed that more eye contact was being made during the RBIP interaction compared to the classroom interaction.

The author concluded that aid from humanoid robot NAO will be beneficial for improving eye contact during learning in classroom setting.

Shamsuddin et al. (2012)[117] explored the response of two children with ASD to a Humanoid Robot NAO that had been programmed to display 5 different emotions using its body poses and gestures. Initial exposure to NAO robot had potential to teach children with ASD about head and body posture that were associated with certain emotions. The authors concluded that positive utilisation of robots will be helpful in the rehabilitation of children with autism.

Shamsuddin et al. (2012)[118] used Humanoid robot for intervention. The interaction began with the simplest module of NAO in static mode for 45-seconds, then doing head-turn, eyes blinking, talking, moving its arms, playing nursery rhymes combined with eyes blinking and ended with NAO playing the 'ABC' song combined with arm movement. Four out of the 5 children exhibited a decrease in autistic behavior (communication subscale) during the single session of child-robot interaction. These promising results indicated that the basic modules of interaction together with the appealing appearance of the NAO robot were able to attract the children's attention, and hence kept each child engaged with the robot during interaction. ASD children with FSIQ of moderately impaired (40-54) were receptive to robot-based intervention. Shamsuddin et al. (2012)[118] looked into a single case subject who had a non-verbal IQ score of 104 (average), verbal IQ score of 110 (high average), FSIQ of 107 (average) and diagnosed as ASD. He complied with all the exclusion criteria including no hearing and vision deficit, no abnormal eye movement, obtained his parent/guardian's consent, was able to speak and follow simple commands in English and did not possess self-injury of aggressive behavior. The overall comparison between observations during child-robot interaction and normal class setting in this particular case study supported the author's hypothesis that the humanoid robot NAO served as a significant platform to support and initiate interaction in children with ASD.

Yussof et al. (2012)[146] recorded using video camera the initial response of all children with ASD who participated in the RBIP (module 1 to 5). This initial response of children with ASD interacting with Humanoid Robot NAO in RBIP was compared with normal interaction in their classroom or in their social life. Interaction with Humanoid Robot NAO generated more concentration level amongst children with ASD. Shamsuddin et al. (2013)[117] programmed the robot in accordance to the purpose of the intervention. Video recording of the regular learning environment (without robot) and during child-robot interaction was done followed by assessment of the videos and comparison of the behavior scores. The authors claimed that the statistical data showed that the robot had significantly reduced the autistic traits of the children with ASD for the subscale stereotypic behavior and communication.

1.4.3 Information Technology

1.4.3.1 Assessing the Effectiveness of ICT Software

Two studies evaluated the Effectiveness of ICT Software that had been developed for children with ASD. The first study was a preliminary investigation of the Interactive Multimedia Learning Awareness (IMLA) in enhancing awareness of autistic characteristics among parents and the

society in Malaysia. It was reported that there was a lack of awareness of autistic characteristics among parents and Malaysian society that needs to be addressed (Dolah et al. 2011)[33].

The second study conducted on 20 children with ASD aged 9 to 14 years suffering from mild autism observed the interface that the children with ASD selected for the same 3-D sonic game within 3-D environment. The authors concluded that this can result in creating a suitable design of Haptic Interface Technique for Children with ASD to enable them to interact and communicate effectively with their families, friends and community (Mustafa et al. 2013)[79].

1.4.3.2   Software development

There were 9 studies on software development for children with ASD in Malaysia. There were 5 reviews, 2 cross sectional and qualitative studies each and 1 case study. Three studies were conducted solely on the children with ASD, whereby the first pilot study reported the use of a specially designed computer game called "Find Me" to improve the social skills of children with ASD. Playing the game regularly improved their performance (Riaza & Sarah 2013)[101]. Another study demonstrated that children with high functioning autism successfully utilised an educational software or computer aided-learning as a practical tool for learning academic skills in a classroom (Abdul Manap et al. 2014)[6]. The third study assessed the use of a personal visual system (DVST Client) to enable children with ASD and fine motor problems to carry out an individual training program (Hitam et al. 2011)[46].

There were 2 studies seen to be beneficial in teaching Quran to the children with ASD. In 1 study, interviews were conducted with five doctors and eleven therapists to identify the basic problems of children with ASD and then developing computer based interventions as educational tools, including learning Quran (Shams Aliee et al. 2013a)[113]. The second study reported the preparation of an interactive course ware prototype using visual supports to teach the basic Quran recitation to the children with ASD and to make them focus attention on learning (Shams Aliee et al. 2013b)[112].

Another study aimed to identify autism behavioural symptoms through the development of Interactive Multimedia Learning Autism (IMLA). The system design of IMLA was based on autistic behavioural symptoms which were the main learning objects in enhancing learner's knowledge and awareness towards these issues (Dolah et al. 2011)[32].

Two studies described the development of Block-Based learning software for children with ASD. (Ismail et al. 2009, Ismail et al. 2012)[51,52]. One study described Block-Based Software Development method and approach that enabled the end-users (such as parents and teachers) to build application software to suit the different needs of an autistic child. The other study described the design and implementation of blocks software development to enable end users to build personalised courseware for children with ASD.

Finally, one study reported the development of an educational software "I like learning" to teach Malay language to children with ASD. This software used the "ADDIE methodology" to attract childrens' attention in learning the Malay Language (Sidek et al. 2014)[122].

1.4.3.3 Use of ICT Tools

Three studies assessed the utilisation of ICT tools among children with ASD.

Tablet acceptance among children with high functioning autism was evaluated among 20 caregivers at NASOM. The high functioning autism children did not seem to have difficulties swiping the touchscreen. Children with ASD who had sensory issues used the stylus pen for browsing the tablet. Hence tablets have the potential of becoming new assistive technology devices for children with ASD (Syarifah Diyanah & Salam 2013)[129].

The possibility of children with high functioning ASD, 8 to 15 years of age to surf the web independently with minimal guidance in three different autistic centres in Malaysia was studied. It was concluded that all the children observed existing search engines were not user friendly and it was difficult for a child with ASD to utilize it with minimal guidance. However, development of suitable communication techniques within the browsers would help the children to surf the web independently (Ravana et al. 2014)[96].

Another study observed 24 children with ASD, aged 5-10 years, response to a multi-media presentation where visuals were accompanied with music. The children were divided into 4 groups, based on their level of functioning and global development. All the children with ASD responded positively to the computerized multi-media program. This indicated role of computer especially as a multi-media aid in understanding the thinking pattern of children with ASD as a means to modify their behavior (See & Tang 2009)[111].

1.4.4   Medical

1.4.4.1   Clinical care and therapy

There were five papers available pertaining to clinical care (Tan & Yadav 2008, Tan & Yadav 2008)[130,131] and service provision (Singh & Gray 2011, Leong et al. 2011, Leong et al. 2013)[123,66,65] of which 2 studied development assessment, one described gross motor skills, two explored the provision of sensory integration therapy, and one explored speech language practices. Clinical assessment studies were performed on children with various types of disabilities aged from 1 month to 12 years, whilst gross motor skills study was specific to autistic school children aged 7 to 17 years old. Both the development assessment studies used Denver Developmental Assessment Test (DDST) II chart and Schedule of Growing Scale (SGS) II were used as outcome measures. Texas Revision of Fait's Basic Motor Skills Test: Basic Movement Performance Profile was used to assess gross motor skills. Both studies pertaining to sensory integration (SI) and speech language therapy (SLT) explored the patterns of such services from the viewpoint of the service providers.

1.4.4.2   Prevalence and risk factors

There was no study that specifically investigated incidence of autism in Malaysia, however there were 3 cross sectional studies and one cohort study that provided some data on its prevalence. Two studies reported the percentage of children with autism specifically among children with

learning disabilities (Aina Mariana & Wong 2011, Toh et al. 2011)[9,134] while the other 2 studies reported the percentage among children with various types of disabilities (Tan & Yadav 2008, Tan & Yadav 2008)[130,131]. The studies were done in various locations in Malaysia; Negeri Sembilan, Sarawak, Kelantan, Perak, Johor and Selangor. Two studies (Aina Mariana & Wong 2011, Toh et al. 2011)[9,134] were done in hospital setting whilst one was in health care clinics (Tan & Yadav 2008)[130,131]. Prevalence of autism in these studies ranged from 5.4 to 9.5%. There was no data available on sociodemography or further description of characteristics of autism.

There was only one study that examined perinatal, antenatal and maternal risks factors associated with autism (Abdullah et al. 2012)[6]. This retrospective study was conducted in 2 government hospitals (Hospital Pulau Pinang and Hospital Bukit Mertajam) in Penang. The population was autistic children aged 2 and 10 years old who were born in HPP or HBM. This study identified 7 risk factors including multiple pregnancy, psychiatric disorder, birth asphyxia, parity between 2 and 3, maternal smoking, maternal age, and race.

1.4.4.3 Interventions

There were 10 publications on interventions performed on children with ASD. The majority of the studies (9 studies) were done in school environment. The subjects in the study included both sexes with high functioning groups in 2 studies; low functioning group in 1 study and the rest were either not specified or mixed. The most frequent intervention was music therapy (4 studies). Other interventions included animation, digital picture, brain training, portrait drawing therapy, interactive stroller and physical training (one study each). Although all interventions showed positive results in their targeted outcomes, significant values were not available due to small number of subjects. Most publications have multiple outcomes in a single study but the commonest outcome measured was social behaviour (5 studies). Other common outcomes include motor skills (3 studies) and communication skills (3 studies). Three studies measured reading skill, cognitive skill and independence as one of their measure outcomes respectively.

1.4.5 Psychology

There were several topics of focus on studies of parents of children with ASD. The main aspects were psychological wellbeing of parents, their perceived support, coping strategies and quality of life.

1.4.5.1 Psychological wellbeing of parents

Four relevant studies looked into parental wellbeing of children with ASD. Three of the studies' subjects were parents with age range between 30 to 60 years old. One study (Vetrayan et al. 2013)[136] was conducted on parents with children of moderate to severe ASD. One study (Nikmat et al. 2008)[81] excluded parents of children with ASD who had history of psychological or mental health disorder.

Three studies (Nikmat et al. 2008, Shobana & Saravanan 2014, Vetrayan et al. 2013)[81,121,136] were conducted in an urban city, among parents who attended either therapy sessions or psychoeducation sessions in hospitals, clinics or special schools. All the three studies were cross-sectional studies with sample sizes ranging from 30 to 100 participants.

Majority of the papers reported strong evidence that parents of children with ASD faced a high level of stress. A paper (Nikmat et al. 2008)[81] investigated 52 parents with children of ASD and found that they, particularly mothers, have significant level of stress and significant clinical disturbance in psychological wellbeing. There was no significant correlation between severity of autistic symptoms and parental stress, psychological wellbeing and support system received by parents.

In comparing the risks and presence of depression among mothers of children with developmental disabilities in four countries (Brazil, Columbia, Thailand, Malaysia), a high percentage (23%) of Malaysian mothers had significant depressive symptoms. Morbid depression is more common among mothers of children with disabilities in Latin America than in Southeast Asia. However, it was difficult to generalize the result due to methodological issues (Osada et al. 2012)[88].

One study found parents who had children with ASD exhibited levels of hopelessness which correlated inversely with parental level of education (Vetrayan et al. 2013)[136]. Another study found that mothers of children with ASD exhibited higher scores on somatic symptoms, anxiety and social dysfunction when compared with their counterparts with Down syndrome and intellectual disability. A study reported negative parental attitude as significant predictor of psychological problems (Shobana & Saravanan 2014)[121].

1.4.5.2 Perceived Support, Coping Strategies and Quality of Life (QoL) of Parents of Children with ASD

There were four cross-sectional studies looking at the support, coping strategies and quality of life for parents of children with ASD.The participants' age ranged from 22 to 48 years old. Two of the studies (Poh & Siew 2012, Hasnah et al. 2013)[94,44] indicated that majority of their subjects were female while the other two studies (Ting & Chuah 2010, Clark et al. 2012)[133,27] did not mention the gender of the participants.

Three studies (Hasnah et al. 2013, Ting & Chuah 2010, Clark et al. 2012)[44,133,27] were conducted in urban cities. Another study (Poh & Siew 2012)[94] was done in three non-governmental organizations but the author did not disclose the exact sites. The sample size for each study ranged from 12 to 52 participants.

A study looking on the availability and type of support perceived by 20 parents of children with disabilities revealed that comprehensive information and support for them was lacking in Malaysia. Most parental support came from informal sources e.g. family, friends and other parents.

One study (Ting & Chuah 2010)[133] reported parents coping strategies used to handle their children's behaviour. These were parents who send their children to the Resource and Educational Centre, Sarawak Autistic Association, Kuching. The study revealed that the parents managed their distress and anxiety mainly through religious means and family support. The study points to a need for more government-supported services for children with ASD and their parents.

1.4.5.3 Public awareness

There was one study looking into parent/ caregivers-child relationship in relation to public awareness and discrimination. The qualitative study was conducted among four parents and two teachers of children with ASD. The study concluded that there was a lack of awareness and understanding of children with ASD among the general public in Malaysia (Jin & Chin 2012)[57].

1.4.5.4 Parents' recognition of early symptoms of ASD

There were two cross-sectional studies looking into this area (Ting & Chuah 2010, Yeo & Lu 2014)[133,144]. The participants were 12 parents and 79 mothers respectively. Both studies found speech delay or loss of speech ability as the first symptoms that alerted them to the possibility of autism. Parents also notice stereotypic behaviour, difficulties in socializing with peers, lack of eye contact, sleep problems, hyperactivity and hypersensitivity to specific sounds (Ting & Chuah 2010)[133].

1.4.6 Miscellaneous

This study was aimed at obtaining the views and consensus of experts on the impact of video on the learning of students with autism in Malaysia. The use of video by experts, identifying behavior of students with autism in their use of video and determining the limitations of video and ways to overcome them by using the Fuzzi Delphi technique (Saiman et al. 2013)[106].

1.4.7 Theses/ Dissertations

There were 13 theses retrieved for this report. Summary for this grey literature was obtained from the abstracts, as full theses were not available. Twelve studies involved children (7 out of 12 studies on children involved only autistic children while another 5 studies involved children with learning disability children), whilst one described computer system development. Three of the 12 studies were observation studies describing the children integrative skills, the association between sensory processing disorder (SPD) and tantrum characteristics, and their non-literal understanding.

The other 8 studies examined the effects of various interventions to improve learning and behaviour. The interventions to improve learning included using multimedia technology (3 studies), puppet (1 study), cooperative teaching method (1 study), economy token (1 study), discrete trial teaching (1 study), and arithmetic teaching aid. One study investigated the effect of sandplay in reducing problematic behavior. The interventions showed positive outcome in some children in all interventions except for sandplay where there was no positive changes in behaviors. Finally one study described the development of NASOM Parent's Support System where a diagnosis module was developed to help parents to diagnose the probability of child having autism.

1.5   DISCUSSION

1.5.1   Education

1.5.1.1   Educational Intervention

One study noted that teachers in schools should be trained to teach social skills to children with moderate autism (Yahya S. et al. 2013)[135]. A meta-analysis of 55 studies by Bellini (2007)[17] noted that social skill interventions have been minimally effective for children with ASD. However, strategies were recommended to increase the effectiveness of teaching social skills to children with ASD. These included increasing the duration of social skill interventions, training in the child's familiar environment and matching the intervention strategy with the type of skill deficit.

Low & Lee (2011)[71] stated that the behavioral patterns and learning styles of children with severe autism should be assessed to ensure development of an effective speech, language and communication intervention. Paul (2008)[92] noted that children with ASD require intensive, early intervention on communication with trained peers in natural settings to enhance this intervention on communication.

Children with ASD who participated in a community based education program had difficulty in reading and writing, although they could identify computer parts and articulate words (Sulaiman et al. 2011)[128]. Different teaching approaches resulted in different reading skills in children with ASD. A pilot study by Flores et al. (2013)[36] demonstrated the implementation of direct instruction (DI) as an effective reading comprehension intervention for students with ASD. However, the author recomended that evaluation should be done on a larger group of students with a more robust methodology.

1.5.1.2   Early Intervention Program

Corsello (2005)[28] reported that experts working with children with autism agreed that early intervention is critical as it leads to better outcome. Recommendations for Early Intervention Program (EIP) should include parent involvement, intensity, a predictable environment, incorporating the child's interests, actively engaging the child and focusing on individualized developmental goals.

Fuentes et al. (2009)[37] reported that handwriting skills were observed to be poor in individuals with autism. A case-control study of handwriting samples from children with and without ASD was performed. Samples were scored on an individual letter basis in 5 categories: legibility, form, alignment, size and spacing. Children with ASD show overall worse performance on a handwriting task than do age-and intelligence-matched controls. More specifically, children with ASD show worse quality of forming letters but do not show differences in their ability to correctly size, align and space their letters. Within the ASD group, motor skills were significantly predictive of handwriting performance whereas age, gender, IQ and visuospatial abilities were not. The authors suggested that training letter formation in combination with general training of fine motor control may be the best direction for improving handwriting performance in children with ASD.

1.5.1.3 Special Education Program

The best educational environment for students with ASD was to be assessed individually and not to be connected with a single classroom model (Renty 2004)[100]. However, benefit of inclusive program for children with ASD was abundant. It included more learning, increased self-esteem, increased expectations of the learning potential of the students, behavioural modelling on normally developing peers, more accepting attitudes from peers and less isolation and stigma for disabled students and their families (Banerji 1995; Mesibov 1996; Peetsma 2001)[14,74,93].

According to the results, implementation of inclusive program for children with ASD required intensive planning, monitoring and collaboration with other agencies. Many teachers who had received training to teach students may not have the required knowledge to teach in an inclusive environment (Kilanowski 2010, Hayes 2013)[60,45]. Only a minority of mainstream teachers believe that students with ASD should be integrated. The issues of the inclusive classroom for children with ASD have been debated for decades (Hayes 2013, Harrower 1999)[45,40]. Proper planning on preparation of teachers (Hayes 2013)[45] and educational adaptation are needed (Panerai 2002)[91] especially in areas of alternative communication, educational environment, parental involvement and finally, autism-specific knowledge and training.

This report revealed that there are multilevel needs to be fulfilled in order to ensure successful transition of children with ASD from secondary school to employment. Some of the needs identified were vocational training, post-secondary education, adult support services, community participation, independent living and outcome of employment (Westbrook et al. 2013)[140].

1.5.2 Engineering

1.5.2.1 Utilizing Electroencephalogram (EEG) as diagnostic tool

Electroencephalogram (EEG) has been recommended as a diagnostic tool for children with ASD in some local research. Our search did not reveal any international article to confirm this. However, Kim (2006)[61] concluded that Video-EEG evaluation done for children with autism who present with seizure-like events reveal epileptiform EEG abnormalities in the majority. EEG is not a standard tool used for diagnosing children with ASD.

1.5.2.2 Robot based intervention

Local studies looked into humanoid robots interaction with ASD children and concluded that social interaction and stereotypic behaviour improved. Children paired with the robot mediator demonstrated increased shared attention (visual contact, physical proximity) and imitated facial expressions (smile) more than the children paired with the human mediator. However forms of shared conventions such as imitation of body movements and of familiar actions are higher with two children paired with a human mediator (Duquette et al. 2008)[35]. Dautenhahn (2000)[30] looked into the design issues that are relevant in a robot as a therapeutic teaching device for children with ASD which the local humanoid-robot studies lack. Local studies compared interaction with humanoid-robot with ASD and typically developing children whilst Werry

& Dautenhahn (1999)[139] compared and found that human robot interaction for some children with ASD was longer than an interaction with a non robotic toy. Robins et al. (2005)[102] concluded that it is not clear whether any of the social and communicative skills that the children exhibit during interaction with the robot have any lasting effect and whether these skills could be generalized and applied in children's day to day life outside the trial scenario. There is no clear evidence that intervention using robot improves social interaction both in local and international studies for children with ASD.

1.5.3   Information Technology

Our report noted that computer aided tools have been used to develop social, communication and academic skills of children with autism spectrum disorders. Globally, in proportion to the increase in number of cases, there has been a similar trend. Information and Communication Technologies (ICTs) create safe environments and reduce the frustrations associated with repeated mistakes in real world (Ingersoll 2013)[50].

Lahiri et al. (2013)[63] demonstrated the development of effective social communication skills among the participants with ASD. However during testing of a technology-assisted intervention, the researchers evaluated that these may not be suitable for individuals with low functioning ASD.

A systematic review on use of computer aided tools for children with autism spectrum disorders (Bartolome & Zapirain 2014)[15] concluded that it strengthened communication skills with visual aids but did not provide evidence that children learn to communicate with such tools. Furthermore, computer aided tools may need to be adapted for children with different levels of severity to gain maximum benefit. Further research should be conducted to assess if the skills gained improved the overall quality of life of these children.

 Our researchers have developed a suitable design of Haptic Interface Technique for children with ASD to improve their communication skills. However, it was noted that the current prototypes developed had to be tested on the patients and further clinical evaluation should be done to ensure the safety of haptics. Design control and bio-feedback systems that correspond to the patient's and therapist's needs should be designed (Vaucelle et al. 2009)[135].

Tablet acceptance among high functioning children with ASD was noted by our researchers. Likewise, it was noted that tablet applications promoted positive behaviors in children with ASD whereby they enjoyed social activities, developed appropriate social skills and expressed themselves. It was recomended to use tablets to strenghten social activities of children with ASD (Hourcade et al. 2012)[48].

Our report noted that children with high functioning ASD found the existing search engines were not user friendly and it was difficult for them to utilize it with minimal guidance (Ravana 2014)[96].

1.5.4   Medical

In our report, it was obvious that epidemiology data on autism was lacking. The prevalence of ASD obtained in this report was extracted from studies, where the primary objectives were not to examine disease prevalence. The prevalence of autism was calculated among children who attended selected health facilities and hence this was not the true reflection of the actual prevalence. The best method to determine prevalence would be a population based survey (Brugha et al 2011)[22]

and not hospital-based study. Although this study managed to obtain the prevalence of autism, it is not possible to compare our prevalence with international data ie. 1 in 68; 12.7/10000 (CDC US 2014)[24] due to methodological differences. Other epidemiology components that have not been researched on locally include the socio-demographic data of those affected by ASD and their parents, the characteristics of ASD and the associated medical conditions. As many as 25-30% of individuals with ASD have associated medical conditions such as epilepsy and sensory impairment (Levy et al. 2010)[67]. Epidemiological information in ASD is crucial in establishing the magnitude of this problem which will assist policymakers to make decisions on resource allocation and healthcare programs. (Baxter 2014)[16].

There has been a growing interest to study effects of various interventions to improve behavior and learning in children with ASD. This is evident from the increasing number of publications in the last five years. Intervention studies in this report have generally focused on non-pharmacological interventions which were implemented on the children, mostly by their teachers. Internationally, intervention studies have moved towards implementation by parents and peers network as well as parental support. (Rogers et al. 2014, Kamps et al. 2014, Stuttard et al. 2014)[103,59,126]. Thus there is a need for the local researchers to expand the target group of their interventional studies. Though all the intervention studies in this report showed positive results, the studies were done with small samples and there were no randomized controlled trials conducted. Thus the positive results obtained from the local studies have limited value in actual implementation.

1.5.5 Psychology

1.5.5.1 Psychological wellbeing of parents

Our report found that caring for children with ASD caused extra stress, difficulties and psychological distress. Several studies have reported this (Browne & Bramston 1998, Warfield et al. 1999)[21,138] and found that parents with children with ASD reported higher stress and more adjustment problems compared to parents with Downs syndrome (Ryde-Brandt 1990, Dumas et al. 1991, Sanders & Morgan 1997)[104,34,107] and mothers of children with intellectual disability without ASD (Olson & Hwang 2001)[85]. This report nothed that hopelessness and education level were inversely correlated, which is consistent with other studies (Breslau et al. 1982)[19].

ASD is a disorder that involves behavioural disturbance and limitation in social skills and responsiveness. These factors have been found to contribute to parental stress and difficulties (Cameron et al. 1991, Hodapp et al. 1997)[23,47]. In addition, restrictions in parents' personal life also contributed to the higher risk of depression in parents of children with ASD. Hence it is important to provide sufficient support for these parents.

It was found that mothers were more vulnerable to have significant stress. This is consistent with other studies (Olson & Hwang 2001, Breslau 1982) [85,19]. It is postulated that mothers are often more involved in looking after the child (Bristol et al. 1988, Moes 1992)[20,76] giving up their jobs and not able to pursue their own interests (Breslau 1982)[19]. It may also be that fathers demonstrate their distress in other ways.

1.5.5.2 Perceived Support, Coping Strategies and Quality of Life (QoL) of Parents of Children with ASD

It was found that parental support from government is lacking and most parents cope by receiving support from families and friends. This is in accordance to studies in other countries too (Sivberg 2002)[125]. There is a need for more government-supported services for children with ASD and their parents.

Little is known about QoL in parents of children with ASD. High level of motivation among them contributed to better QoL. Many papers found such parents exhibited a lower QoL as compared to parents of healthy children and those with intellectual disability and cerebral palsy respectively (Mugno et al. 2007, Allik et al. 2006)[78,10]. The lower parental QoL could be due to environmental factors, genetic factors or combinations of both (Mugno et al. 2007)[78]. Further research is needed to examine the genetic and environmental influences on parental QoL.

1.5.5.3 Public awareness

In Malaysia, general public awareness on ASD is lacking. This is consistent with findings in other developing nations (Arif et al. 2013, Shaukat et al. 2014, Shetty & Raiz 2014)[11,119,120].

1.5.5.4 Parents' recognition of early symptoms

Parents noted speech delay or loss of speech ability as the earliest symptom alerting them on the possibility of ASD. This is similarly reported in other studies (Young 2003, Goin-Kochel 2005)[145,38].

1.5.6 Miscellaneous

Usage of video is effective on students with autism besides shaping the behavior desired (Saiman K. et al. 2013)[106]. Similarly, a review by Delano (2007)[31] concluded that video modeling interventions were effective in teaching a variety of skills to children with ASD.

1.5.7. Theses

A significant number of theses were accessed for this report, many as a result of postgraduate research. These theses hold valuable information but due to lack of publications, the information is inaccessible to others. Researchers should make an effort to publish their theses in scientific journals to improve existent evidence based scientific knowledge.

1.6   CONCLUSION

ASD research in Malaysia shows a rising trend since the year 2000. The study design of majority of the studies were cross sectional, case control and qualitative. There was a noticeable published literature gap on studies on children with ASD. General public awareness on ASD is lacking.

The papers were categorized as Education, Engineering, Information Technology, Medical, Psychology and Miscellaneous.

Papers on prevalence and sociodemography data were lacking. Special need education program is deficient and the educators require strengthening of training in this field. Early Intervention Program (EIP) was beneficial for children with ASD. Several interventions inclusive of robot, music and movement therapy were described to improve their behavior. Computer aided tools have been used to develop social communication and academic skills of children with ASD. However, educational and ICT software need further evaluation and have to be specifically designed to cater the needs of children with varying levels of severity. Tablet and multimedia presentations were positively received by children with ASD.

EEG has been suggested to assist in the diagnosis of ASD although this is not a standard practice. There is no clear evidence that intervention using robot improves social interaction both in local and international studies for children with ASD.

The earliest symptoms recognized by parents of children with ASD are speech delay or regression of speech. Understandably, parents of children with ASD are noted to have a lower quality of life. Most parents received support from families and friends. However, support from both governmental and non-governmental organizations needs to be strengthened.

Our report ascertained gaps in ASD research in Malaysia. Future research priorities in ASD could be identified and focussed towards epidemiological, intervention, education and family/ carer based studies. High quality studies are required as evidence for policy makers to improve standard of care in management strategy and service provision for children with ASD.

1.6.1   Public Health Implications

Identifying the main areas of need:

- Public awareness & early diagnosis
- Training at all levels (educators, carers, professionals)
- Easy access to service provision (EIP & Special Need Education)
- Continued support from childhood to adulthood
- Parental support
- Conduct prioritized research

Appendix 1

ABSTRACTS

1.1   Education

1.1.1   Educational Intervention

1.1.1.1   Teaching of Speech, Language and Communication Skills for Young Children with Severe Autism Spectrum Disorders: What Do Educators Need to Know?

Low H.M. & Lee L.W.
New Horizons in Education 59(3), 2011: 16-27

Abstract: *Background:* Globally, there is an increased prevalence of preschool and school-age children diagnosed with Autism Spectrum Disorders. Current reports show that about one in every 110 children fall within this category of disorders. Consequently, the successful inclusion of these children in both regular and special education classes is becoming a critical issue to address. *Aims and methods:* In this paper, attention is placed on the children's speech, language and communication skills which are the primary deficits associated with this category of disorders. Approaching it from the perspective of speech and language therapy, this paper will offer insights and suggestions to educators in regular schools and special education programs on how to teach speech, language and communication skills to young children with severe Autism Spectrum Disorders. A case study is illustrated to provide the objective exemplar of how a child with severe ASD could learn and improve once being given the appropriate, evident-based and individualized teaching management and intervention. *Conclusion:* The teaching of speech, language and communication skills to children with severe ASD requires a prior understanding of their behavioral patterns and learning styles. The teaching could be targeted to help them to develop the deficient skills and to use compensatory strategies to facilitate communication. A better understanding of how to teach children with severe ASD in schools will lead to a better teaching and learning experience to both the teachers and the children, with important implications on promoting sustainable inclusive education for these children.

1.1.1.2   Facilitating ESL Students with Autism Learn Sight Vocabulary: Teachers' Practices and Voices

Yahya S., Md Yunus M. & Hasnah T.
International Journal of Sciences: Basic and Applied Research 11(1), 2013: 90-98

Abstract: Teachers' support is critical to the learning of special needs students. Without teachers' assistance and understanding, it may be difficult for such students to develop learning. The paper reports the findings of a study that looked into English language teachers' practices in facilitating primary school ESL students with autism learn sight vocabulary. Observational field notes, interviews, and document analysis indicate that the teachers used a variety of ways to help the students learn. The findings indicate humanistic language teaching practices. The practices seem to be important in promoting sight vocabulary development among the students. The findings have important implications for teacher educators, in service and pre service teachers involved in teaching ESL students with autism in inclusive and special education settings.

1.1.1.3   Instructional Practices in Enhancing Sight Vocabulary Acquisition of ESL Students with Autism

Yahya S., Md Yunus M. & Hasnah T.
Procedia Social and Behavioral Sciences 93, 2013: 266-270

Abstract: Teaching sight vocabulary to students with autism is a challenge as these students have different needs from their nondisabled peers. This study explored teachers' instructional practices in teaching sight vocabulary to ESL students with autism in the natural classroom setting. Data collection included field notes on classroom observation and interviews of teachers. The findings of this study

suggested that teachers provided support through bridging second language instructions with the students'L1 (Malay) to ease learning. Findings also indicated that teachers adjusted their level of vocabulary during instruction to promote sight vocabulary acquisition. Further, results suggested that giving the students frequent opportunities for using words as their nondisabled peers promotes sight vocabulary acquisition.

1.1.1.4 First We Imagine, Then, We Collaborate: An Insight with Autistic Children

Abd Rahim N. & Harun N.I.
Gading Business and Management Journal 10(2), 2006: 57-67

Abstract: This research focuses on the autistic children learning a second language. It investigates the nature, number and balance of interactions of ten children and further investigates the content of discussion and reactions which occurred while they were using the learning approach. The subjects consist of 10 children (7 to 15 years old) with autistism from five schools in Selangor and Negeri Sembilan, Malaysia. The 'Imaginative Learning Approach' is introduced to enhance learning the English language and, in turn, encourage subjects in collaborating with their peers. It is found that autistic learners are able to collaborate with peers in the 'Imaginative Learning Approach'.

1.1.1.5 Teaching Approach for Autism Students: A Case in Malaysia

Omar H., Hussin Z. & Siraj S.
Procedia Social and Behavioral Sciences 106, 2013: 2552-2561

Abstract: Children with Autism are isolated in their own nature, not because they are visually or hearing impaired but because of the difficulty of understanding what is happening around them. Pupils' background of Autism disorders as expressed in term of delayed language development, communication, social interaction and behavior have created problems for teachers when implementing the teaching and learning process in the classroom. This paper presents the findings of a case study conducted in Malaysia to identify teaching approaches applied by the teachers during the process of teaching pupils with Autism. This study was carried out by interviews with two teachers who teach Autism student in Special Education classes and a teacher who teaches Autism students in an Inclusive classroom. All respondents were selected based on criteria of already having more than five years teaching experience and a history of outstanding teacher awards over their service. Verbatim interview data are further supported by the observation data and document analysis. This study has demonstrated impressive results in which teachers are always trying to reach out and attract the attention of students with autism to focus on the classroom teaching by using the elements of love and profound concern. The study also found that patience was apparent in the teachers and exhibited at a high level on a continuous basis during teaching sessions; this was seen to alter some Autism students' negative behavior to a more positive behavior.

1.1.2 Early Intervention Program

1.1.2.1 Early Identification and Intervention of Autism Spectrum Disorder among Young Children

Badzis M. & Zaini M.F.
IIUM Journal of Educational Studies 2(2), 2014: 67-89

Abstract: The present study focused on the paramount importance of early identification and intervention of Autism Spectrum Disorder (ASD) among young children. The focus of the study is on children with autism and their typical characters which are identified by adults. The study investigates the occurrence of Autistic Spectrum Disorder (ASD) among young children from the parents'

perspective. This descriptive and analytical study aimed at finding 1) parents' perception of the need of early identification and intervention of children with autism, 2) parents' own perception of the challenges and strategies to help students with autism increase their school performance and 3) parents' view on strategies to help change the societal perception on ASD. There were three research questions to investigate the parents' perception in the current study; 1) the issue pertaining to the need of early identification of children with autism, 2) the questions related to useful of identification to parents, school teachers and society, 3) the questions on the challenges and strategies parents had to help ASD children receive optimal care by adults. It was found that parents identified their children behavior as ASD, regardless its degree of severity. The behaviors such as 1) emotionally unstable with bad tempered, 2) easy to be frustrated, 3) having ritual behavior, 4) quick walking habit, 5) problem with understanding, 6) reserved personality and lonely were identified with the help of the teachers in school. Strategies to help children with autism are also discussed in this paper.

1.1.2.2 The Practice of Early Intervention Programming Autistic Children from the Parents' Perspective

Liew P.Y. & Mohd Ali M.
Jurnal Pendidikan 33, 2008: 19-33

Abstract: The purpose of this study is to explore parents' perspective on the usage of the types of intervention, service delivery and family involvement in the early intervention program received by autistic children. Data were obtained through questionnaires and interview. Questionnaires were distributed to 50 parents of autistic child aged 2 to 8 years old from 5 different autistic or learning disabilities centres three out of these parents were randomly chosen to be the interview subjects. Data was descriptively analyzed using percentages while the qualititative data were trancribed verbatimly. The results showed that speech therapy is the kind of intervention that most autistic children received. There were changes in the development of the autistic child as a result of intervention. The results also showed that there is a lack of consistency in service delivery between the services delivered by centers and service practitioners. The results too indicated that in most of the cases only mothers were involved in the early intervention programme. This study has implication on the service planners and parental involvement in the intervention programs.

1.1.2.3 An Exploratory Study on the Special Education and Early Intervention Programme for Autistic Children

Sani B., Wan Chik M.N. & Badzis M.
The International Conference on Early Childhood and Special Education (ICECSE) 2011: 'Nurturing Every Child's Potential for a Better Future', Penang, Malaysia, 10-12 June 2011: 1-9

Abstract: The objective of this paper is to explore the special education and the intervention programme for autistic children run by two Non-Governmental Organizations and identify how their programmes help autistic children improve learning disability. The methodology of this study is qualitative using a single case study. The research will be an exploratory study with a field study on two different organizations which are currently active in helping children with learning disabilities. Semi-structured interviews and informal conversations are used to obtain the data. Findings showed that both centres used a naturalistic curriculum model where activities carried out are mostly dealing with real life activities, while topics and skills are focused on sensory skills and children are taught to use their senses and attention span. Teaching methods used are a mixture of several latest teaching techniques currently being applied worldwide for autistic children. In the early intervention programme, the teaching and learning techniques are based on the individual child_s ability. Both centres admitted that some parents play a supportive role while others play non-supportive roles. More knowledge of the learning process and learning development of autistic children as well as the teaching and early intervention strategies is needed to provide better understanding and guidance for teachers and parents or caregivers to deal with the needs of these children.

1.1.2.4 Monitoring Progress using the Individual Education Plan for Students with Autism

Hasnah T., Mohd Hanafi M.Y., Fadliana C. & Mohd Mokhtar T.

Abstract: The Individual Education Plan (IEP) is a written document specifically developed for students with disabilities. It contains learning objectives for the student, including facilities and resources needed to achieve these objectives. This study investigated the IEP process carried out in an autism learning laboratory established in a local university in Malaysia. Specifically, this study investigates the objectives set for the students and their achievement of these objectives. IEPs were developed IEPs for 10 students with autism who are studying in this laboratory. Results showed that students' achievement ranged from 40% to 100% of their IEP objectives.

1.1.3 Teachers Knowledge

1.1.3.1 Towards Holistic Inclusion in Malaysia: Knowledge of Special Educational Needs among In-Service Distant Learning Students

Saad S., Ibrahim H. & Nayan N.

Abstract: The findings of previous researches showed that mainstream teachers' have a negative attitude towards students with special educational needs (SEN) in Malaysia due to the lack of information and awareness. The purpose of this study was to determine the knowledge level of SEN among experienced mainstream teachers in Malaysia. A survey was distributed among 147 teachers undergoing distance learning Bachelor of Education (BEd) degree in a public university. Teaching experience and familiarity with SEN persons did not affect the knowledge level of the three groups of participants. The results of the study revealed that teachers had a moderate level of knowledge on SEN. The implication of these findings for inclusion and for future research in Malaysia is also provided. This study also made recommendations on how to improve the knowledge level of SEN inservice teachers in Malaysia, and the need to assess the knowledge on SEN among parents, paraprofessionals, educational administrators and other stake holders in order to achieve holistic inclusion for pupils with SEN.

1.1.3.2 Teachers' Perceptions of Including Children with Autism in a Preschool

Nornadia M.R., Hasnah T., Sazlina K., Norshidah M.S. & Mohd Hanafi M.Y.

Abstract: Inclusive education supports the vision of the United Nations (UN) in upholding the fundamental rights of children with special needs towards education. In Malaysia, the Persons with Disabilities Act 2008 recognized the rights of children and persons with disabilities in regards to education. However, the implementation of inclusive education for children with autism in Malaysia has been problematic, especially in preschool. Therefore, this study investigated teachers' perceptions of including children with autism in a mainstream preschool. The objectives of this study were: 1) to determine the attitudes of teachers towards inclusive education 2) to identify the knowledge and skills of pre-school teachers regarding inclusive education 3) to identify the barriers and challenges in implementing inclusive education in pre-school 4) to investigate the reasons behind the non-acceptance of preschool teachers on having children with autism in their classes. Data were collected using a structured interview. Three pre-school teachers in Selangor agreed to participate in this study. The interviews were transcribed text verbatim and information was analyzed by identifying relevant themes. The findings showed that the teachers were not prepared to teach children with autism in

their class because they did not know the characteristics of children with autism and did not understand the importance of inclusive education. In conclusion, the practice of inclusive education in pre-school is yet to be implemented successfully due to some constraints experienced by teachers and lack of support in the environment.

1.1.3.3 Observational Study on Teachers' Approach in Teaching Children with Autism to Read

Mislan N., Tian A., Sharifuddin R.S., Guan J. & Lee M.F.
Journal of Education and Practice 3(12), 2012: 156-164

Abstract: Children with autism are characterized with unique cognitive and social emotional development which makes the process of teaching them to read to be difficult and complicated. In attending to the special needs and characteristics of children with autism, special education teachers should have necessary knowledge and techniques in teaching children with autism to read and taking their characteristics into consideration during the reading lesson. This research aims to examine the approaches used by teachers in teaching children with autism to read. A total of two special education teachers were willing to participate in the case study. A non-participant observation was carried out with the two respective teachers in different time frame in a selected autism centre. The findings were presented in different phases of the reading process which were carried out. There are no single theories which was used in teaching students to read in each phase. It involves the combination of various theories to help students to understand the content of the reading material. Based on the findings, the teachers used several theories in teaching reading to children with autism. These theories include reading theories (traditional, cognitive and metacognitive view of reading) and Vygotsky's Sociocultural theory.

1.1.3.4 Tahap Latihan, Pengetahuan dan Keyakinan Guru-guru Pendidikan Khas tentang Autisme (Special Educators' Level of Training, Knowledge and Confidence of Autism)

Hasnah T., Mohd. Hanafi M.Y., Mohd. Mokhtar T. & Salleh N.
Jurnal Pendidikan Malaysia

Autism is a developmental disorder that negatively impacts the ability for communication and interaction. Current statistics have reported an increase in its prevalence. Therefore, the need for well trained teachers to teach children with autism has also increased. This study was implemented to investigate the level of training, knowledge, and confidence of special education teachers on autism. Formal teacher training courses was found to be rather ineffective in training special education teachers to understand and teach children with autism. It has also been found that inservice training is slightly better in quality. This caused them to have low confidence in their ability to teach children with autism. However, they showed interest to undergo advanced courses to enhance their competence in educating children with autism. Therefore, formal special education teacher training needs to be improved through an additional component on autism. Special education teachers also need to be provided with access to inservice training in autism because the field of autism education has progressed and various strategies that have been proven effective scientifically are now available. Further studies are needed to identify weaknesses in both types of teacher training and methods to improve the quality of both in terms on education for children with autism.

1.1.4 Children Development

1.1.4.1 Kemahiran Asas Sosial Kanak-Kanak Autisme di Persekitaran Sekolah

Vijayen G.
Maktab Perguruan Keningau. Sabah

Abstract: Kajian kes ini bertujuan untuk menjawab tiga persoalan kajian iaitu a) apakah kemahiran asas sosial yang telah oleh kanak-kanak autisme. b) apakah kemahiran-kemahiran asas sosial yang belum dikuasai oleh kanak-kanak autisme, dan c) apakah faktor-faktor yang membolehkan kanak-kanak autisme berupaya menguasai dan tidak menguasai kemahiran asas sosial mengikut pandangan guru. Tiga kanak-kanak autisme di Sekolah Kebangsaan Bukit Padang, Kota Kinabalu, Sabah, dipilih sebagai subjek dan tiga orang guru yang mengajar subjek-subjek ini ditemubual. Kajian ini berfokus kepada lima kemahiran asas sosial sahaja. Kaedah pemerhatian dan temubual dengan instrument senarai semak dan soalan terbuka digunakan. Dapatan kajian menunjukkan kelima-lima kemahiran asas sosial dikuasai oleh subjek tetapi belum menguasai beberapa sub kemahiran. Dapatan temubual menunjukkan faktor guru, persekitaran, rakan sebaya, dan kaedah mengajar membolehkan penguasaan kemahiran-kemahiran asas sosial. Sebaliknya faktor kekurangan pendedahan mengenai autisme dan kaedah mengajar yang khusus, pertukaran guru dan kekurangan pengetahuan ibu bapa mengenai autisme menghalang penguasaan kemahiran asas sosial.

1.1.4.2 Pencil Grip among Children with Learning Disabilities to Increased Writing Skill

Lim C.Y., Mohd Hanafi M.Y. & Mohd Mokhtar T.
Malay Language Education Journal, 2012: 65-77

Abstract: Efficient handwriting during learning is important to every student because its failure can bring a negative effect to self-esteem and academic achievement. It is an obstacle to academic achievement in school especially in Special Education Integration Learning Disabilities Program (PPKI). Children Categories Of Learning Disabilities (KKBP) in Malaysia are Down Syndrome, Mild Autism, Attention Deficit Hyperactivity Disorder (ADHD), Minimum Mentally Retarded and Specific Learning Disabilities (example Dyslexia). This survey analysis was conducted to highlight the types of pencil grip among KKBP, the types of levels of pencil grip for learning disabilities students at school stage and determine the difference of pencil grip in KKBP categories. This study involves photo shooting of pencil grip when writing by 225 respondents from seven primary schools undergoing Special Education Integration Program in Klang district, Selangor. A pilot study was carried out on 36 respondents in a school. The findings showed that the category Specific Learning Problems recorded the highest percentage for all three types of pencil grip level is 8.4% (19 students) for mature stage, 51.6% (116 students) for immature stage and 1.8% (4 students) for other levels. Hopefully, this research can provide input to the educator to be more focus on how to grip a pencil when writing and therapists working to design more effective intervention program and provide feedback to the curriculum education planners on formulating a more effective curriculum for KKBP. Few suggestions were also presented.

1.1.4.3 The Level of Cognitive Ability among Learning Disabilities Children in Malacca Malaysia

Sulaiman T., Baki R. & Megat A. Rahman P.Z.
International Journal of Psychological Studies 3(1), 2011: 69-77

Abstract: The objective of the study is to examine the cognitive ability of children with learning disabilities (LD) who were involved in the PDKNet education program. The children involved in this study are made up of children with learning disabilities (LD). A total of 106 children from 7 Community

Based Rehabilitation (CBR) Centre in Malacca took part in this study. The instrument used in this study is divided into 5 main basic categories which consisted of the ability to identify computer hardwares, alphabets, words, colours and shapes. The findings of the study indicated that more than half of the children with learning disabilities (LD) were able to identify components of a computer such as monitor, keyboard and mouse. More than half of the LD children were also able to recognize and pronounce words and alphabets. However, they face difficulties in reading and writing the respected words as well as having difficulties in providing examples for the shapes asked. Therefore, teaching children especially children with learning disabilities should be given more attention to help them to read and to write.

1.1.5   Special Education Program

1.1.5.1   Effective Transitional Plan from Secondary Education to Employment for Individuals with Learning Disabilities: A Case Study

Loh S.C. & Syed Yahya S.Z.

Abstract: One of the major goals in the education and training of individuals with special needs is to prepare them for independence. However, in the Malaysian context, parents who have special adolescents are in doubt as to what would be the future of their children soon after they have finished the vocational training. This case study explores the transitional needs and subsequently to develop an effective transitional plan from secondary education to employment for Malaysian individuals with special needs. The sample comprises two high school special educators and four persons with learning disabilities who are at work. The findings were triangulated among five co-ordinators of Non-Governmental Organisation, as well as parents for the four persons with learning disabilities and their employers. The findings reveal that transitional needs of individuals with special needs includes collaborative support system, job coaching, self-advocacy skills training, career guidance and transition assessment, vocational training, trained transition personnel and transition services. The transition process would be a collaborative process between the government and non-governmental sector. From the findings, an effective transitional plan from secondary education to employment for students with learning disabilities was drawn. Several implications have been drawn from this study.

1.1.5.2   Pelaksanaan Program Pendidikan Inklusif Murid Autistik di Sebuah Sekolah Rendah: Satu Kajian Kes

Kamaliah M. & Wan Amimah W.M.

Abstract: Tujuan kajian ini adalah untuk mengenal pasti pelaksanaan Program Pendidikan Inklusif murid-murid autistik di sebuah sekolah rendah di Kuala Lumpur. Kajian ini menggunakan pendekatan kualitatif dan kuantitatif untuk mengumpul data-data. Seramai dua puluh satu orang responden terlibat dalam kajian ini yang terdiri daripada seorang Guru Besar yang kemudiannya digantikan oleh Guru Penolong Kanan, Penyelaras Program Integrasi Pendidikan Khas Pembelajaran, tiga orang Guru Pendamping dari Persatuan Autistik Kebangsaan Malaysia atau *The National Autism Society Of Malaysia* (NASOM), tiga orang guru mata pelajaran, tiga orang murid autistik dan sepuluh orang murid normal. Sekolah A merupakan sebuah sekolah yang menjalankan Program Pendidikan Inklusif yang dinamakan "Projek Rintis Pendekatan Inklusif Bagi Murid-murid Autistik". Seramai lapan orang murid autistik dari (NASOM) telah berjaya dimasukkan secara sepenuh masa di kelas biasa di sekolah tersebut. Istimewanya program ini ialah setiap kelas yang mempunyai murid autistik akan disertai oleh seorang guru pendamping dari (NASOM) yang akan membantu murid-murid tersebut. Semua guru kelas dan guru mata pelajaran telah diberi kursus pendedahan berkaitan dengan murid-murid autistik dan Program Pendidikan Inklusif oleh pegawai-pegawai dari Jabatan Pendidikan Khas,

Kementerian Pelajaran Malaysia (KPM) dan (NASOM). Dapatan kajian mendapati guru-guru kelas dan guru mata pelajaran menjalin kerjasama yang baik dengan guru-guru pendamping dari (NASOM) untuk membantu aktiviti pembelajaran murid-murid autistik. Murid-murid ini mampu mengikuti aktiviti pengajaran dan pembelajaran bersama-sama rakan sekelas yang lain dan berdikari sekiranya guru pendamping tidak hadir. Semua murid-murid tersebut gembira belajar di sekolah ini. Mereka boleh berkomunikasi dengan rakan-rakan sekelas dan guru-guru mata pelajaran. Guru Penolong Kanan menyarankan Program Pendidikan Inklusif akan berkesan jika dirancang dengan rapi dari pihak KPM dan diimplimentasikan dengan bantuan dan pemantauan berterusan.

1.1.5.3 Overcoming the Challenge of Inclusion through Smart Initiatives: A Case Study

Hussin S., Loh S.C. & Quek A.H.

Abstract: In Malaysia, children with special needs have the opportunity for education in special schools as well as in integrated and inclusion programs conducted in mainstream primary and secondary schools. Children who benefit from these integrated and inclusion programs include those with autism alongside many other categories of special needs. Children from the integrated program who are high functioning have the privilege to be included in mainstream classes. Many questions remain, however, on how to best implement the inclusion programs in Malaysian schools. As such, the challenge of inclusion remains. In this article, we describe the smart initiatives since 2005 by the Malaysian Government and the Non-Governmental Organisations in overcoming the challenge of including children with autism into the mainstream classes. A research visit was conducted with the aim of gathering insight into the successful inclusion of children with autism in the mainstream classes in one of the primary schools located in metropolitan Kuala Lumpur in the Klang Valley, Malaysia. Children with autism in the inclusive classrooms were allowed to participate in classroom activities and to respond to teachers' questions to enhance their experiential learning. Few key features towards successful inclusion such as smart collaboration, co-teaching, peer learning, after-school coaching and experiential learning were identified. This smart initiative has spearheaded few more inclusion programs throughout Malaysia.

1.2 Engineering

1.2.1 Utilizing Electroencephalogram (EEG) as Diagnostic Tool

1.2.1.1 2D Affective Space Model (ASM) for detecting autistic children

Razali N. & Abdul Wahab A.R.

Abstract: There are many research works have been done on autism cases using brain imaging techniques. In this paper, the Electroencephalogram (EEG) was used to understand and analyze the functionality of the brain to identify or detect brain disorder for autism in term of motor imitation. Thus, the portability and affordability of the EEG equipment makes it a better choice in comparison with other brain imaging device such as functional magnetic resonance imaging (fMRI), positron emission tomography (PET) and megnetoencephalography (MEG). Data collection consists of both autistic and normal children with the total of 6 children for each group. All subjects were asked to clinch their hand by following video stimuli which presented in 1 minute time. Gaussian mixture model was used as a method of feature extraction for analyzing the brain signals in frequency domain. Then, the extraction data were classified using multilayer perceptron (MLP). According to the verification result, the percentage of discriminating between both groups is up to 85% in average by using k-fold validation.

1.2.1.2 Affective Face Processing Analysis in Autism using Electroencephalogram

Othman M. & Abdul Wahab A.R.

Abstract: Past research in the area of psychology has indicated the inability of Autism Spectrum Disorder (ASD) patients for interpreting other people's emotion. This impairment is due to their lack of social motivation and eye contact during communication, causing insufficient information to the brain for interpreting emotional faces. This paper investigates human brainwaves for understanding affective face processing of ASD children. Pattern classification results are explained based on the 2-dimensional emotion model. The 2-dimensional model explains human emotion in terms of the pleasant/unpleasantness (or valence) and intensity (or arousal). Analysis results revealed that emotion of the non-autistic group is altered towards matching the affective faces currently displayed on the computer monitor. Emotion dynamics of ASD children, however, indicated the trend for reversed valence while watching emotionally related facial expressions.

1.2.1.3 A Source-Discrimination Approach for Detection of ASD Using EEG Data

Qidwai U.A. & Shams W.K.

Abstract: This paper presents a study which was done in an attempt to discriminate between two motor actions; eyes-open task and eyes-closed task, for two classes; Autism Spectrums Disorders (ASD) and Typical or Normal (TP). Both of these groups were composed of school children with ages between 6 to 9 years. Utilizing the Time Different of Arrival (TDOA) approach applied with raw Electroencephalography (EEG) data for feature extracted in time domain. For each action, specific features were calculated and a Multilayer Perception (MLP) based Neural Network was used to classify the data into the two classes. The classification process was carried out for three scenarios for each group; first, all task for both group were combined together, second, eyes-open were classified for both groups separately, and third, eyes–closed was classified separately. The results show accuracy over 90 % and clearly discriminate for the features.

1.2.1.4 Characterizing Autistic Disorder based on Principle Component Analysis

Shams W.K. & Abdul Wahab A.R.

Abstract: Autism is often diagnosed during preschool or toddled age. This diagnosis often depends on behavioral test. It is known that individuals with autism have abnormal brain signals different from typical persons yet this difference in signals is slight that it is often difficult to distinguish from the normal. However, Electroencephalogram (EEG) signals have a lot of information which reflect the behavior of brain functions which therefore captures the marker for autism, help to early diagnose and speed the treatment. This work investigates and compares classification process for autism in open-eyed tasks and motor movement by using Principle Component Analysis (PCA) for feature extracted in Time-frequency domain to reduce data dimension. The results show that the proposed method gives accuracy in the range 90-100% for autism and normal children in motor task and around 90% to detect normal in open-eyed tasks though difficult to detect autism in this task.

1.2.1.5 Dynamic Analysis of Critical Features in EEG for Motor Imitation among Autistic Children

Razali N. & Abdul Wahab A.R.

Abstract: Research study among children with autism had shown impairment in motor imitation in addition to social disability. Currently, imitation becomes an important issue which can be seen as new procedure to detect early childhood autism. Hence, this paper proposed the used of motor imitation action by analyzing the brain waves frequency. Experimental results revealed that control and autistic children both perform the motor imitation well but the brain activation for both group are different. Autistic children demonstrate a very high intensity brain activation indicating they are struggling to do the action. This illustrates some potential methods that can be extended in detecting autism for early childhood.

1.2.1.6 Human-Robot Interaction Intervention Therapy Procedure for Initial Response of Autism Children with Humanoid Robot

Yussof H., Ismail L.I., Shamsuddin S., Hanapiah F.A., Mohamed S., Piah H.A., Idris S., Hashim H. & Zahari N.I.

Abstract: This paper presents the initial response of Autism children interacting with Humanoid Robot NAO in Robot-based Intervention Program. Twelve Autism children from National Autism Society of Malaysia (NASOM) is being selected based on their behaviour characteristics which has been identified by certified clinical specialist, psychiatrist, occupational therapy and psychologist. Their Intelligence Quotient based on Stanford Binet Intelligence Test has been first carried out and they have undergo the autism diagnose based on Autism Diagnostic Observation Schedule by certified psychologist from NASOM. The twelve of Autism Children will then participated in the Robot-based Intervention Program (RBIP), which started from module 1 until module 5. The interaction between Autism Children and Humanoid Robot NAO is being recorded with two Sony Video Camera and one mini camera mounted on the chess of Humanoid Robot Nao for initial response analysis based on Gillian Autism Rating Scale-2nd Edition. The interaction module between the children and robot has been developed by using the graphical user interface from choreographe of Humanoid Robot Nao.

1.2.1.7 Source-Temporal-Features for Detection EEG Behavior of Autism Spectrum Disorder

Shams W.K. & Abdul Wahab A.R.

Abstract: This study introduces a new model to capture the abnormal brain activity of children with Autism Spectrum Disorder (ASD) during eyes open and eyes closed resting conditions. EEG data was collected from normal subjects' ages (4 to 9) years and ASD subjects match group. Time Difference of Arrival (TDOA) approach was applied with EEG data raw for feature extracted at time domain. The neural network, Multilayer Perception (MLP) was used to distinguish between the two groups during the two tasks. Results show significant accuracy around 98% for both tasks and clearly discriminate for the features in z-dimension his electronic document is a "live" template and already defines the components of your paper [title, text, heads, etc.) in its style sheet.

1.2.1.8 Study of Electroencephalography Signal of Autism and Down Syndrome Children using FFT

Sudirman, Saidin S. & Safri N.M.
2010 IEEE Symposium on Industrial Electronics and Applications (ISIEA 2010), Penang, Malaysia, 3-5 October 2010: 401-406

Abstract: Electroencephalography (EEG) signal between normal and special children is slightly different. Different types of special children will generate different shape of EEG patterns depend on their neurological function. This paper demonstrates the classification of EEG signal for special children: to determine and to classify level and pattern of EEG signal for autism and Down syndrome children. EEG signal was recorded and captured from normal and special children based on their visual response using Visual Evoked Potential (VEP) method. The data is analyzed using Fast Fourier Transform (FFT), so that, normal and special children can be distinguished based on alpha (_) value. As a result, alpha value for normal children at 10 Hz is higher than autism and Down syndrome children. A friendly user interface was built for easy storage and visualization.

1.2.2 Robot-based Intervention

1.2.2.1 A Qualitative Method to Analyze Response in Robotic Intervention for Children with Autism

Shamsuddin S., Yussof H., Hanapiah F.A. & Mohamed S.
2013 IEEE RO-MAN: The 22nd IEEE International Symposium on Robot and Human Interactive Communication, Gyeongju, Korea, 26-29 August 2013: 324-325

Abstract: This paper presents a method to carry out qualitative analysis when evaluating the interaction between child and robot in autism intervention. The technique consists of 24-items of behavioral assessment which was referenced to the Gilliam Autism Rating Scale-Second Edition (GARS-2). GARS-2 is a screening instrument used to identify and diagnose autism. Preliminary results from a pilot study show that this method had allowed qualitative observation to be carried out to compare the behavior of autistic children with and without the presence of a robot. The feasibility of this technique will be further justified through future wide-spread studies involving a larger number of children spanning across the whole spectrum of autism.

1.2.2.2 Estimation of Concentration by Eye Contact Measurement in Robot-based Intervention Program with Autistic Children

Ismail L.I., Shamsudin S., Yussof H., Hanapiah F.A. & Zahari N.I.
Procedia Engineering 41, 2012: 1548-1552

Abstract: Lacking of eye contact in social interaction and communication is one of the impairments that being diagnosed with some of the children with Autism Spectrum Disorder (ASD). This paper presents the initial response of eye contact time between humanoid robot NAO and ASD children in Robot-based Intervention Program (RBIP) interaction and normal classroom interaction. Twelve ASD children from National Autism Society of Malaysia (NASOM) based on inclusive criteria and certain ASD characteristics are being selected to participate in this intervention program. The interaction between humanoid robot NAO and ASD children is being recorded for both RBIP interaction and normal classroom setup. The eye contact time in both interactions for each child is being observed and recorded. The eye contact of the ASD child is often seen in RBIP interaction as compared to the normal classroom interaction.

1.2.2.3   Initial Response in HRI- a Case Study on Evaluation of Child with Autism Spectrum Disorders Interacting with a Humanoid Robot NAO

Shamsuddin S., Yussof H., Ismail L.I., Mohamed S., Hanapiah F.A. & Zahari N.I.
Procedia Engineering 41, 2012: 1448-1455

Abstract: The evolution of human-robot interaction (HRI) is now expanding its wings to aid children with Autism Spectrum Disorders (ASD) in areas of socialization, communication and playful behavior through robot-based intervention. Herein we present our holistic, longstanding goal to contribute to the lives of children with ASD; who suffer a lifelong developmental disability. The purpose of this paper is to elaborate on a case study in our pilot experiment where a child with ASD is exposed to the humanoid robot NAO in order to gauge his initial response and behavior in the presence of a robot. NAO robot is the chosen robotic agent as it is a commercially available humanoid with simpler in appearance compared to real humans, thus appears more approachable to children with ASD. The pilot procedures involve the robot executing basic, simple components of interaction through a series of 5 different modules. In this study, the principal results show that the basic HRI carried out by the robot is able to suppress the child's autistic behavior during the child-robot interaction. Also, more eye contact is observed between the child and robot compared to the child with his teacher during regular class session. Relating this to the child's IQ which falls in the moderate category, it is suggested that children with ASD in the same IQ group will be receptive to robot-based intervention even in the first interaction session. Hence, it can be concluded that the humanoid robot NAO has potential to serve as a platform to support and initiate interaction in children with ASD.

1.2.2.4   Motor Movement for Autism Spectrum Disorder (ASD) Detection

Razali N. & Abdul Wahab A.R.
Information and Communication Technology for the Muslim World (ICT4M), 2010 International Conference, Jakarta, Indonesia, 13-14 December 2010: E90-E95

Abstract: In this paper, we are looking at the differences between autistic and normal children in term of fine motor movement. Previous findings have shown that there are differences between autistic children and normal children when performing a simple motor movement tasks. Imitating a finger tapping and clinching a hand are two examples of a simple motor movement tasks. Our study had adopted one of the video stimuli for clinching the hand from Brainmarkers. 6 selected autistic children and 6 selected normal children were involved in this study. The data collection is using EEG device and will be analyzed using Gaussian mixture model (GMM) and Multilayer perceptron (MLP) as classifier to discriminate between autistic and normal children. Experimental result shows the potential of verifying between autistic and normal children with accuracy of 92%. The potential of using these techniques to identify autistic children can help early detection for the purpose of early intervention. Moreover, the spectrums of the signals also present big differences between the two groups.

1.2.2.5   Robot-based Intervention Program for Autistic Children with Humanoid Robot NAO: Initial Response in Stereotyped Behavior

Ismail L.I., Shamsudin S., Yussof H., Hanapiah F.A. & Zahari N.I.
Procedia Engineering 41, 2012: 1441-1447

Abstract: The development and research on Human-Robot Interaction (HRI) between the humanoid robot and autistic children is new and innovative. This paper presents the initial response of stereotyped behavior in HRI between Humanoid Robot NAO and children with Autism Spectrum Disorder (ASD) during the Robot-based Intervention Program (RBIP) and normal class session. The presence of stereotyped behavior in children with ASD is being evaluated during the RBIP interaction and normal class session interaction. Humanoid Robot NAO is being utilized for the interaction in

RBIP. The relationship between initial response of stereotyped behavior and the intelligence level of ASD children were analyzed during two interaction set-up, which were RBIP and normal classroom interaction, from which these findings are discussed in this paper. Our focus of discussion in this research is the initial response of autistic children exhibiting stereotyped behavior in RBIP and normal classroom session.

1.2.2.6 Humanoid Robot NAO as HRI Mediator to Teach Emotions using Game-centered Approach for Children with Autism

Shamsuddin S., Yussof H., Miskam M.A., Che Hamid M.A., Abdul Malik N., Hashim H., Hanapiah F.A. & Ismail L.I.
HRI 2013 Workshop on Applications for Emotional Robots, Tokyo, Japan, 3-6 March 2013

Abstract: This short report presents the latest development in our robot-based intervention program for children with autism. Following the outcome from our first pilot study; the aim of this current experiment is to explore the application of NAO robot to engage with a child and further teach about emotions through a game-centered and song-based approach. The children participating in this study has been diagnosed with mild autism. Initial exposure to the robot shows that the NAO robot; a humanoid with moderate likelihood to actual human does have potential to teach children with autism about head and body postures that are associated with certain feelings or emotions. Overall observation suggests the positive utilization of robots, specifically the humanoid robot NAO in the rehabilitation of autistic children.

1.2.2.7 Humanoid Robot NAO Interacting with Autistic Children of Moderately Impaired Intelligence to Augment Communication Skills

Shamsuddin S., Yussof H., Ismail L.I., Mohamed S., Hanapiah F.A. & Zahari N.I.
Procedia Engineering 41, 2012: 1533-1538

Abstract: This report presents the findings from our pilot study on the initial behavior of autistic children of moderately impaired intelligence when exposed to simple human-robot interaction (HRI) modules executed by a humanoid robot NAO. All 5 children have been specifically assessed using the Autism Diagnostic Observation Schedule (ADOS) and their diagnosis is classified as autistic disorder. We hypothesize that NAO's human-like appearance, its capability to blink its eyes, speak and play music; coupled with the simplicity of the HRI modules will be able to entice the children's interest to engage in communication. Hence, this would significantly reduce the children's autistic characteristics in communication behavior compared to the usual class setting. In this study, the principal result shows that 4 out of the 5 children exhibited a decrease of autistic behavior (in communication subscale) when the robot is executing HRI modules during the single session of child-robot interaction. This promising outcome indicates that the NAO robot were able to attract the children's attention, keep each child engaged with the robot during interaction and hence give positive impact to the children's communication behavior. Relating this to the children's FSIQ, it can be deducted that autistic children with FSIQ of moderately impaired (from 40-54) are receptive to robotbased intervention. This is again showed by the lower autistic traits observed during the HRI modules compared to in-class setting. Overall, this research suggests that autistic children of moderately impaired intelligence show good response to robot-based intervention. This finding is crucial to form a solid foundation and proof on the positive utilization of the humanoid robot NAO for the children affected by autism.

1.3   Information Technology (IT)

1.3.1   Assessing the Effectiveness of ICT Software

1.3.1.1   A Preliminary Investigation: Potential of Interactive Multimedia Learning Awareness (IMLA) in Enhancing Awareness of Autistic Characteristics among Parents and Society in Malaysia

Dolah J., Wan Yahaya W.A.J. & Chong T.S.

Abstract: In this article, we report the feedback from respondents in relation to the implementation of Interactive Multimedia Learning Awareness (IMLA) in enhancing awareness of autistic characteristics among parents and society in Malaysia. Methods of gathering information such as observation and interviews were used in order to identify the current level of awareness towards autistic children. Nine respondents were selected to participate in this interview ranging from two content experts from the National Autism Society of Malaysia (NASOM), a researcher who is also an expert in autism from Universiti Kebangsaan Malaysia (UKM), a mother with autistic children, a mother without autistic children, two parents without autistic children and three unmarried women. The findings of this preliminary investigation confirm that there is a lack of awareness that needs to be addressed by Malaysian society. As a conclusion, the implementation of Interactive Multimedia Learning Awareness (IMLA) needs to be designed and developed to facilitate and to enhance the awareness of autistic characteristics in Malaysia.

1.3.1.2   Framework Methodology of the Autism Children - Vibratory Haptic Interface (ACVHI)

Mustafa M., Arshad H. & Zaman H.B.

Abstract: This paper provides the Framework Methodology of the Autism Children –Vibratory Haptic Interface (AC-VHI) conducted on the mild autism children who have impairment in social interaction. This paper has exclusively explored problems faced by Malaysian autistic children in a National Autism Society at Kuala Lumpur, Malaysia. It also has been conducted at two locations: the classroom and the court of the National Autism Society in Malaysia (NASOM), Kuala Lumpur, Malaysia. The paper has sampled 20 children with mild autism, who have impairment in social interaction, based on the records of the National Autism Society of Malaysia. The sample collection method followed the purposive sampling approach, which is a form of non-probability sampling that allowed us to choose a case, because it illustrates some features or processes, in which we are interested. The framework included three main three process which are Process one, process Two and Process Three. This's three processes of the framework was suitable with the area of research and could to accomplish objectives of this research in helping the autism children to interact and communicate effectively with their families, friends and the broad community. The framework included three main three process which are Process one, process Two and Process Three. This's three processes of the framework was suitable with the area of research and could to accomplish objectives of this research in helping the autism children to interact and communicate effectively with their families, friends and the broad community.

1.3.2 Software Development

1.3.2.1 Computer Game Approach Focusing on Social Communication Skills for Children with Autism Spectrum Disorder: An Initial Study

Abdul Manap A., Sarah R.D., Riaza M.R. & Sardan N.A.
International Conferences on Computer Graphics, Visualization, Computer Vision, and Game Technology (VisioGame 2013), Jakarta, Indonesia, 21 December 2013: 26-31

Abstract: Autism Spectrum Disorders (ASD) and autism are both general terms for a group of complex disorders of brain development. ASD is characterized by difficulties with communication, social deficits, stereotyped or repetitive behaviours and interests. One of the major reasons behind the push to use technology and multimedia to assist interaction with children diagnosed with ASD is that they have shown a preference for, as well as a fascination with, "visual stimuli" such as computer applications, games, and videos. Primordial purpose of this study is to synthesize a survey regarding social problems and situations faced by children with autism. A number of questionnaires for parents and teachers with a semi-structured interview for five doctors and eleven therapists were conducted to identify basic problems of children with Autism and psychological methods for each problem.

1.3.2.2 Computer Game Approach for Children with Autism Spectrum Disorder: A Pilot Study

Riaza M.R. & Sarah R.D.
Recent Advances in Computer Science: Proceedings of the 6th WSEAS World Congress: Applied Computing Conference (ACC '13) & Proceedings of the 12th WSEAS International Conference on Information Security and Privacy (ISP '13), Nanjing, China, 17-19 November 2013: 174-179

Abstract: Computer games are currently a significant topic in research for children with some forms of disability. Autism is one of the groups of serious development problems known as Autism Spectrum Disorder (ASD). It is a lifelong disability that prevents people from understanding what they see, hear and sense. Children with learning disability such as ASD who have serious impairments with social interaction, communication skills and in behaviour need a high degree of personalization in using computer games. In this paper we present a pilot study conducted on six ASD children of age ranging from 5 to 8. This game called *find me* is specially designed to teach children on improvement of social skills. Participant observation was conducted to understand their behaviour in game engagement and get feedback on their needs and learning goals, as a basis for further research on this topic.

1.3.2.3 Courseware Development Course 'I Like Learning" for Malay Language Learning Among Austisme Children

Sidek S.F., Fathil N.S., Mohamed Zain N.Z. & Kamaliah M.
Malay Language Education Journal 4(1), 2014: 1-10

Abstract: Children with autism usually have difficulty learning as it is quite hard to attract their attentions. In this research, educational software named 'I Like Learning' has been developed to help children with autism learn Malay Language. The research respondents were five primary school students in Kuala Lumpur who had been diagnosed with mild level of autism. For the monitoring purposes, the existing monitoring form with some modification according to the research needs, suggested by Megan Davis, Kerstin Dautenhahn, Chrystopher L. Nehaniv and Stuart D. Powell in their research entitled The Narrative Construction of Our (Social) World: Steps towards an Interactive Learning Environment for Children with Autism was used. The research findings were analysed using a Qualitative content analysis based on several research questions with some modification that was also suggested in their research. The result shows that the educational software that has been developed using ADDIE methodology is able to attract the children's attention in learning Malay Language subject.

1.3.2.4 Design and Implementation of Blocks-Based Educational Courseware for Children with Learning Disabilities

Ismail A., Omar N. & Mohd Zin A.

Abstract: Customized education is now being seriously considered for children with learning disability such as autism who have serious impairments with social, emotional and communication skills. One of the approaches for providing this type of education is by using highly personalized educational courseware. The aim of this study is to describe the design and implementation of blocks for developing educational courseware for autistic children with learning disabilities. The availability of these blocks enables end-users (such as parents or teachers) to build personalized educational courseware within the block-based software development environment. The process of designing and implementing programming blocks involves four main activities: blocks identification process, blocks design, blocks implementation and evaluation. In order to prepare the autistic child to learn to read, four blocks that are required in the pre-reading stage: apart from these three blocks, there are three types of blocks that need to be provided so that application programs can be properly developed. The suitability of the blocks have been shown by using simple case studies.

1.3.2.5 Developing Learning Software for Children with Learning Disabilities through Block-based Development Approach

Ismail A., Omar N. & Mohd Zin A.

Abstract: Children with learning disability such as autism who have serious impairments with social, emotional, and communication skills require a high degree of personalization in using the educational software develop for them. The aim of this paper is to propose Block-Based Software Development method and approach that enables the end-users (such as parents and teachers) to build application software to suit the different need of an autistic child. This research hopefully can produce useful tailorable learning software in order to assist educating autistic children.

1.3.2.6 Digital Visual Schedule and Training System for Centre of Autistic Children

Hitam S., Tan K.L., Sahbudin R.K.Z., Mokhtar M., Ahmad Anas S.B. & Sali A.

Abstract: Research indicated that there is no proven cure for autism sufferers. Usually, implementing the appropriate treatment and education can eventually help the autism person to be integrated into their community. However, the conventional visual schedule and training system that depending on physical tool and toy bringing the difficulty on changing or update the picture, text and current using tool. Therefore, Digital Visual Schedule and Training System (DVST System) is developed as a user-friendly, interactive and flexibility system for children with autism. The inconveniency of traditional training program that depending on physical tool or multiple application software is improved by DVST system that provides a complete set of features and functions for the therapist and autistic children to carry out the administration work (for therapist-Server) as well as training program (for autistic children-Client) in a single application.

1.3.2.7 Facilitating Autistic Children's Split Attention in Designing Computer Teaching Instructions

Shams Aliee Z., Jomhari N., Rezaei R. & Alias N.
Life Science Journal 10(3), 2013: 88-96

Abstract: One of the most important difficulties of autistic children in learning is not being able to focus attention on the relevant information. Considering autistic individuals have higher visual abilities in comparing with ordinary people, visual supports are used to enable learning. Intending to offer visual information displays, computers are used among individuals with autism. Previous researches indicated that autistic children could be supported effectively by providing a structured and controlled environment using computer based intervention. Preparing instructions for the autism spectrum requires customizing specific design issues to facilitate their split attention. Moving forward in this paper, it is concluded that in addition to the design issues to be considered for the autistic children, teaching instructions need to be incorporated. This paper aims to present the specified user interface design issues incorporated with the required teaching instructions for the autistic children to facilitate their split attention.

1.3.2.8 Impact of Video on Learning in Students with Autism in Malaysia: Future Prospects

Saiman K., Sinnatamby S., Mustafa L.M., Alias N. & Siraj S.
Procedia Social and Behavioral Sciences 103, 2013: 459-466

Abstract: Use of video in Malaysia is seen as having a bright future because technology development is expanding even more now. Thirty articles related to use of video on students with autism have been investigated. Only 12 articles have been selected as appropriate for use as references for this study. This article looks at the future prospects of impact of video on learning of students with autism in Malaysia. The focus of this study is the use of video by experts, identifying behavior of students with autism in their use of video and determining the limitations of video and ways to overcome them. This study uses the Fuzzy Delphi approach to achieve consensus of experts on the focus of study. The findings show that usage of video is extremely effective on students with autism besides shaping the behavior desired. Although video has its limitations, these can be overcome in various ways as suggested by the experts and researchers.

1.3.2.9 The Implementation of Interactive Multimedia Learning Autism (IMLA). Alpha, Beta and Pilot Testing Stages

Dolah J., Wan Yahaya W.A.J. & Chong T.S.
International Journal of Scientific & Engineering Research 3(8), 2012: 1-5

Abstract: The increasing numbers of Autism have been increased lately. Even though many research dedicated to autistic children around the world but the outcome was too limited and only made known to the doctor and the parents. None of this outcomes could be shared and distribute to society because the outcomes was too technical and limited. The information's related to Autism are too general and only focus on certain cases. The main issues arises are how this information's could be learn and shared amongst society? This study proposes one prototype to be implemented which is the implementation of Interactive Multimedia Learning Autism (IMLA). The development of IMLA was resulted from rigorous researches that have been made before such as through extensive literature reviews and Preliminary Investigation (PI). This study will highlight the elements and process used in the development such learning theories, theoretical framework, alpha, beta and pilot testing. The findings from the study will lead to the implementation of IMLA and will be tested with real target respondents. The findings show that the significance levels of knowledge, awareness and motivation of target respondents are increased significantly.

1.3.2.10 User Interface Design Issues for the Autistic Children

Shams Aliee Z., Jomhari N., Rezaei R. & Alias N.
Life Science Journal 10(3), 2013: 58-62

Abstract: One of the most important problems of the autistic children is split attention that avoids them from being able to focus attention on their learning. Because of having higher visual abilities in comparing with ordinary people, visual supports are required to be used for these individuals. With the intention of presenting visual information displays, computers are used among children with autism. On the other hand, many other researches proved that by providing a structured and controlled computer based environments, autistic children could be supported effectively. Thus, specific design issues should be customized for them to facilitate their split attention in learning. Accordingly, This paper aims at providing an application that considers the identified design issues based on Fakih method for the autistic children to manage their split attention.

1.3.3   Use of ICT tools

1.3.3.1   Autism and the Need for Special User Interface Design for Web Surfacing

Ravana S.D., Gurusamy N. & Varathan K.D.
Education Practice and Innovation 1(2), 2014: 93-105

Abstract: In view of distinctive information needs and skills among users, we ought to evaluate if existing information retrieval systems are competent to cater for these users. The present study highlights the feasibility of search engine for children with special needs, specifically children with Autism Spectrum Disorder (ASD). The objective of this study is to investigate the utilization of a search engine for the purpose of learning and entertainment of children with ASD. The shortcomings of the existing commercial search engines in terms of accommodating the needs of these children will be discussed. Finally, based on the survey analysis from the mediators, important criteria of a search engine user interface design for children with ASD were proposed.

1.3.3.2   Children with High Functioning Autism Acceptance in Using Tablet

Syarifah Diyanah Y. & Salam S.
The International Journal of Soft Computing and Software Engineering [JSCSE], Vol. 3, No. 3, Special Issue: The Proceeding of International Conference on Soft Computing and Software Engineering 2013 [SCSE'13], San Francisco, CA, U.S.A., 1-2 March 2013: 826-828

Abstract: This paper presents the preliminary study of the tablet acceptance among children with high functioning autism. Children who were diagnosed with high functioning autism have an IQ score of 80 or above. Generally, their autism characteristics are not obvious and often they are mistakenly underserved as having a low profile characteristic. The discussion is generally based on observation of three sample high functioning autism children, feedback from distributed questionnaire to all of 20 caregivers at National Autism Society of Malaysia (main center at Titiwangsa, Kuala Lumpur) and interview with autism specialist from the same organization. This preliminary study will help to see on the tablets potential of becoming a new assistive technology device as a pacing technology for autism children.

1.3.3.3 Using a Multi-Media Presentation to Analyze Thinking Patterns of Children with Autism

See C.M. & Tang K.N.
International Journal of Interdisciplinary Social Sciences 4(1), 2009: 369-384

Abstract: Temple Grandin has suggested that rigidity in both behavior and thinking is a major characteristic of people with autism (Autism Today, 2002). "Rigid in thinking" in such children means taking information literally, focusing on details at the expense of the total concept, and having difficulties dealing with the multiple perspectives of abstract thinking. Other literature supports this view that people with autism are rigid in their thinking and have no theory of mind. Teachers, parents, or caregivers face difficulty in communicating with these children because it can be really hard to understand what they want, especially with those children that have little or no verbal communication. Therefore, it would be useful to understand an autistic child's thinking so that his teachers, parents and caregivers can intervene and re-direct the thinking in the management of his behavior. Research has been conducted to address this issue at an autistic centre by using an audio-visual slide presentation which is divided up into the five themes, (a) color, (b) light, (c) visual, (d) perception, (e) cartoon, and (f) character. The audio-visual slide presentation was shown to 24 children with autism aged between 5-10 years old. Each child attended a 45 minutes session thrice weekly over six months. After the children had experienced the audio-visual presentation, they were asked to describe or draw what they had seen. Their drawings or descriptions were analyzed for their thinking pattern and conclusions have been drawn which form the basis for some behavioral therapies to direct attention to the present and to what they see.

1.4   Medical

1.4.1   Clinical Care & Therapy

1.4.1.1   Assessing the Development of Children with Disability in Malaysia

Tan K.L. & Yadav H.
Med J Malaysia 63(3), 2008: 199-202

Abstract: This is a cross-sectional study investigating the profile of children with disability registered with the primary health care clinics in Malaysia. The purpose of the study was to assess the developmental stage of children with disability. Secondary data from the pilot project conducted by the Family Health Development Division, Ministry of Health Malaysia was used in this study. The study period was for six months from 1st August 2004 until 31st January 2005. A total of 900 disabled children were selected in this study. Schedule of Growing Scale (SGS) II was used for analysis. Results showed more boys than girls were affected with a ratio of 6:4. The mean total SGS score increases as the age of the child increased. The score was highest in delayed speech cases and lowest in cerebral palsy cases. The performance among children with delayed speech was the highest while children with cerebral palsy were the lowest. There was a statistically significant difference between the major ethnic groups in delayed speech and attention deficit hyperactive disorder.

1.4.1.2   Reassessment on the Development of Children with Disability in Malaysia

Tan K.L. & Yadav H.
Med J Malaysia 63(1), 2008: 17-20

Abstract: This is a cohort study investigating the profile of children with disability registered with the primary health care clinics in Malaysia. The purpose of the study was to determine whether reassessment on the development of children with disability under rehabilitation should be done at three months interval or six months interval. Secondary data from the pilot project conducted by the

Family Health Development Division, Ministry of Health Malaysia was used in this study. The study was carried out for seven months from 1st August 2004 until 28th February 2005. A total of 168 disabled children followed up for six months were selected in this study. Schedule of Growing Scale (SGS) II was the tool used for analysis. Results showed a statistically significant difference in the mean total SGS score at six months interval but not at three months interval. The result suggests that reassessment on children with Down Syndrome, Autism, Cerebral Palsy, mental retardation and delayed speech under rehabilitation should be carried out every six months while children with gross developmental delay and slow learner might need a longer interval for reassessment.

1.4.1.3 A Comparison of Malaysian and Australian Speech-Language Pathologists' Practices with Children with Developmental Disabilities Who are Pre-Symbolic

Singh S.J., Lacono T. & Gray K.M.
International Journal of Speech-Language Pathology 13(5), 2011: 389-398

Abstract: The aim of this study was to explore the assessment, intervention, and family-centred practices of Malaysian and Australian speech-language pathologists (SLPs) when working with children with developmental disabilities who are pre-symbolic. A questionnaire was developed for the study, which was completed by 65 SLPs from Malaysia and 157 SLPs from Australia. Data reduction techniques were used prior to comparison of responses across questionnaire items. Results indicated that SLPs relied mostly on informal assessments. Malaysian and Australian SLPs differed significantly in terms of obtaining information from outside the clinic to inform assessment. When providing intervention, SLPs focused mostly on improving children's pre-verbal skills. A third of Australian SLPs listed the introduction of some form of symbolic communication as an early intervention goal, compared to only a small percentage of Malaysian SLPs. Regarding family involvement, SLPs most often involved mothers, with fathers and siblings being involved to a lesser extent. Overall, it appeared that practices of Malaysian SLPs had been influenced by developments in research, although there were some areas of service delivery that continued to rely on traditional models. Factors leading to similarities and differences in practice of SLPs from both countries as well as clinical and research implications of the study are discussed.

1.4.1.4 Sensory Integration Therapy in Malaysia and Singapore: Sources of Information and Reasons for Use in Early Intervention

Leong H.M., Carter M. & Stephenson J.
Education and Training in Autism and Developmental Disabilities 48(3), 2013: 421-435

Abstract: Sensory integration (SI) therapy is a popular form of intervention for children with disabilities, particularly those with autism spectrum disorders, even though research evidence demonstrating beneficial outcomes from the use of SI therapy is limited. A questionnaire was distributed to early intervention education service providers in Malaysia and Singapore to explore the reasons why they choose to use SI therapy, their sources of information and training in its use, and the ways in which it was employed. Occupational therapists were consistently reported as a major source of information and training in SI therapy, and their advice was a primary reason for using SI therapy. SI therapy was provided to students based on a wide range of criteria, of which challenging behaviors related to sensory stimuli were the most consistently reported. About half of the participants appeared to believe that there was sufficient evidence on the efficacy of SI therapy from research, even though they seemed to lack direct access to sources such as university courses and academic journals. Based on these findings, it was recommended that efforts be taken to disseminate research information to service providers in order to promote evidence-based practice.

1.4.1.5 The Use of Sensory Integration Therapy by Intervention Service Providers in Malaysia

Han M.L., Stephenson J. & Carter M.

Abstract: Sensory integration (SI) therapy is a controversial intervention used in intervention for children with disabilities that is popular in the United States. Little is known about the use of SI therapy for children with disabilities in educational centres in developing nations such as Malaysia. Supervisors and teachers from seven educational intervention centres in city-centre areas in Malaysia were interviewed on their use of SI therapy. Occupational therapists were found to have a major influence on the decision to use SI therapy by the interviewees. It was also found that SI therapy was implemented in a limited manner in these centres and that one of the primary factors that motivated teachers to use SI therapy was the perception that students' behaviours were associated with sensory stimulation. Implications for evidence-based decision-making in developing countries are discussed.

1.4.2 Prevalence and Risk Factors

1.4.2.1 Auditory Stimulus for Children with High Functioning Autism: Towards Reducing Developmental Disorders and Inattentive Attitudes

Ong J.H.L., Dani N.A. & Johari A.Z.

Abstract: Preliminary findings in several works have described that children with high functioning autism frequently show hypersensitivity to auditory stimulus. We seek the answer by using auditory stimulus interventions in our time series research. Interventions were assigned alternately to weekly 30 minutes learning session each for musical auditory stimulus followed by musical songs auditory stimulus for 8 weeks without washout period. The aim is to detect trends such as reductions in developmental disorders and inattentive attitudes among participants. Targeted variables for developmental disorders are responsiveness in language, social, cognitive, and emotion. Cognitive and emotion responsiveness are included as a new variables which has not been reviewed by any of the authors referred to. The participants are 5 boys (mean age 12.2 years) with a primary diagnosis of HFA and students of special education programme for children with autism conducted by The National Autism Society of Malaysia (NASOM). The result shows that musical songs auditory stimulus is more beneficial to children with high functioning autism in reducing their developmental disorders with the highest responsiveness both in language and cognitive variables. The same stimulus is also regarded as the more valid intervention in measuring the participants' attentive attitudes by showing a 43 percent reduction with a ratio of 1 in musical auditory stimulus equal to 2 in musical song auditory stimulus. Nevertheless, both interventions cannot reduce the autistic aloneness, a deficit in the social skill of children with high functioning autism. A possible beneficial future study on the effect of musical songs auditory stimulus in children with Rett syndrome is strongly suggested.

1.4.2.2 Children with Learning Disabilities in the Paediatric Clinic, Hospital Tuanku Ja'afar Seremban: An Overview

Aina Mariana A.M. & Wong S.L.

Abstract: The aim of the study was to document the prevalence of learning disability among the children attending the Paediatric Clinic in Hospital Tuanku Ja'afar Seremban. The demographic distribution of these patients; the age of detection of the problem; the associated medical conditions and types of intervention received by these patients were documented. Patients who were between the ages of five to twelve years were included in the study. Learning disability was divided into three

categories: speech and articulation problems, academic skills disorder and other categories which included developmental delay. Children with cerebral palsy were excluded from the study. Out of 1320 patients screened, 355 were found to have learning disorders. Majority were Malays, with the male to female ratio of 1.9:1. Most of the patients stayed in Seremban. The learning problem was most commonly detected at the age of 4 years and below. The commonest type of learning disorder was developmental delay, followed by academic skills disorder, speech and academic skills problems and speech disorders. Problems that were detected early were speech problems and developmental delay. Majority of the children had associated medical conditions. Most of the patients received some form of intervention but 11.3% did not attend any intervention program at all. A strategy should be formulated and implemented to help this group of children.

1.4.2.3 Clinical Diagnosis and Non-Verbal Ability of Primary-One School Children with LD

Toh T.H., Wong S.C. & Abdullah M.R.
International Journal of Public Health Research Special Issue, 2011: 33-40

Abstract: *Introduction:* More school children were referred for learning difficulty (LD), especially after the introduction of LINUS sccreening programme by Ministry of Education Malaysia. Aims: To study the clinical diagnosis and non-verbal ability of primary-one school children with LD after paediatric assessment, as well as associated behavioural issues and socio-economincal background. Methods: Assessment findings by Paediatricians and Naglieri Non-Verbal Ability Test® (NNAT®) results of all primary-one school children referred in year 2010 with LD were studied retrospectively. *Results:* Ninety-three children were included (62.4% male), and 72.0% of them failed the LINUS screening programme. The commonest diagnoses were Borderline Intellectual Disability (ID, 37.6%) and Mild ID (19.4%). Other diagnoses included Attention Deficit Hyperactive Disorder (ADHD, 11.8%), Specific Learning Disability (SLD, 10.8%), Autistic Spectrum Disorder (n = 5) and Severe Language Disorder (n = 3). Mean NNAT scores were 84.5 ± 11.8 (n = 85), of which 9.4% children scored less than 70 (<2nd percentile), while 63.7% scored between 71 and 90 (3rd-24th percentile). Twenty-three children (27.1%) scored 90 - 110 (25th-75th percentile) and 111-119 (76th-90th percentile). More than two-thirds of the parents never attended school, or only received education up to Form 3. Nearly 80% of mothers were housewife and 78.7% of fathers were labour or semi-skilled workers. A significant numbers of children with ADHD, Borderline ID, Mild ID and Severe Language Disorder/ SLD had significant or borderline internalizing and/or externalizing behaviours. *Conclusions:* Majority of primary-one school children referred for LD do not have intellectual disability. Their clinical diagnosis and non-verbal ability were very variable. A significant number of them have poor socio-economical background and associated behavioural problems. A more realistic education system and targeted program should be offered.

1.4.2.4 Perinatal, Maternal and Antenatal Associated Factors for Autism: A Case Control Study

Abdullah M.N., Wan Mohamad W.M.Z., Abdullah M.R., Yaacob M.J. & Baharuddin M.S.
2012 IEEE EMBS International Conference on Biomedical Engineering and Sciences, Langkawi, Malaysia, 1719 December 2012: 144-148

Abstract: Autism disorders are a group of neurodevelopmental disorders which characterized into three main domains which are social interaction impairment, communication delay and repetitive or stereotypic behavior. Many studies had suggested that the risk factors for autism derive from three big factors namely environmental factors, genetic predisposition and vaccine induced. The aim of this study was to investigate the perinatal, maternal and antenatal associated factors on autistic disorder children at Hospital Pulau Pinang and Hospital Bukit Mertajam, Pulau Pinang. A case control study involving 312 cases and control was conducted using data retrieved from hospital records at Pulau Pinang hospital and Bukit Mertajam hospital from 2001 to 2008. The departments involved were Psychiatric, Obstetrics and Gynecology and Record and Management Department. All cases which met

the inclusion and exclusion criteria were included in the study. Univariable and multivariable logistic regression were used to explore the perinatal, maternal and antenatal associated factors associated with autistic disorder children. There were seven associated factors contributed most to autistic disorder determination. The factors were maternal age [Adjusted Odds Ratio (OR): 1.41; 95% Confidence Interval (CI): (1.27, 1.57)], maternal smoking reported at first antenatal visit [Adjusted OR: 13.61; 95% CI: (1.87, 99.35)], birth asphyxia [Adjusted OR: 0.35; 95% CI: (0.11, 1.08)], psychiatric history [Adjusted OR: 54.94; 95% CI: (12.07, 250.04)], multiple gestation [Adjusted OR: 4.81; 95% CI: (1.86, 12.45)], parity for more than 4 [Adjusted OR: 0.11; 95% CI: (0.03, 0.47)], parity between 0 and 1 [Adjusted OR: 0.19; 95% CI: (0.07,0.55)], Chinese race compared to the Malay race [Adjusted OR: 10.11; 95% CI: (3.61, 28.30)] and Indian race compared to the Malay race [Adjusted OR: 5.14; 95% CI: (1.38, 19.16)]. The results suggested that autistic disorders were associated with perinatal, maternal and antenatal factors such as delivery, pregnancy and maternal characteristics.

1.4.3   Interventions

1.4.3.1   Brain Training to Improve Sociability and Behavior of Autism Spectrum Disorder (ASD) Children and Young Adults

Norsiah F. & Mohd Mahayuddin N.A.
Procedia Social and Behavioral Sciences 143, 2014: 308-314

Abstract: This article details on the use of brain training device, Neuro feedback Training (NFT) device to improve the sociability and behaviour of ASD children and young adults. A quasi-experimental study using pre-test and post-test within subject design was used. The research involved thirty-four participants, purposively selected from Kuching Autistic Association (KAA). The Autism Treatment Evaluation Checklist (ATEC) was used to measure the effectiveness of NFT on ASD children and young adults in KAA. The observation emphasized on sociability and behavioral changes among the participants. The findings showed an overall improvement in total ATEC score. Sociability and behaviors are among ASD children and young adults. There is a difference between ATEC post-test score in behavior with the age of participants.

1.4.3.2   Communication Responses of an Indian Student with Autism to Music Education

Chiang E.F. & Ching S.L.
Procedia Social and Behavioral Sciences 65, 2012: 808-814

Abstract: The purpose of this study is to investigate the communication responses of a male subject with autism towards music intervention. Interview and observation results revealed that the subject had typical autistic communication impairments before the music education sessions. A single-case-single-site qualitative action research design was used to inquire into the verbal and non-verbal interactions, singing as well as the reading skills of the subject. Research findings through observations, video recording and interview with the class teacher revealed that the subject had obvious improvement in his verbal and non-verbal interactions as well as his reading and singing skills after intervention. Finally, recommendations for conducting music interventions were given.

1.4.3.3 Digital Pictures to Enhance Storytelling amongst Special Needs Children

Abd Rahim N., Sujud A., Yacob Y. & Zainon Hamzah Z.A.

Abstract: English has a difficult role to play since it is the second language for most Malaysian and in the Malaysian Education system for the special needs as there is no special syllabus for the autistic children. Children with autism are expected to learn the same thing with the rest of the children in the normal school. Autistic children have difficulty to concentrate and therefore the same learning syllabus with the normal children will make them difficult in acquiring the language in a short time. Even though, the normal children will have the difficulty of learning the language but they have a lot of time to learn at home or with their friends around them. In other way, the autistic children will have to learn more than the normal children. Autism is a complex developmental disorder that appears in the first 3 years of life, though it is sometimes diagnosed much later. It affects the brain's normal development of social and communication skills. Autism is a spectrum that encompasses a wide continuum of behavior (Bailey, D. B., Jr., D. D. Hatton, et al., 2001). Core features include impaired social interactions, impaired verbal and nonverbal communication and restricted and repetitive patterns of behavior. This paper focuses on Asperger syndrome which is also considered as autistic spectrum. This paper investigates Asperger children's motivation level when using digital pictures in creating a short story in the task based English language classroom and investigate the language use in the short story created by asperger children when using digital camera in the task based English language classroom. It is hoped that digital pictures able to enhance storytelling amongst the special needs children.

1.4.3.4 Disability Learning Tool: Brushing-Teeth Using Music for Autism

Othman A. & Kamarudin F.N.

Abstract: This research is an attempt of combining music with the 3D animation technique in order to develop a disability-learning tool which can be used as one of occupational therapy for autism children. Autism is a developmental disability of the brain, much like dyslexia, mental retardation, or attention deficit disorder that often makes it hard to communicate with and relate to others. The treatment that we are going to apply in our research is related to the occupational therapies which involved music, multisensory stimulant and computer usage. Occupational therapy assists autistic people in developing the skills for daily job such as brushing teeth. Music can stimulate brain and help individuals with a wide range of cognitive and emotional challenges to improve their ability to function. Music primarily can help autism children improve their observable level of functioning and selfreported quality of life in various domains such as cognitive functioning, motor skills, emotional and effective development, behavior and social skills. The problem that we are trying to overcome by doing this project is the independence among autism children. At the autism centre where we did our research, they are manually taught by parent or teachers and they have to teach the same thing every day. For example, the teachers have to show them every day on how to brush teeth using the teeth set and the big tooth brush. They seem cannot remember all the steps. In this research, by collaborating these elements, we try to develop a 3D animation disability-learning tool to help in stimulating independence in autism children. Music is included in the animation as part of the treatment. The objectives of this projects are first to investigate and analyze the acceptance of different types of music among autism children. Our second objective is to develop a 3D animation that show steps in brushing teeth according to the beat of the selected music. The third objective is to analyze the effectiveness of the application in stimulating remembrance brushing technique skills. 3D animation is a technique that can visualize characters or movement as same as in the real life. The current technology of 3D animation exist today is amazing. This application which is called Disability Learning Tool: Brushing-Teeth Using Music for Autism has been tested to a group of autism children with mild cases and has shown positive result. It can be seen that the independence in the autism children gradually increased. However, there's a lot more to do for further improvement and we are going to look into each of these weaknesses in detail.

1.4.3.5 Interactive Stroller for Increasing Focus Time and Participation in Learning Al Quran for Autistic Children

Bilikis B. & Jomhari N.
Advanced Engineering Forum 10, 2013: 63-68

Abstract: Autistic children with hyperactive behavior are usually denied when it comes to teaching of Al Quran or academic skills due to their inability to focus and participate in learning. They exhibit minimal time of attention while learning as they enjoy running around and engaging in other activities that stimulates them. This study was carried out in order to identify an environment that accommodates learning and hyperactive behavior of autistic children. The learning of Al Quran was taught in two different environments. The first environment was the school center where the students sits on the floor and the second environment was in a moving stroller. A moving car was also used as an alternative. The result of this study indicated that the level of participation in a stroller and car increased and it was more effective for gaining the child's participation compared to the sitting in the class.

1.4.3.6 Leaving No Child Behind: Investigation on Gross Motor Skill among Autistic Children

Norkamariah M., Tarveen K., Zainal Abidin Z., Asha Hasnimy M.H. & Halijah I.
International Sport Science Conference, Putrajaya, Malaysia, 19-20 December 2006

Abstract: Autism is defined as a developmental disability that affects the ability of a person to communicate, understand language, play, and interact with others (Dunlap & Bunton-Pierce, 1999). Children who suffer from autism usually show uneven gross and fine motor skills and lack of cooperativeness in group play. Opportunities should be given among autistic children to interact successfully with peers. An investigation was conducted to investigate the performance of gross motor skill among autistic children. Seven autistic children performed 20 items of Texas Revision of Fait's Basic Motor Skills: Basic Movement Performance Profile (Faith, 1978). Results indicated that the autistic children scored lower than their normal peers. The mean score of gross motor activities indicated that autistic boys perform better than autistic girls. The autistic children showed difficulties in performing nonlocomotors movements as compared to locomotors movements. Suitable physical activity program should be developed to widen the opportunity and increase physical ability of autistic children to interact and play with their peers.

1.4.3.7 Music Education for Children with Autism in Malaysia

Chiang E.F. & Mohd Jelas Z.
Procedia Social and Behavioral Sciences 9, 2010: 70-75

Abstract: The purpose of this study is to enhance our understanding of the effects of teaching group music to 5 children with autism. An action research methodology was adopted using the action cycles of plan-act-observe-reflect design. A cross-case analysis showed that group music teaching was generally effective in improving verbal and non verbal communication, and the demonstration of both positive motor skill development as well as negative motor reactions among the subjects. Although the outcome for social behaviours was minimal, three of the subjects showed reciprocal social spirit and outward expressive behaviour in the musical games.

1.4.3.8 Portrait Drawings Therapy: Windows of Hope for Children with Autism Spectrum Disorder

Yap B.C., Salleh A. & Jusoff K.

Abstract: The paper reports a case study on the ability of a group of children with autistic spectrum disorders (ASD) in recognising face using potrait drawing technique. Sample comprised of four ASDs children and four non-ASDS children and eight teachers. Eight individual drawing sessions were conducted with the children sample. Data were collected using observations, interviews and Portrait Drawing Assessment (PDA) Instrument. Results showed that the two groups of children had different profile. The analysis was also able to identify the drawing developmental stage of each participant. The results imply that drawing technique has a potential to draw autistics children attention and teacing them to recognise faces. This paper concludes that potrait drawing session has a great potential to be an intervention for ASDs children developing communication. As the present study was the first for children with ASD in Malaysia therefore more evidences are required to confirm the finding.

1.4.3.9 Program Intervensi Kemahiran Membaling Bolaterhadap Pelajar Autisme Sekolah Menengah: Satu Kajian Kes

Tan T.B. & Loh S.C.

Abstract: The purposes of this research were to examine the effectiveness of an intervention program on ball throwing skill and to explore autistic students' ability in throwing the ball right at the target. Three autistic male students aged between 14 and 18 years old were chosen as subjects of the study. They were undergoing the Special Education Integrated Program in two secondary schools in Kuala Lumpur. The intervention program designed in this study was conducted within five weeks, with three sessions per week, and sixty minutes per session. The training in this intervention program was systematically planned in accordance with the principles of training. The training sessions started with warming up, followed by drilled practice and cooling down. At the end of the drilled practice, each subject was given five trials in skill testing. An Individualized Educational Plan (IEP) for each subject was drawn based on the subject's achievement in previous skills. Hence, the level of activities planned for each subject in drilled practice differed from one another. Data were recorded based on the observations on the behavior and targeted distance of ball throwing in skill-based tests. The results showed that the intervention program was effective in enhancing the ability of three autistic students in ball throwing. Subjects A, B, and C each demonstrated the ability to throw the ball right at the target with distances of 32 feet, 12 feet and 2 feet respectively.

1.4.3.10 The Use of Music and Movement Therapy to Modify Behaviour of Children with Autism

See C.M.

Abstract: Children with autism are often associated with behavioural problems such as being restless and fidgety; exhibiting tendencies to touch and hit people; being noisy (shouting or screaming); temper tantrums, being inattentive; non-compliance; spaced out; and body stiff. These behavioural patterns might be extreme and highly apparent or more subtle. Hence, music and movement therapy was developed to help improve the behaviours of children with autism. There were a total of 41 children who participated in the research, and they were divided into two groups and two sessions. Group 1 comprised of 18 children (5 girls and 13 boys). The age of the children in Group 1 ranged from 2 to 10 years old. Meanwhile, Group 2 comprised of 23 children (2 girls and 21 boys). The age

of the participants in Group 2 ranged from 11 to 22 years old. The music therapy was carried out weekly and two sets of music therapy were used alternately for 10 months. The duration for each session was an hour. A Target Behaviour Checklist was also developed for the study purpose. The parents, music teachers and research assistant evaluated the child's behaviour on an average of once a month for 10 months. One-way ANOVA and T-test were used to examine whether there was a significant change or improvement in the target behaviours among the two groups of children. The findings demonstrated that music and movement therapy has positive effects on the behaviours of these children, especially in helping children with autism to improve in restlessness, fidgety, temper tantrum and inattentive behaviours.

1.4.3.11 Use of Music and Movement Therapy to help persons with Autism

See C.M.

Abstract: Individual with autism usually appear physically normal but display motor and coordination deficit. Therefore, they need fine motor, gross motor and motor coordination skills training. A structured Music and Movement Therapy for individual with autism was developed and for the purpose of this study, the focus is to review the effect of the Music and Movement Therapy on motor and coordination skills of persons with autism. A total of 41 children and adolescents participated in the study and were divided into two groups. Group 1 comprised of 18 children (5 girls and 13 boys). The age of these children ranged from 2 to 10 years old. Meanwhile, Group 2 comprised of 23 adolescents (2 girls and 21 boys). The age of these adolescents ranged from 11 to 22 years old. A session of the Music and Movement Therapy was carried out weekly and two sets of Music and Movement Therapy module were used alternately for 10 months. Each Music and Movement Therapy session is for 45 minutes. A Motor and Coordination Performance Checklist was developed to enable the parents, facilitators and research assistant to evaluate the participants' skills averagely once a month for 10 months. T-test and descriptive analyses were conducted to examine any significant improvement and changes of the motor and coordination skills among the two groups. In this study, the children and adolescents with autism showed improvement in their motor and coordination skills after participating through the Music and Movement Therapy in this study.

1.5   Psychology

1.5.1   Psychological Wellbeing of Parents

1.5.1.1   Stress and Psychological Wellbeing among Parents of Children with Autism Spectrum Disorder

Nikmat A.W., Ahmad M., Ng L.O. & Razali S.

Abstract: *Objective:* To investigate the prevalence of parental stress and psychological wellbeing among parents with autistic children and their associations with dimensions of support system. Methods: This is a preliminary cross sectional study which randomly selected parents with clinically diagnosed autistic children. Those parents who attended psycho-education session on management of autistic children at Health Psychology Unit were randomly selected to enroll in the study. Psychological wellbeing, parental stress and dimensions of support system were assessed by using the General Health Questionnaire (GHQ-28), the Parenting Stress Index (PSI) and the Provision Social Relation (PSR), respectively. Results: Of 52 parents with autistic children (34 female and 18 male), about 90.4% of parents had significant parenting stress, and 53.8% of parents showed clinical disturbance in psychological wellbeing. Gender (t=1.67, p=0.02) and occupation (F=4.78, p=0.01) showed statistically significant association with psychological wellbeing. No association found between other socio-demographic factors, parental stress and psychological wellbeing with dimensions of support system among parents with autistic children. *Conclusion:* Parents with autistic children have

high prevalence of stress and psychological disturbances. Interactions of various factors need to be acknowledged and considered in order to reduce the burden of parents with autistic children.

1.5.1.2 Level of Hopelessness among Parents with Autistic Children

Vetrayan J., Daud A. & Smily Jesu P.V.P.
Indian Journal of Health and Wellbeing 4(4), 2013: 875-878

Abstract: This study aimed to investigate the level of hopelessness among parents with autistic children. The study also to identify whether the age of the child and the level of education affect their level of hopelessness. The participants of this study consist of 33 parents with autistic children with their age ranging from 31 to 60 years old (with mean age 39 years and 5 months). The children were reported to be moderately autistic while 23 of them were severely autistic. Beck Hopelessness Scale is used to assess the level of hopelessness of parents with autistic children. The mean value of the level of hopelessness among parents with autistic children was 4.55 which mean that parent of autistic children were mildly affected by feeling of hopelessness. There is a large negative correlation between level of hopelessness among parents with autistic children (r=0.616, p=0.001, p<0.05). But there no correlation between age of the child and level of hopelessness (r=0.078, p=0.666, p<0.05). Most of the parents with autistic children were mildly affected by feeling of hopelessness.

1.5.1.3 Comparative Study on Attitudes and Psychological Problems of Mothers towards Their Children with Developmental Disability

Shobana M. & Saravanan C.
East Asian Arch Psychiatry 24, 2014: 16-22

Abstract: *Objective:* Parents' positive attitudes and psychological wellbeing play an important role in the development of the children with developmental disability. This study aimed to measure the prevalence of psychological problems among mothers of children with autism disorder, intellectual disability, and Down syndrome. The second aim was to assess the differences in mothers' attitudes and psychological problems among their children with intellectual disability, autism disorder, and Down syndrome. The third aim was to identify whether negative attitude was a predictor of psychological problems in these mothers. *Methods:* In this study, 112 mothers of children having mild and moderate levels of autism disorder, Down syndrome, and intellectual disability were assessed using the Parental Attitude Scale and General Health Questionnaire–28. *Results:* Overall, mothers of children with intellectual disability were found to have the most negative attitude towards their child. Mothers of children with autism disorder exhibited higher scores on somatic symptoms, anxiety, and social dysfunction when compared with their counterparts with Down syndrome and intellectual disability. Negative attitude was a significant predictor of psychological problems. Conclusion: Parental attitudes and psychological problems would vary among mothers of children with different types of developmental disability.

1.5.1.4 Depression Risks in Mothers of Children with Developmental Disabilities: A Cross-Cultural Comparison of Brazil, Colombia, Malaysia and Thailand

Osada H., de Amorim A.C., Velosa A., Wong P.W., Lotrakul P. & Hara H.
International Journal of Social Psychiatry 59(4), 2012: 398-400

Abstract: *Background:* Compared with US or European countries, there are fewer mental health services for mothers of children with developmental disabilities in Latin American and/or Southeast Asian countries. *Aims:* To explore the risk of depression in mothers of children with developmental disabilities in countries with a lack of mental health professionals, we conducted cross-cultural comparisons for four countries: Brazil, Colombia, Malaysia and Thailand. *Methods:* Using the CES-D,

we compared the participants' depressive symptoms, by which we also estimated the prob-ability of morbid depression. *Results:* In every country, participants tended to show depressive symptoms. In the CES-D total scores and the numbers of mothers who were observed to have a high level of depressive symptoms, there were significant differences among countries (F = 4.36, p = .006; $x2$ = 10.3, p = .015). *Conclusions:* Considering cultural models, we could apply evidence-based intervention to depressive mothers of chil-dren, and conduct intervention and treatment for those mothers and evaluate ways of providing better mental health services to these individuals.

1.5.2 Perceived support, coping strategies & quality of life of parents with children with ASD

1.5.2.1 A Survey on Quality of Life and Situational Motivation among Parents of Children with Autism Spectrum Disorder in Malaysia

Poh C. S. & Siew H.T.

Abstract: This study aimed to examine the relationship between quality of life (QoL) and situational motivation (SIMS) adopted by parents of children with autism spectrum disorder (ASD). Participants were 47 parents who had at least one son or daughter with ASD, and were recruited from 3 NGOs in Malaysia. Approval from person in charge of the 3 NGOs and informed consent from participants were obtained before conducting the study. Purposive sampling was used to select participants, and questionnaire survey method was used to collect data. In the questionnaire participants needed to fill in their demographic information and 2 scales - the WHOQOL-BREF and the SIMS. The results found that more parents with high intrinsic motivation to participate in the program have better social relationships than those with low intrinsic motivation, and more parents with high identified regulation to participate in the program have better physical health than those with low identified regulation. No such association was found in those parents who participated in the programs due to the external regulation and motivation. This finding can provide a better understanding of how motivation relates to QoL among parents of children with ASD. Programmers at NGOs may consider applying the findings into their programs and policies to improve the QoL of parents of children with ASD.

1.5.2.2 An Initial Look at the Quality of Life of Malaysian Families That Include Children with Disabilities

Clark M., Brown R. & Karrapaya R.

Abstract: *Background* While there is a growing body of literature in the quality of life of families that include children with disabilities, the majority of research has been conducted in western countries. The present study provides an initial exploration of the quality of life of Malaysian families that include children with developmental/ intellectual disabilities. Dynamics characterising Malaysian society are described as developments in social policy and service delivery that support persons with disabilities and their families. *Method* Questionnaire data were collected using the Family Quality of Life Survey – Short Version. Members of 52 families that included one or two children with disabilities were interviewed. Their responses provided their perceptions within six dimensions of family quality of life across the nine life domains assessed. *Results* Findings showed a consistent pattern of relatively strong perceived 'importance' ratings in each of life domains as compared to mean ratings for other family quality of life dimensions. Some dimensions of family quality of life, in particular 'opportunities', 'initiative' and 'attainment', demonstrated particularly strong associations with each other. Overall means of satisfaction with and attainment of family quality of life as well as global evaluations of quality of life and satisfaction all demonstrated significant associations, although each of these correlations accounted for less than 50% of the common variance. *Conclusions* The importance rating can be viewed as a determining factor in terms of quality of life, and it played a critical role in supporting attainment of, and satisfaction with, family quality of life, assuming opportunities, initiative

and stability are adequate. The need for a broader sample including families that were not receiving services was noted. Future research questions based on the results of the current study and some of the dynamics impacting Malaysian society are also suggested.

1.5.2.3   Support for Parents of Children with Disabilities in Malaysia

Hasnah T., Yunus V., Mohd Hanafi M.Y. & Wan Md Zain W.N.
The Social Sciences 8(2), 2013: 213-219

Abstract: Parents of children with disabilities need information and practical support in order to reinforce their confidence and ability to cope with the stress of parenting their children. The objective of this study is to gain an understanding on the availability and types of support perceived by parents of children with disabilities in Malaysia. About 20 parents of children with various disabilities were interviewed. The interviews were transcribed and analyzed for themes. Findings suggested that there is a lack of comprehensive information and support for parents of children with disabilities in Malaysia. Instead, support for parents come from informal sources, such as family, friends and other parents. Formal support from government agencies, non-governmental organizations and the private sector should be improved in order to empower parents to provide better care for their children. Suggestions on how to improve these services include getting parents input and carrying out evaluations of current services.

1.5.2.4   Parents' Recognition of Autistic Behaviour and Their Coping Strategies: A Case Study at Sarawak Autistic Association

Ting S.H. & Chuah H.K.
International Journal of Social Policy and Society 7, 2010: 52-65

Abstract: The paper reports the parents' recognition of autistic behaviour of their children and the coping strategies they used to handle their children's behaviour. The case study involved 12 parents with children registered at the Sarawak Autistic Association, Kuching. Semi-structured interviews revealed that more parents reported differences in social interaction patterns and physical behaviours than speech impairment when compared to children with normal development. The behavioural indicators of autism highlighted by the parents were stereotypic behaviour, sleep problems, hyperactivity and hypersensitivity to specific sounds. The autistic children also showed difficulty mixing with peers, liking to be hugged and lack of eye contact. However, it was the loss of speech ability and absence of speech development which alerted them to the possibility of autism. The study revealed that the parents handled their distress and anxiety mainly through religious means and family support. The findings suggest the need for support and services for autistic children in Sarawak.

1.5.3   Public Awareness

1.5.3.1   Narrative from the Care Givers of Autism Spectrum Disorder Children in Malaysia

Jin K.K. & Chin C.G.
International Proceedings of Economics Development and Research 48(40), 2012: 193-197

Abstract: The paper adopts the lens of moral philosophy to take on a relational approach. Data was collected using qualitative methods of observation and interviews. The narratives drawn from the care givers of autism spectrum disorder children will be presented. The findings show a lack of awareness and understanding of children with autism spectrum disorder among the general public in Malaysia. The themes emerging from the narrative further support Eva Kittay's views on aspects of interdependent relations. Carers of autism spectrum disorder children yearn for acceptance of their children in the general community.

1.5.4 Parents Recognition of Early Symptoms of ASD

1.5.4.1 Factors Associated with Diagnosis of Autism Spectrum Disorder (ASD) under the Age of 24 Months in Malaysia

Yeo K.J. & Lu Xi
Sains Humanika 2(1), 2014: 65-69

Abstract: A total of 79 mothers of children with autism spectrum disorder (ASD) who were born within the period of 1998 to 2008 in Malaysia, were selected to answer the questionnaire in this study. The Childhood Autism Rating Scale (CARS) was adapted for parents (CARS-P) to assess the degree of autistic symptoms perceived by mothers. Difficulty in learning to speak was the first symptom found by most of mothers (above 60%). The binary logical regression result found the higher CARS-P score (severity of autistic symptom perceived by mothers) as predictor of the higher probability on early diagnosis of ASD under the age of 24 months. Larger samples are suggested in future study.

1.6 Miscellaneous

1.6.1 Impact of Video on Learning in Students with Autism in Malaysia: Future Prospects

Saiman K., Sinnatamby S., Mustafa L.M, Alias N. & Siraj S.
Procedia - Social and Behavioral Sciences 103, 2013: 459 – 466

Abstract: Use of video in Malaysia is seen as having a bright future because technology development is expanding even more now. Thirty articles related to use of video on students with autism have been investigated. Only 12 articles have been selected as appropriate for use as references for this study. This article looks at the future prospects of impact of video on learning of students with autism in Malaysia. The focus of this study is the use of video by experts, identifying behavior of students with autism in their use of video and determining the limitations of video and ways to overcome them. This study uses the Fuzzy Delphi approach to achieve consensus of experts on the focus of study. The findings show that usage of video is extremely effective on students with autism besides shaping the behavior desired. Although video has its limitations, these can be overcome in various ways as suggested by the experts and researchers.

1.7 Thesis/ Dessertation

1.7.1 Education

1.7.1.1 Development of an Arithmetic Study Aid for Autistic Children

Lee S.G.
Universiti Malaya, 2007

Abstract: The primary objective of this study is develop a Systematic Airthmetic Study Aid, SASA as a complementary aid in the teaching of basic computational skill, especially addition, to autistic children in normal school setting. A systematic approach was used to design SASA and it has proven its influence in bridging the number sense of a child to addition skills. With the intended goals being firstly identified and defined, resources materials were collected and reviewed, a sound arithmetic teaching aid was ultimately formed. It was validated by a panel of experienced Mathematics teachers. The pretest and posttest in each unit were used in evaluating the effectiveness of the instructional programme. SASA consists of a pre-knowledge assessment and 4 instructional units. Units 1 and units 2 are instruction for 5-frame and Unit 3 and Unit 4 are instructional for 10-frame. For each type of

frames, concrete and representation frames are complementing with the instructions assisting the child to acquire number sense and addition skills. Each unit comprises a pretest and a posttest to test the performance of the child. For all the four units, the child attained high achievements. The systematic approach of SASA together with the attractive study frames have helped the child to master addition skill. The child responded positively to the use of concrete and representation frames in SASA. The mathematical ability is achieved after the instruction material being introduced to the child. The SASA developed is thus proven to be an effective study aid.

1.7.1.2 Meningkatkan Keberkesanan Pembelajaran Simpulan Bahasa dalam Kalangan Murid Tahun 3 Bermasalah Penglihatan Melalui Kaedah Koperatif

Mat Adam A.N.I.
Institut Pendidikan Guru Malaysia, Kampus Ilmu Khas, 2011

Abstract: This study was conducted to improve the effectiveness of idiomatic learning to Year 3 pupils with visual impaired student in a school through a cooperative. A total of four pupils were selected to participate in this study. The focus of this study was to assess whether the cooperative method is carried out to enhance the interest of students in activities to understand the concept and purpose of each learned idioms and improve student achievement in Malay Language. Initial survey found that students quickly lose focus on the teaching of idiomatic expressions by the teacher through the questions and answers and the use of teaching aids flash card. Students will only be focusing on 10 to 20 minutes when you are in class during teaching and learning process to be implemented. To alleviate this problem, cooperative learning methods have been used. Results showed that students can understand easily learned idiomatic meaning. Pupils also enjoyed the session more lesson and study carried out.

1.7.1.3 Penggunaan Boneka dalam Teknik Main Peranan untuk Meningkatkan Kemahiran Bertutur Murid-murid Bermasalah Pembelajaran Kelas K4

Mohamed Shohor M.F.
Institut Pendidikan Guru Malaysia, Kampus Ilmu Khas, 2010

Abstract: This research was conducted to improve the speaking skill of pupils with learning disabilities of K4 class using dolls in role playing techniques. Respondents in this study consisted of three students with learning disabilities, with each category of down syndrome, autism, and slow learner a school in Kuala Lumpur. Using puppets in teaching and learning process will attract students to communicate in two ways, indirectly improve their speaking skills. Survey found that the speaking skills of students K4 class is weak. Therefore, researchers have used the puppet in the induction step instruction set and cover teaching and learning as the first intervention. Then, researchers use the puppets during the teaching and learning take place as the second intervention. The results showed that the use of puppets in role playing techniques to increase the number of references to the word and reduce errors to mention the words by the subjects under study. Improvement in terms of efficiency and understanding in communication is also seen after the puppets used in the step of teaching and learning.

1.7.1.4 Penggunaan ICT dan Kad Perkataan untuk Meningkatkan Kemahiran Membina Ayat Tunggal dalam Bahasa Melayu untuk Murid-murid Bermasalah Pendengaran Tahun 3

Daud M.A.
Institut Pendidikan Guru Malaysia, Kampus Ilmu Khas, 2011

Abstract: The purpose of this research is to improve the skills of hearing impaired pupils in constructing simple sentences by using ICT and word cards. Two pupils from Year 3 were selected in this research. The main focus is to evaluate if the use of ICT and word cards would able to improve the skills of hearing impaired pupils in constructing the simple sentences. Earlier observation shows that some pupils were not able to complete the task given due to their lack of understanding to construct sentences correctly. Therefore, ICT and word cards were used to overcome this problem. The result shows that the pupils were able to construct simple sentences when using these methods.

1.7.1.5 Use Token Economy to Reduce Behavior Problems among Learning Disabilities Pupils from Group 5 in Visual Art

Abdul Ghaffar N.A.
Institut Pendidikan Guru Malaysia, Kampus Ilmu Khas, 2010

Abstract: This action research was undertaken to reduce the behavior problems of learning disabilities children by using token economy. The target of this study is 7 pupils from group five around Selangor. Token economy was chosen because the pupils tend to listen to teacher's instructions better as it is more rewarding. Initial observations were carried out during the teaching and learning process. The findings do indicate that pupils have undesirable behavior problems during the teaching and learning process. Pupils are introduced to the method of compensation called the token economy. This technique is done by pasting a sticker each time the pupils perform desired behaviors and removing a sticker each time pupils show undesirable behavior. The study was carried out for three month. Results indicate that seven pupils were successfully in reducing undesirable behaviors through the use of token economy. Records of all the observations and findings of interviews conducted show that the undesired behaviors of students were successfully changed through the token economy method.

1.7.1.6 Using Discrete-Trial Teaching to Increase Social Skills of Autistic Children

Malie Y.
Universiti Kebangsaan Malaysia, 2007

Abstract: The purpose of this study was to find out on the effectiveness of discrete-trial teaching approach to facilitate increased social skills of autistic children in the aspects of eye contact, joint attention, imitation and turn taking. A case study was conducted using multiple baseline design strategy across participants. This case study was conducted for 16 weeks involving three autistic children with the mean age of 8 years old. Observation was divided into 2 parts: baseline and intervention, where each session was allocated for 10 minutes with 30 seconds interval. The instruments used in this study were the autistic social skill rating scale to identify the social skills of autistic children; the intervention observation form to record the frequency of the data into percentage and the social skill lesson plans to conduct the study. Fieldwork observation form was also used to record the data qualitatively. Data from the autistic social skill rating scale and the intervention observation form were analyzed using descriptive statistics: frequencies, percentage and mean. Qualitative data were described according to the prompt and reinforcement types received during the intervention. The findings of this study indicate that discrete-trial teaching can be implemented to increase the social skills of autistic children. All of the participants exhibit increase in their eye contact and joint attention skills during the intervention sessions. Only two participants showed an increase in their imitation and turn-taking skills. The findings also show that the participants received

prompt in term of modeling. There is qualitative difference in the use of reinforcement among the participants. This study has implication on educational practice and pedagogy in relation to the social skills of the autistic children.

1.7.2   Allied Health

1.7.2.1   A Study of Non-Literal Understanding in Children with High Functioning Autism

Hasherah M.I.
Universiti Kebangsaan Malaysia, 2002

Abstract: This study was carried out to investigate non-literal understanding in 2 high functioning autistic (HFA) children aged 8 and 11 years old respectively. This group was then compared with 2 normal children matched by the same chronological age and gender. Another 6-year-old normal child was also included in this study to match the receptive language age of the HFA group. A play-based methodology was used to carry out the current study. The child listens to a taperecorded story into which 10 idiomatic expressions were embedded. The child then acts out the story as it is played again, sentence by sentence. The play is video recorded and transcribed. Actions for each idiom are categorized and then analyzed. The results indicate that the children with HFA did, as a group, demonstrated fewer appropriate idiomatic interpretations and more inappropriate interpretations than of the normal group. However the higher response for inappropriate scores reflected more fuzzy responses than the literal ones. This may indicate awareness among these children that the literal meaning is inappropriate in the absence of adequate idiom vocabulary. It may also reflect difficulty in retrieving known idioms from memory and/or selecting the most appropriate meaning from several possibilities in context. Besides that, it is also worth noting that, although other language structures develops fairly well in the HFA group, non-literal understanding of this group was at the level of a six year old normal child. It is suggested that the characterization of children with high functioning autism as predominantly literal needs to be revised. Rather than seeking a blanket characterization of nonliteral understanding in an essentially heterogeneous group, it may be more useful to consider that literalization strategy adapted for idiom comprehension in these children is a secondary manifestation of semantic and/or pragmatic difficulties.

1.7.2.2   Effectiveness of Sand Play Intervention against the Behaviour Regulation among Autistic Children in Center of Community Based Rehabilitation of Selangor

Ngah Y.C.
Universiti Kebangsaan Malaysia, 2011

Abstract: This is a study of sand play interventions. The study was conducted on autism children in the center of community based rehabilitation (CBR) Tanjong Karang, Selangor. This study aimed to investigate whether the sand play interventions help in reducing problematic behaviors and changing behaviors of autism children who had participated in the sand play intervention programs. The study also investigated the effectiveness of sand play interventions in regulating the behaviors of high function and low function autism children. To achieve these objectives and experimental and qualitative case study has been conducted among three autism children. The first participant was aged four years and five months, the second participant was aged six years and two months, and the third participant was aged eight years and four months. Each session of sand play interventions consisted of an opening ritual, the sand play period and the closing ritual. This study was conducted at the center of the CBR and the participants' house, respectively. Qualitative data collected included demographic data, interviews with the mothers of participants and trainers of PDK, direct observation during the interventions sessions conducted, and the informant. Participants' behaviors in each session were recorded using behavioral observation form. The behaviors of hurting themselves or others, stereotypic behaviors, aggressive behaviors, and behaviors of damaged properties were investigated

among the informants in this study. Data analysis did not show any positive changes in behaviors observed among the participants after participated in the intervention program. This study showed that the sand play intervention did not display different effects on high function participant and low function participants. The implications of the findings, study limitations, and suggestions for future research are discussed in this study.

1.7.2.3 Interrogative Skills: Comparison between Normal Malay Children with Malay Autistic Children

Ab Jabar S.Z.A.
Universiti Kebangsaan Malaysia, 2003

Abstract: The purpose of the study was to determine the capabilities of Normal Malay Children (KKN) and Autistic Children (KKA) in interrogative skills and to compare performance between the two groups. This was a descriptive and cross-sectional study, which consists of 4 KKN and 4 KKA with the language age of 6 years old. The language age was determined by Malaysian Developmental Language Assessment Kit-Expressive level (MDLAK). Mental age of KKA was determined by Vineland Adaptive Behaviour Scale (VABS). Subjects were tested with the same question list. Subjects needed to answer the questions spontaneously. Cues were given to get the subjects to answer correctly. Based on the results, it was noted that the ability to answer the questions spontaneously for KKN was above 65% while the KKA percentage was lower than 30%. For the rest of the questions, cues were needed to get the subjects to answer them correctly. The most frequently-used cue was question cue for KKN. Both groups showed a low percentage in answering incorrectly or inappropriately. Subjects tend not to give answers for those questions even with cues. Based on the research results, cues given in verbal way gave no benefit to KKA in order to help them in answering questions. The high percentage in cue usage for KKA was visual cues, which included picture selection.

1.7.2.4 Sensory Processing Disorder and Tantrum Characteristics in Children with Autism in Klang Valley

Ismail S.F.
Universiti Kebangsaan Malaysia, 2009

Abstract: Sensory processing disorder affects behavior in children with Autism. The purposes of this study are to 1) determine the prevalence of children with Autism who exhibit temper tantrum, 2) determine the composition of tantrum characteristics in children with Autism, 3) determine sensory processing domains in children with Autism who exhibit temper tantrum, 4) compare sensory processing domains in boys and girls who exhibit temper tantrum and 5) correlate between tantrum characteristics and sensory processing domains. This longitudinal study was done at five branches of National Autisme Society of Malaysia around Klang Valley. Data collection was done in October to December 2008. There are two main focuses in this study which are tantrum characteristics and sensory processing disorder in children with Autism. This study used the Tantrum Behavioral Checklist to determine temper tantrum status and tantrum characteristics and Short Sensory Profile is to determine the level of sensory processing disorder. The samples (n=54), are children with Autism ages between 3 to 6 years old. The results show that there is no significant difference between two of the sensory processing domains and tantrum characteristics. The domains of movement sensitivity and under-responsivity or sensation seeking were found to be related to tantrum characteristics among children with Autism.

1.7.3   Information Technology (IT)

1.7.3.1   Interactive CD Learning for the Treatment of Autism Children

Siti Iradah I.
Universiti Teknikal Malaysia Melaka, 2008

Abstract: Interactive CD Learning for the Treatment of Autism Children is an educational courseware used for autism children in primary schools. Since the autism disorder qualifies as learning disability, a treatment and therapy progress especially in their educational process is necessary to assist them. There are four modules in this educational courseware prototype that is based on *Huraian Kurikulum Pendidikan Khas Bermasalah Pembelajaran* (PKBP). The topic selected is to identify and naming the living things (human), which are further divided into sub-modules based on Science, Social and Environments Components. By using graphics, animation, voice and sound effects, children's interest, attention, and learning of verbal material increased over a control group who received only a traditional therapeutic learning approach. It is developed to assist teachers and students with autism in primary schools to a life path a normalcy. In particular, this report explains seven main chapters which consist of Introduction, Literature Review and Project Methodology, Analysis, Design, Implementation, Testing and Project Conclusion. The introduction explains what the application is and what their purposes are. While in the literature review and project methodology, it explains the existing similar application and comparison, the methodology approach and project requirement. Analysis is the critical part in this report which all information are captured and recorded properly. In addition, the requirements analysis is also covered in this part. The Design is where the architecture of educational courseware prototype will be defined. The implementation explains the production and implementation process which encompasses the text, graphic, audio and animation production, and the media integration. Testing was conducted among the special education primary and private school teachers and students. It is carried out in order to retrieve their opinions on this courseware prototype. The respondents consist of 5 special education teachers and 8 autism students from Bukit Cina Primary School, Autism Intervention Centre (NASOM), and Joy Workshop (PKIIM) in Malacca. The findings of this study are useful for autism community in order to assist them to learn. Finally, the Project Conclusion explains the prototype strengths and weakness.

1.7.3.2   National Autism Society of Malaysia-Nasom Parent's Support System: Diagnosis Module

Kong C.H.
Universiti Teknologi Malaysia, 2010

Abstract: NASOM Parent's Support System – Diagnosis Module is a tool that has similarity to Decision Support System (DSS). This system is introduced to a portal of our UTM's master student, Puan Aida in order as a suggestion to perform medical monitoring by using this tool. This project is a combination of 3 systems that consists "NASOM Parent's Support System – Information System Module", "NASOM Parent's Support System – Diagnosis Module" and also "NASOM Parent's Support System – Monitoring Module". "NASOM Parent's Support System Diagnosis Module" is a web based as a purpose to help the users mainly parents to diagnose the probability of the child to be autism. This system is developed using Evolution Prototype methodology. The software's used in developing this system are consists of ASP.NET which is used as the main programming language and also MSSQL as to manage the system's database. Besides, Microsoft Visual Studio 2008 is used in order to produce an interactive and user friendly web based system. By developing this project, hopefully the system can smooth the process of obtaining diagnose result for the autism children.

1.7.3.3 Penggunaan Video dalam Perisian Power Point bagi Meningkatkan Tumpuan Belajar Murid-murid Bermasalah Pembelajaran Kelas 3 Melur dalam Kemahiran Urus Diri Mengikat Tali Kasut

Abu Halim
Institut Pendidikan Guru Malaysia, Kampus Ilmu Khas, 2010

Abstract: The purpose of this study is to improve the skills of self-governance among pupils of class 3 Melur with learning disabilities through the use of video in power point. The target group consists of seven pupils with four girls and three boys in a group. They are categorized into the problem of autism, Down syndrome, Slow Learner and multiple disabled. Researchers have used video to enhance pupils' skills of lace shoes and directly teach them to be independent. The results of this survey show that the undesirable behavior occur such as unfocused on teaching and learning processes, running out of class and sleeping in class. In an effort to obtain data, researchers have used various techniques through video such as *pause and play* technique, *see and do,* and yes and no technique in the period of four weeks. Data collection has been made through interviews with their teachers/ mentors, teachers of Self Governance subject, assistants' student management (PPM) and analysis of documents from each pupil. The final result shows the improvement in terms of controlling the class and pupils focus on learning. They also feel that learning is more enjoyable.

1.7.3.4 Relation between Sensory Processing Problems among Autistic Children with Their Parent Distress Level

Ahmad M.A.
Universiti Kebangsaan Malaysia, 2011

Abstract: Most of autistic children showed features of sensory processing disorder (SPD). They markedly show have difficulty in social skills, emotional, physical and behavior problems. The study showed the effects of mental burden and psychological effects on the parents of children with autism. This study aimed to investigate the relationship between SPD in children with autism on their parent mental burden. This research was conducted from September 2010 until December 2010. This cross sectional study involving the participation of as many as 37 parents of children with autism in 7 registered Community Rehabilitation (CBR) in Kuala Selangor. Short Sensory Profile (SSP) and Zarit Burden Interview Revised (ZBIR) were completed to 37 parents. Results of index showed the mental burden of parents of children with autism have higher level of mental burden with the mean rate of 42.32. Min score of ZBIR found the father to feel more depressed (43.70 + 14, 522) than the mothers (41.81 + 17,321). However, no difference in the mental burden of the mother and the father (>0.05). Besides, there were no significant differences between the mental burden of the parents based on race, age, educational level and income group. There was a significant correlation relationship between sensory processing problems of children with autism with their parents mental burden (p<0.05). The conclusion of the study is there were no significant differences between the mental burden of the parents based on race, age, educational level and income group and SPD encountered in children with autism have a relationship with the mental burden of their parents. Future research may help parents to understand their child's problems and intervention based therapies to help in dealing the autistic children with SPD and at the same time reduce the mental burden experienced by parents.

Appendix 2

DATA EXTRACTION TABLE

3.1.1 **Educational Intervention**

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
1.	Yahya S., Md Yunus M. & Hasnah T.(2013)	Facilitating ESL Students with Autism Learn Sight Vocabulary: Teachers' Practices and Voices	To report the findings of a study that looked into English language teachers' practices in facilitating primary school ESL students with autism learn sight vocabulary.	NA	4 ESL teachers	NA	NA	NA	NA	The findings indicated humanistic language teaching practices. The practices seem to be important in promoting sight vocabulary development among the students. The findings have important implications for teacher educators, in service and pre service teachers involved in teaching ESL students with autism in inclusive and special education settings.
2.	Low H.M. & Lee L.W. (2011)	Teaching of speech, language and communication skills for young children with severe autism spectrum disorders: what do educators need to know?	To describe a speech, languange and communication intervention process of a child with severe autism	The subject has severe autism	A 4 year old girl with severe autism	4	Female	severe	Speech, language & communication by a SLP	Subject showed improvements in turn-taking, object-picture matching, following one-step commands but not in imitating vocalization.

No	Author(s)	Study Design			Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	Intervention	Outcome
3.	Abd Rahim N. & Harun N.I. (2006)	First We Imagine, Then, We Collaborate: An Insight with Autistic Children	To find out as to whether autistic learners are able to collaborate with their peers by 'Imaginative Learning Approach' in the language classroom.	NA	10 children with autism from 5 schools in Selangor & Negeri Sembilan	7 to 15 years old	NA	NA	Imaginative Learning Approach	It is found that autistic learners are able to collaborate with peers in the 'Imaginative Learning Approach'.
4.	Yahya S., Md Yunus M. & Hasnah T. (2013)	Instructional practices in enhancing sight vocabulary acquisition of ESL students with autism	Explore teachers' instructional practices in teaching sight vocabulary to ESL students with autism in the natural classroom setting.	NA	4 teachers in 3 primary schools in Malaysia. 2 mainstream teachers and 2 special education teachers	NA	NA	NA	NA	The findings of this study suggested that teachers provided support through bridging second language instructions with the students' L1 (Malay) to ease learning. Findings also indicated that teachers adjusted their level of vocabulary during instruction to promote sight vocabulary acquisition. Further, results suggested that giving the students frequent opportunities for using words as their nondisabled peers promotes sight vocabulary acquisition.
5.	Omar H., Hussin Z. & Siraj S. (2013)	Teaching approach for autism students: a case in Malaysia	To identify teaching approaches used by teachers when implementing the teaching process to pupils with autism	3 teachers and 3 students with autism. Inclusion criterias at least 5 years teaching experiences, had been awarded an excellent tracher awards, at least a bachelor degree, willing to cooperate and commit.	3 teachers and 3 students with autism	NA	NA	NA	NA	Teachers always try to reach out and attract attention of the students to focus. High level of pateince is apparent.

No	Author(s)	Title	Study Design		Participant's characteristic				Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
6.	Badzis M. & Zaini M.F. (2014)	Early Identification and Intervention of Autism Spectrum Disorder Among Young Children	To investigate: (a) parents' perception of the need of early identification and intervention of children with autism (b) parents' own perception of the challenges and strategies to help students with autism increase their school performance (c) parents' view on strateies to help change the societal perception on ASD	Current study selected the sample based on the researcher's immediate environment and friendship	1 mother with 1 child with autism	NA	NA	NA	NA	1. There was a need of students with autism to be involved in school activities, however, teachers need to identify certain activities suitable for the child with autism. 2. The use of early identification is to involve parents, teachers and society to make the children with ASD to be independent adult later in their life. 3. Successfull helping strategies involved role played by parents, teachers, school counselor & homeroom teacher.
7.	Liew P.Y. & Mohd. Ali M. (2008)	Amalan Program Intervensi Awal Kanak-Kanak Autistik Mengikut Perspektif Ibu Bapa	To explore parents' perspective on the usage of the types of intervention, service delivery and family involvement in the early intervention program received by autistic children	A total of 50 parents who have autistic children between the ages of 2 to 8 years old and has received early intervention program for at least 6 months	50 parents of chilldren with ASD	F & M	NA	NA	Various intervention involved: aumentative communication, behavioral support, expert consulatation, inclusive service, parents training, speech	1. Program intervensi awal yang diterima kurang teratur dan terancang. Ibu bapa mendapatkan maklumat dan menentukan intervensi yang diamalkan ke atas anak masing-masing secara persendirian selepas mengenal pasti bahawa anak mereka mengalami simptom-simptom autisme. 2. Cara pelaksanaan dan pengamalan program adalah kurang

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
									therapy, music therapy, occupational therapy, e.t.c.	selaras antara pusat latihan atau pembekal perkhidmatan. Perkhidmatan-perkhidmatan yang disediakan adalah kurang jelas dari segi penaksiran dan penilaian, laporan kemajuan, perancangan pengajaran dan teknik pengajaran 3. Ibu bapa melibatkan diri dan mengetahui peranannya dalam pelaksanaan program intervensi awal. Walaupun begitu, sejauh manakah penglibatan dalam kalangan ibu bapa dan keluarga dalam pelaksanaan program intervensi awal masih perlu ditinjau dengan lebih mendalam
8.	Hasnah T., Mohd Hanafi M.Y., Fadliana C., Mohd Mokhtar T. (2010)	Monitoring progress using the individual education plan for students with autism	To investigate the IEP process carried out in an autism learning laboratory established in a local university in Malaysia. Specifically, this study investigates the objectives set for the students and their achievement of these objectives.	Students with autism who study in the UKM/Hulu Langat Autism Learning Laboratory. No mention on exclusion criteria.	10	3-16 years old	9 boys, 1 girl	Moderate and severe autism	Early Intervention Program (EIP)	Students' percentage of achievement of learning objectives ranged from 40% to 85.71%.

No		Study Design				Participant's characteristic			Intervention	Outcome
	Author(s)	Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
9.	Sani B., Wan Chik M.N. & Badzis M. (2011)	An Exploratory Study on the Special Education and Early Intervention Programme for Autistic Children	To explore the special education and the intervention programme for autistic children run by two Non-Governmental Organizations and identify how their programmes help autistic children improve learning disability	NA	two respondents working in organizations located in Ipoh, Perak	NA	All females	NA	NA	Findings showed that both centres used a naturalistic curriculum model where activities carried out are mostly dealing with real life activities, while topics and skills are focused on sensory skills and children are taught to use their senses and attention span. Teaching methods used are a mixture of several latest teaching techniques currently being applied worldwide for autistic children. In the early intervention programme, the teaching and learning techniques are based on the individual child_s ability. Both centres admitted that some parents play a supportive role while others play non-supportive roles.

3.1.3   Teacher's Knowledge

No	Author(s)	Title	Study Design		Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)	

No	Author(s)	Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	Intervention	Outcome
10.	Mislan N., Tian A.,Sharifuddin R.S., Guan J & Lee M. F. (2012)	Observational Study on Teachers' Approach in Teaching Children with Autism to Read	To obtain in-depth understanding regarding the teaching approaches used by special education teachers in educating children with autism to read	Special education teacher	2 special education teachers	NA	NA	NA	NA	Total observation in the autism centre is six. Each observation took duration of 90 minutes. Approaches used in teaching were divided into 4 phases namely: 1. Introduction phase 2. Pre-reading phase 3. Guided reading phase 4. Post reading phase
11.	Nornadia M.R., Hasnah T., Sazlina K., Norshidah M.S & Mohd. Hanafi M.Y. (2013)	Teachers' Perceptions of Including Children with Autism in a Preschool	To investigate teachers' perceptions of including children with autism in a mainstream preschool. The objectives of this study were: 1) to determine the attitudes of teachers towards inclusive education 2) to identify the knowledge and skills of pre-school teachers regarding inclusive education 3) to identify the barriers and challenges in implementing inclusive education in pre-school	Mainstream preschool teachers. Exclusion: NA	3 mainstream preschool teachers	NA	All females	NA	NA	The findings showed that the teachers were not prepared to teach children with autism in their class because they did not know the characteristics of children with autism and did not understand the importance of inclusive education.

No	Author(s)	Title	Study Design			Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
			4) to investigate the reasons behind the non-acceptance of preschool teachers on having children with autism in their classes.							
12.	Saad S., Ibrahim H. & Nayan N. (2013)	Towards holistic inclusion in malaysia: knowledge of speciel educational needs among in-service distant learning students.	To determine the knowledge level of Special Educational Needs (SEN) among experienced mainstream teachers in Malaysia.	147 teachers undergoing distance learning Bachelor of Education (BEd) degree in IIUM	147 teachers undergoing distance learning Bachelor of Education (BEd) degree in IIUM	NA	NA	NA	NA	Moderate level of knowledge on autism (57.8%) among 147 teachers. Only 0.7% had high level knowledge on autism, while 4.8% had high high level knowledge on autism. 36.1% of the teachers had none/ low knowledge on autism.
13.	Hasnah T., Mohd Hanafi M.Y., Mohd Mokhtar T., Norani S. (2010)	Tahap Latihan, Pengetahuan & Keyakinan Guru-guru Pendidikan Khas tentang Autisme	To investigate the level of training, knowledge, and confidence of special education teachers on autism.	Responden merupakan peserta yang terlibat dalam sebuah bengkel tentang autisme yang dianjurkan oleh Fakulti Pendidikan, Universiti Kebangsaan Malaysia	112 guru pendidikan khas dari Selangor, Johor, Negeri Sembilan dan Wilayah Persekutuan Putrajaya	4 responden; 20-30 tahun, 49 responden; 31-40 tahun, 17 responden; 41 hingga 50 tahun dan 2 responden 51-60 tahun.	9 responden (8.04%) ialah lelaki dan 102 responden (91.07%) ialah perempuan.	NA	NA	Kursus perguruan formal didapati kurang berkesan dalam melatih guru pendidikan khas untuk memahami &mendidik kanak-kanak autisme. Kualiti latihan dalam perkhidmatan bagi pendidikan autisme hanyalah pada tahap sederhana, tetapi lebih baik daripada latihan perguruan formal; menyebabkan guru mempunyai tahap keyakinan yang rendah dalam mendidik

3.1.4   Children Development

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Age	Gender	Type of autism (if avail able)		
14.	Vijayen G. (2002)	Kemahiran Asas Sosial Kanak-kanak Autisme di Persekitaran Sekolah	To study the level of social skills among children with autism and to identify the challenges and support towards learning social skills.	Subjects are receiving special education in government school	3 students and 3 teachers	10, 10, 9 years old	3 male students	moderate autism	This study does not implement an intervention but describes the social skills of the subjects	Education in the school focused on academics and social skills were not focused on enough. Teachers thought that group teaching was not effective for children with autism. Lack of training for teachers. Lack of awareness and teaching skills among parents.
15.	Lim C. Y., Mohd Hanafi M. Y. & Mohd Mokhtar T. (2012)	Genggaman pensel kanak-kanak bermasalah pembelajaran dalam meningkatkan kemahiran menulis	1. To highlight the types of pencil grip among KKBP 2. To determine the types of levels of pencil grip for learning disabilities students at school stage 3. To determine the difference of pencil grip in KKBP categories	Integrasi Bermasalah Pembelajaran (PPKIBP) di sekolah rendah yang disediakan oleh KPM dalam daerah Klang, Selangor.	Populasi kajian di daerah Klang sejumlah 609 orang (Pejabat Pelajaran Daerah Klang 2011) dipilih secara rawak daripada senarai sekolah rendah tersebut.	NA	F & M	Mild Autism	NA	Hasil tinjauan menunjukkan murid-murid bermasalah pembelajaran hanya memenuhi 8 daripada 10 jenis genggaman pensel. jenis-jenis genggaman tidak matang (peringkat tidak matang) terdiri daripada genggaman jejari silang tapak tangan, genggaman supinate tapak tangan, genggaman dengan lanjutan jari, genggaman ibu jari silang, genggaman tripod statik, genggaman empat jari, genggaman thumb tuck, genggaman thumb wrap dan genggaman broken type. Jenis-jenis genggaman matang (peringkat matang) terdiri daripada genggaman tripod lateral dan genggaman tripod dinamik

No	Author(s)	Study Design		Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	
									(Schneck & Henderson 1990). Manakala, jenis-jenis genggaman pensel selain daripada jenis-jenis genggaman matang dan jenis-jenis genggaman tidak matang dikategorikan sebagai peringkat lain-lain.
16.	Sulaiman T., Baki R. & Megat A. Rahman P.Z. (2011)	The Level of Cognitive Ability among Learning Disabilities Children in Malacca Malaysia	To examine the cognitive ability of children with learning disabilities (LD) who were involved in the PDKNet education program.	The subjects were enrolled in Community Based Rehabilitation Centers	106 children with learning disabilities (59 with autism)	NA	43 males, 63 females	NA	This study does not implement an intervention but describes the cognitive skills of the subjects	The findings of the study indicated that more than half of the children with learning disabilities (LD) were able to identify components of a computer such as monitor, keyboard and mouse. More than half of the LD children were also able to recognize and pronounce words and alphabets. However, they face difficulties in reading and writing the respected words as well as having difficulties in providing examples for the shapes asked.

3.1.5 Special Education Program

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/exclusion criteria		Age	Gender	Type of autism (if available)	Intervention	Outcome
17.	Loh S.C. & Syed Yahya S.Z. (2013)	Effective Transitional Plan from Secondary Education to Employment for Individuals with Learning Disabilities: A Case Study	To develop an effective transitional plan from secondary education to employment for these individuals.	People with disabilities who are working, theiremployer, parents, special eduators, NGO	18 (5 NGO, 4 disable employee, 4 parents, 2 special educators, 3 employers). 1/4 mild ASD	NA	3 males, 1 female	mild ASD	NA	The lack of vocational training for students with special needs has resulted in poor employment outcomes. Many students are unable to have a successful transition from secondary education to employment because they are not equipped with the necessary vocational skills. There is a lack of centers which provide vocational training for students with learning difficulties. This shortage has resulted in many individuals with learning difficulties to become unemployed and homebound.
18.	Hussin S., Loh S. C. & Quek A. H. (2012)	Overcoming the challenge of inclusion through smart initiatives: a case study	To gather insight on the successful inclusion of children with autism into the mainstream classes in one of the primary schools located at the metropolitan of Kuala Lumpur, at Klang Valley	NA	7 Special Education teachers and 1 NASOM teacher	NA	NA	HFA	NA	This article does not measure the improvements of the students. Instead it describes the challenges that the children faced and the process of having them in the inclusive program. This article also identified 5 elements that contributed towards successful inclusion; smart collaboration, co teaching, peer learning, after school coaching and experiential learning.

No	Author(s)	Study Design			Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
19.	Kamaliah M. & Wan Amimah W.M. (2010)	Pelaksanaan Program Pendidikan Inklusif Murid Autistik di Sebuah Sekolah Rendah: Satu Kajian Kes	To describe the implementation of an inclusive program for children with autism in a primary school in KL.	Children who were receiving services in NASOM. It is assumed that these children had been diagnosed there.	Asst Headmaster, Sp Ed coordinator, 3 shadow aides from NASOM, 3 teachers, 3students with autism and 10 neuro typical students	primary school age	Not described	NA	Inclusive program	Having shadow aides helped the children with autism tremendously. All teachers agreed that the children improved in terms of academic, communication and behaviour. Due to the training provided by NASOM and the Special Ed Dept, teachers and the shadow aides were able to collaborate smoothly. Low number of students in the classroom was one of the factors why the program was successful.

3.2 Engineering

3.2.1 Utilizing Electroencephalography (EEG) as a diagnosis tool

No	Author(s)	Title	Study Design		Participant's characteristic				Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
1.	Razali N. & Wahab A. (2011)	2D affective space model (ASM) for detecting autistic children	Electroencephalogram (EEG) was used to understand and analyze the functionality of the brain to identify or detect brain disorder for autism in term of motor imitation.	NA	Both autistic and control children with 6 children each group. The autistic children were selected by National Autism Society of Malaysia (NASOM) while the control subjects are mix of staff's and relative's children. All subjects went through the IQ test using Stanford binet IV which was done by the psychologists from NASOM.	Around 7 to 9 years old.	NA	NA	Subjects were asked to watch video stimuli that were approved by a psychiatrist. Video stimuli showed three different emotions which are happy, calm and sad while the last video stimuli are video of person that clinching their hand (switched left and right hands) within one minute time (figure 4 & 5).	There are significant differences between the control subject and the autistic children.

No	Author(s)	Study Design		Participant's characteristic			Intervention	Outcome
		Title	**Aim of study**	**Inclusion/ exclusion criteria**	**Population of study (n)**	**Age**	**Gender**	**Type of autism (if avail able)**	**Intervention**	**Outcome**
2.	Othman M. & Wahab A. (2010)	Affective face processing analysis in autism using electroencephal ogram	To investigate human brainwaves for understanding affective face processing of ASD children.	NA	The subjects of our experiments are 6 children diagnosed with ASD and 12 age-matched typically developing children.	7-9 years	NA	NA	No intervention. The electrodes are placed on the children's scalp and data are collected using BIMEC EEG machine. For baseline recording, subjects are instructed to open their eyes for one minute and close their eyes for another minute. Afterwards, the emotional faces are displayed to the children for the affective states of calm, happy and sad. The recorded brainwaves are then saved for off-line processing.The stimuli consist	Results from our experiments showed that it is possible to detect differences in the emotion dynamics of autistic children compared to non-autistic group.

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
									of happy, sad and calm human faces which are as movie clips with the duration of 1 minute for each affective state. Two sets of movie clips were prepared for each emotion.	
3.	Qudwai U.A. & Shams W.K. (2013)	A Source-Discrimination Approach for Detection of ASD Using EEG Data.	1. To investigate the new features 2. To investigate how ASD and normal groups of children can be distiguished during rest conditions as well as other motor tasks.	1. Six typical children from age 6 to 9 years from a local primary school and six children with autism from NASOM 2. ASD diagnosis made by psychiatrist using the DSM IV criteria.	Six typical children from age 6 to 9 years from a local primary school and six children with autism from NASOM.	6 to 9 years of age	NA	NA	Utilizing the TDOA approach applied with raw EEG data for feature extracted in time domain. Data classified in 2 classes.	EEG signals in children with ASD is helpful in the diagnostic process. The resuts reveal high discrimination between eyes- open and eyes- closed for both groups.

No	Author(s)	Study Design		Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)	Intervention	Outcome
4.	Shams W.K. & Rahman A.W.A. (2011)	Characterizing autistic disorder based on Principle Component Analysis	To identify autistic child during motor and open-eyes tasks by applying Principle Components Analysis (PCA) to Short Time Fourier Transform (STFT) of Electroencephalogram (EEG) signals.	NA	Six autistic children from the National Autistic Society of Malaysia (NASOM), and six typical subjects from preschool	7 - 9 years	NA	NA	No Intervention. The subjects were subjected to two task for experimentation. The first task contained motor movement where subject sit in 75 cm away from monitor screen and asked to follow the right and left hand movement movie while the other task is done by asking the subject to sit in rest condition with open eyes looking on black screen.	This result of work shows that it is more practical to detect autism by depending on motor activities than in open eyes activities. This result suggests that in motor task, the motor cortex region of autistic subjects is active in different ways from normal subjects. Therefore, this can be useful in clinic by paying attention to the changes in EEG signal during motor task for early detection of autism.

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if avail able)		
5.	Najwani R. & Abdul Wahab (2011)	To examine features of EEG for motor imitation in autistic children	12 children (6 control children, 6 autistic children)	12	NA	NA	NA	No intervention. Using EEG to measure brain signals	Compared to normal children: Problem occurred during the communication in their brain while doing required action. Autism children have some difficulty in open and close hand action.
6.	Yussof H., Ismail L. I., Shamsuddin S., Hanapiah F. A., Mohamed S., Piah H. A., Idris S., Hashim H. & Zahari N. I. (2012)	To assess initial response of autism children interacting with Humanoid Robot NAO in RBIP	NA	12 autism children from NASOM	NA	NA	NA	All children participated in the RBIP (module 1 to 5) and the interaction is recorded using video camera for initial response analysis based on GARS 2	Interaction with Humanoid Robot NAO generate more concentration level amongst children with autism.
7.	Shams W.K. & Wahab A. (2013)	Introduce a new model to capture the abnormal brain activity of children with Autism Spectrum Disorder (ASD) during eyes open and eyes closed resting conditions.	Six typical subjects from preschool and six autistic subjects in the same age from the National Autistic Society of Malaysia(NASOM)	7-9 years old	NA	NA	ASD	No intervention.	This study features new model to analyze EEG data to characterize behavior of autistic and normal subjects in time domain.

Title (Row 5): Dynamic analysis of critical features in EEG for motor imitation among Autistic children

Title (Row 6): Human–Robot Interaction Intervention Therapy Procedure for Initial Response of Autism Children with Humanoid Robot

Title (Row 7): Source-temporal-features for detection EEG behavior of autism spectrum disorder

No	Author(s)	Study Design		Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
8.	Saidin S. & Safri N.M. (2010)	Study of Electroencephalography signal of autism and Down syndrome children using FFT	To determine and classify EEG patern for autism and Down Syndrome children	NA	6 normal, 2 autism and 8 Down Syndrome children	3- 12 years	Male and female	Not available	EEG signal recorded. External artifact reduced.MATLAB software version 7.0 used to determine alpha value.	Normal children have alpha value greater than autism children. While autism children have alpha value greater than Down Syndrome children

3.2.2   Robot-based Intervention

No	Author(s)	Study Design			Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)	Intervention	Outcome
9.	Shamsuddin S., Yussof H., Hanapiah F.A. & Mohamed S. (2013)	A Qualitative method to analyze response in robotic intervention for children with autism	To observe the initial response of 12 children diagnosed with autism when they were exposed to a facilitated interaction with a humanoid robot.	All children diagnosed using the Autism Diagnostic Observation Schedule (ADOS)	12 children with autism from NASOM	NA	NA	NA	Program the robotin accordance to the purpose of the intervention. Video recording of the regular learning environment (without robot) and during child-robot interaction. Assessment of the videos and comparison of the behavior scores is done.	Statistical data showed that for the subscale stereotypic behavior and communication, the robot had significantly reduced the autistic traits of the children with autism. In the social interaction subscale, the scores of autistic behavior during robotic interaction was only a fraction lower than their actual traits without the robot.
10.	Ismail L.I., Shamsudin S., Yussof H., Hanapiah F.A. & Zahari N.I. (2012)	Estimation of Concentration by Eye Contact Measurement in Robotbased Intervention Program with Autistic Children	To estimate initial response of eye contact time between humanoid robot NAO and ASD children in RBIP and normal classroom interaction.	NA	12 ASD children from NASOM	NA	NA	NA	The eye contact time for interaction between humanoid robot NAO and ASD children is recorded for both RBIP interaction and normal classroom setup.	The eye contact of the ASD child is often seen in RBIP interaction.

| No | Author(s) | Study Design | | Population of study (n) | Participant's characteristic | | | Intervention | Outcome |
		Title	Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if avail able)		
11.	Shamsuddin S., Yussof H., Ismail L.I., Mohamed S., Hanapiah F.A. & Zahari N.I. (2012)	Initial Response in HRI- a Case Study on Evaluation of Child with Autism Spectrum Disorders Interacting with a Humanoid Robot NAO	To elaborate on a case study in our pilot experiment where a child with ASD is exposed to the humanoid robot NAO in order to gauge his initial response and behavior in the presence of a robot.	K has a non-verbal IQ score of 104 (average), verbal IQ score of 110 (high average), full-scale IQ of 107 (average) and he is diagnosed as Autism Spectrum. He also complies with all the exclusion criteria including no hearing and vision deficit, no abnormal eye movement, obtained his parent/guardian's consent, able to speak and follow simple commands in English and does not possess self-injury of aggressive behavio.	single subject study.	10 years old	NA	Although not mentioned in the DSM-IV-TR (Diagnostic and Statistical Manual of Mental Disorders: Fourth Edition-Text Revision), K can be classified as having high-functioning autism as his IQ falls in the average to above-average range.	Intervention is Humanoid robot	The overall comparison between observations during child-robot interaction and normal class setting in this particular case study supports our hypothesis that the humanoid robot NAO serves as a significant platform to support and initiate interaction in children with ASD.

No	Author(s)	Study Design			Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
12.	Razaii N. & Rahman A.W.A. (2010)	Motor movement for autism spectrum disorder (ASD) detection	Looking at the differences between autistic and normal children in term of fine motor movement.	All of the selected autistic children have undergone formal intervention with professional therapists and currently studying in mainstream schools. Average IQ level	The data collection of our studies consisted of 6 autistic children and another 6 normal children which already been matched according the age and IQ test.	7 to 9 years old	NA	NA	No intervention. The video stimuli of fine motor movement will be displayed to the children and it required them to imitate the tasks. Before recording the real signal of the experiments, the subject was given some time to watch and follow the movement as in the video stimuli. The real recording will start with a minute of eyes closed followed by a minute of eyes open and followed by another minute of the fine motor movement.	The activation signals for the autistic children are far less than the normal children. The spectrum indicates the theta, alpha and beta waves and the red colour showed the most activated signals during the tasks. The activation signal of autistic children during the imitation tasks is not continuous. Signals of normal subject are more consistent and continue till the end of the tasks.

No	Author(s)	Study Design		Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
13.	Ismail L.I., Shamsudin S., Yussof H., Hanapiah F.A. & Zahari N.I. (2012)	Robot-based Intervention Program for Autistic Children with Humanoid Robot NAO: Initial Response in Stereotyped Behavior.	The initial response of stereotyped behaviour in Human- Robot Interaction between Humanoid Robot NAO and children with ASD during RBIP and normal class session.	NA	NA	NA	NA	NA	The initial response of stereotyped behaviour is observed and evaluated in the behaviour score sheet for RBIP and classroom interaction.	ASD children with higher FSIQ responds with less stereotyped behaviour in the presence of RBIP compared to the normal human-human interaction in normal classroom session.
14.	Shamsuddin S., Yussof H., Miskam M.A., Che Hamid M.A., Abdul Malik N., Hashim H., Hanapiah F.A. & Ismail L.I. (2013)	Humanoid Robot NAO as HRI Mediator to Teach Emotions using Game-centered Approach for Children with Autism.	To explore the response of two autistic children to a humanoid robot NAO that has been programmed to display 5 different emotions using its body poses and gestures.	Understand, speak and follow simple command in English, no nystagmus or self-injury, no deficit in hearing and vision.	2 children with mild autism	7 and 9 years respectively	Male	Mild	Initial exposure to NAO robot does have potential to teach children with autism about head and body posture that are associated with certain emotion.	Positive utilisation of robots in the rehabilitation of children with autism.

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study / Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
15.	Shamsuddin S., Yussof H., Ismail L.I., Mohamed S., Hanapiah F.A. & Zahari N.I. (2012)	Humanoid Robot NAO Interacting with Autistic Children of Moderately Impaired Intelligence to Augment Communication Skills	To observe autistic children of moderately impaired intelligence in terms of communication behaviour when they are exposed to simple human-robot interaction (HRI) modules executed by a humanoid robot NAO. / NA	5 autistic children	Mean age of 8.6 years. Range 6-13	4 boys and 1 girl	NA	Intervention is Humanoid robot. The interaction begins with the simplest module of NAO in static mode for 45-seconds, then doing head-turn, eyes blinking, talking, moving its arms, playing nursery rhymes combined with eyes blinking and finally ends with NAO playing the 'ABC' song combined with arm movement.	4 out of the 5 children exhibited a decrease in autistic behavior (communication subscale) when the robot is executing HRI modules during the single session of child-robot interaction. These promising results indicate that the basic modules of interaction together with the appealing appearance of the NAO robot were able to attract the children's attention, and hence keep each child engaged with the robot during interaction. This 'engagement' had resulted with a reduction in autistic behavior of these children compared to their typical environment in class.From the graph, it can be deducted that autistic children with FSIQ of moderately impaired (from 40-54) are receptive to robot-based intervention.

3.3 Information Technology (IT)

3.3.1 Assessing the Effectiveness of ICT Software

No	Author(s)	Study Design		Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)		
1.	Dolah J., Wan Yahaya W.A.J. & Toh S. C.(2011)	A Preliminary Investigation: Potential of Interactive Multimedia Learning Awareness (IMLA) in Enhancing Awareness of Autistic Characteristics among Parents and Society in Malaysia.	To outline the process in the development of Interactive Multimedia Learning Autism (IMLA). The objective is to determine which learning theories, theoretical framework and instructional system design that works and To analyze the process of alpha, beta testing and pilot testing.	NA	9 respondents ranging from two content experts from the National Autism Society of Malaysia (NASOM), a researcher who is also an expert in autism from Universiti Kebangsaan Malaysia (UKM), a mother with autistic children, a mother without autistic children, two parents without autistic children and three unmarried women autistic children.	NA	M & F	NA	Implementation of online Interactive Multimedia Learning Autism (IMLA), and the autistic behavioural symptoms characters will be the main learning objects in enhancing learner's know-ledge and awareness towards these issues.	Lack of awareness that needs to be addressed by Malaysian society.

No	Author(s)	Title	Study Design			Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)		
2.	Mustafa M., Arshad H. & Zaman H.B. (2013)	Framework Methodology of the Autism Children -- Vibratory Haptic Interface (AC-VHI)	Provides the Framework Methodology of the Autism Children – Vibratory Haptic Interface (AC-VHI) conducted on the mild autism children who have impairment in social interaction.	Mild autism in National Autism Society of Malaysia (NASOM) having impairments in social interactions.	20 autistic children suffering from mild autism in National Autism Society of Malaysia (NASOM) and having impairments in social interactions.	Aged btw 9 to 14 years old	NA	Mild autism having impairments in social interactions.	A generalized sequence of the steps involved in the process of developing the virtual 3D environment (3D screen, glasses, and vibratory haptic interface) with 3-D sonic game.	To create suitable designing of Haptic Interface Technique for Autistic Children.

3.3.2 Software Development

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
3.	Abdul Manap A., Sarah R. D., Riaza M. R. & Sardan N.A. (2014)	Computer Game Approach Focusing on Social Communication Skills for Children with Autism Spectrum Disorder: An Initial Study	To synthesize a survey regarding social problems and situations faced by children with autism.	Carried out on parents	NA	NA	NA	NA	The identified design issues aims at preparing teaching instructions for the autistic children in learning to make them focus attention, and avoid splitting attention using computer based intervention in teaching Quran. The future enhancement of this paper is to evaluate the effectiveness of the designed system on the autistic children's split attention, and improve the lacks of user interface design specification for them.	Findings suggest that computer-based technologies might be useful educational aides for students with ASD. Computer games provide a safe, secure, and less anxious environment for autistic users. The users can play and practice and learn by their mistakes at their own place.

No	Author(s)	Study Design			Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
4.	Riaza M.R. & Sarah R.D. (2013)	Computer Game Approach for Children with Autism Spectrum Disorder: A Pilot Study	Reports a pilot study using a specially designed game called Find Me.	six ASD children of age ranging from 5 to 8.	six ASD children	Age ranging from 5 to 8.	5 boys and 1 girl	NA	Understand their behavior in game engagement and try to understand their needs and preferences in learning. Computer game called find me is specially designed to teach children on improvement of social skills.	Children responded to the game slower than usual on the first session, but their performance improved as they played the game regularly
5.	Sidek S.F., Fathil N.S., Mohamed Zain N.Z., Kamaliah M. (2014)	Pembangunan Perisian Kursus 'Saya Suka Belajar' Untuk Pembelajaran Bahasa Melayu Bagi Kanak-kanak Autisme	Reports the development of educational software named 'I Like Learning' to help children with autism learn Malay Language.	Respondents were five primary school students in Kuala Lumpur who had been diagnosed with mild level of autism	5 primary school students	NA	NA	Mild	NA	The result shows that the educational software that has been developed using ADDIE methodology is able to attract the children's attention in learning Malay Language subject.

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if avail able)		
6.	Ismail A., Omar N. & Mohd Zin A. (2012)	Design and implementation of blocks-based educational courseware for children with learning disabilities	To design and implement blocks for development od educational software for autistic children.	NA	Autistic children	NA	NA	NA	Block based softare development for pre reading.	Enables end users to build personalised courseware within the block based educational software environment.
7.	Ismail A., Omar N. & Zin A.M. (2009)	Developing learning software for children with learning disabilities through Block-Based development approach.	To propose Block-Based Software Development method and approach that enables the end-users (such as parents and teachers) to build application software to suit the different need of an autistic child.	NA		NA	NA	NA	The block-based approach that derived from the component-based and end-user approach and how the application software can be developed by the end-users by using this block-based approach.	Block-Based Software Development that offers tailorable design architectures that enables the parents or teachers to customize application software to suit different needs of an authistic child.

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
8.	Hitam S., Tan K.L., Sahbudin R.K.Z., Mokhtar M., Ahmad Anas S.B. & Sali A. (2011)	Digital Visual Schedule and Training System for Centre of Autistic Children	Reports the Usage of DVST System to enable therapists and autistic children to carry out administrative work and training program in a single application.	NA	NA	NA	NA	NA	5 phases are involved in the project development process. DVST Client is system enabled the childern to use a personal visual system to carry out their individual training program.	Improve the student learning process and autistic children with fine learning problems to carry out their learning more easily.
9.	Shams Aliee Z., Jomhari N., Rezaei R. & Alias N. (2013)	Facilitating Autistic Children's Split Attention in Designing Computer Teaching Instructions	Presents the specified user interface design issues incorporated with the required teaching instructions for the autistic children to facilitate their split attention.	NA	NA	NA	NA	NA	NA	in addition to the design issues to be considered for the autistic children, teaching instructions need to be incorporated

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
10.	Dolah J., Wan Yahaya W.A.J. & Toh S. C. (2012)	The Implementation of Interactive Multimedia Learning Autism (IMLA). Alpha, Beta and Pilot Testing Stages	To outline the process in the development of Interactive Multimedia Learning Autism (IMLA). The objective is to determine which learning theories, theoretical framework and instructional system design that works and To analyze the process of alpha, beta testing and pilot testing.	Total sample was 20 undergraduate students	NA	NA	NA	NA	Implementation of online Interactive Multimedia Learning Autism (IMLA). and the autistic behavioural symptoms characters will be the main learning objects in enhancing learner's knowledge and awareness towards these issues.	In general the overall results showed that there are signi-ficance relationship between Knowledge and Awareness in all stages of two presentation modes. In term of interaction be-tween modes there are significance relations exists. This result showed that Modality mode proved to have strong effects on the target respondents in term of minimizing the extraneous effects in identifying Autism behavioral symptoms.
11.	Shams Aliee Z.., Jomhari N.., Rezaei R. & Alias N. (2013)	User Interface Design Issues for the Autistic Children	Reports on how to prepare the interactive courseware prototype to teach the basic Quran recitation to the autistic children, and how to make autistic individuals focus attention on learning.	ASD children, teachers, doctors, and therapist who associate with ASD patients.	NA	NA	NA	NA	NA	re for parents and teachers of the participants help us to set the main aim of this research among problems with the highest priority and to recognize the components that should be concerned in a game based on the psychological methods. Fig 3 therapists selected communication problems as the most crucial problem among children with autism followed by social skills problems and behavioral problems respectively.

3.3.3 Use of ICT Tools

No	Author(s)	Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	Intervention	Outcome
			Study Design			**Participant's characteristic**				
12.	Ravana S.D., Gurusamy N. & Varathan K.D. (2014)	Autism and the Need for Special User Interface Design for Web Surfacing	To investigate the utilization of a search engine for the purpose of learning and entertainment of children with ASD.	NA	NA	NA	NA	NA	NA	This study concludes that the existing search engines were not user friendly and it is difficult for a child with ASD to utilize it with minimal guidance.
13.	Syarifah Diyanah Y. & Salam S. (2013)	Children with High Functioning Autism Acceptance in Using Tablet.	The preliminary study of the tablet acceptance among children with high functioning autism.	high functioning autism children and 20 caregivers at NASOM.	three sample high functioning autism children, and feedback from distributed questionnaire to all of 20 caregivers at NASOM.	NA	NA	High functioning autism.	Observation of three sample high functioning autism children, feedback from distributed questionnaire to all of 20 caregivers at NASOM.	The high functioning autism children seem has no difficulties swiping the touchscreen. In casefor autism children with sensory issues, they can always try using the stylus pen for browsing the tablet.
14.	See C.M. & Tang K. N. (2009)	Using a Multi-Media Presentation to Analyze Thinking Patterns of Children with Autism	To observe autistic children response to a multi-media presentation	Children withthe following criteria were divided into four groups: (1) very low functioning group, with global development of about 1-2 years old;	24 children with autism	Aged btw 5-10 years old	NA	NA	This study used a multi-media presentation. Visuals in the presentations were accompanied with music selected not to be overly stimulating,	Generally, all the children with autism responded positively to the computerized multi-media program.

No	Author(s)	Title	Aim of study	Inclusion/exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	Intervention	Outcome
				(2) low functioning group, with global development of about 3-4 years old; (3) moderate functioning group, with global development of about 5-6 years old; and (4) high functioning group with global development level equal to the chronological age.					and were organized into five collections with the following theme: (a) color, (b) light, (c) visual perception, (d) cartoon, and (e) character. A 45 minutes session was provided three times a week per child for six months. For each session, the teacher selected one or two collections and played them to the child while observing the child's behavior. A video recording was made of the session for later analysis of behavior and response. At the end of the presentation, the child was asked to draw, write, act out, or talked about what he saw and understood.	

3.4 Medical

3.4.1 Clinical Care & Therapy

No	Author(s)	Title	Study Design		Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
1.	Tan K.L. & Yadav H. (2008)	Assessing the Development of Children with Disability in Malaysia	1. To describe the characteristics of children with disability attending primary health care clinics. 2. To score the developmental assessment among children with disability using an appropriate assessment tool. 3. To determine any significant difference in the developmental assessment score among children with disability in the three major ethnic groups.	The inclusion criteria in this study include all of the cases from the pilot study. The exclusion criteria include cases from East Malaysia, cases that are not Malaysian and cases at age at assessment of more than 144 months (12 years old). This study included cases from four states involving 36 primary health care clinics. The four states include Kelantan with six clinics involving six nurses, Perak with eight clinics involving eight nurses, Johor with eight clinics involving eight nurses and Selangor with fourteen clinics involving fourteen nurses.	A total of 900 children with disability attending rehabilitation provided by the primary health care clinic were included in the study. 5.6% autism (50),	The mean age 57.5 months for all participants	NA	NA	No intervention	There was a statistically significant difference between the major ethnic groups in delayed speech and attention deficit hyperactive disorder.

No	Author(s)	Study Design			Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
2.	Tan K.L. & Yadav H. (2008)	Reassessment on the Development of Children with Disability in Malaysia.	To determine any significant difference on the development of children with disability reassessed at three months and at six months according to ethnic group and types of disabilities.	A total of 168 children with disability were assessed at three different time intervals (baseline, three months and six months).	16/168 autism	1-120 months	NA	NA	No intervention	Significant differences in the mean total scores at three months interval for mental retardation while statistically significant differences at six months interval were noted for Down syndrome, Autism, Cerebral palsy, mental retardation and delayed speech.
3.	Leong H. M., Carter M. & Stephenson J. (2013)	Sensory Integration Therapy in Malaysia and Singapore: Sources of Information and Reasons for Use in Early Intervention	To investigate: (a) What were the sources of in- formation about SI therapy used by intervention service providers; (b) Why was SI therapy chosen by intervention service provid- ers; and (c) How did intervention service pro- viders determine who should receive SI therapy.	Provides SI therapy	32 Malaysian provider that provides SI therpay	NA	SI therapy	NA		85.6% of their clients are ASD. Staffing and teaching qualifications. Sources of information and training and dura- tion of using SI therapy. Reasons for using SI therapy. Criteria for using SI therapy.

No	Author(s)	Study Design			Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)	Intervention	Outcome
4.	Leong H.M., Stephenson J. & Carter M. (2011)	The Use of Sensory Integration Therapy by Intervention Service Providers in Malaysia.	To explore the use of SI therapy in intervention centres in Malaysia and staff perceptions of the therapy; What were the sources of information about SI therapy? Why was SI therapy chosen as an intervention strategy? How did intervention centres implement SI therapy? What effects did teachers and administrators report?	A total of 10 teachers, including seven senior teachers and three regular teachers, from the seven education centres participated in the interviews.	10 teachers	NA	NA	NA	NA	Sources of Information about Sensory Integration Therapy. Reasons for Selecting Sensory Integration Therapy. Implementation of Sensory Integration Therapy. Effects of Sensory Integration Therapy.

3.4.2   Prevalence and Risk Factors

No	Author(s)	Study Design		Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		

No	Author(s)	Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	Intervention	Outcome
6.	Ong J.H..L, Dani N.A. & Johari A.Z. (2013)	Auditory Stimulus for Children With High Functioning Autism: Towards Reducing Developmental Disorders and Inattentive Attitudes.	To determine whether developmental disorders and inattentive attitudes of children with high functioning autism can be reduced by the use of auditory stimulus.	IQ (FSIQ) above 70 and have sufficient language to complete the task. They displayed adequate attention to music and motor or vocal imitation abilities and no mental retardation.	5 children with ASD	Mean age 12.2 years	Boys	HFA	Interventions are assigned alternately to weekly 30 minutes learning session each for musical stimulus auditory stimulus followed by musical songs auditory stimulus for 8 weeks without washout period.two different types of auditory stimulus, namely musical auditory stimulus and musical songs auditory stimulus.	The target variables were language, social, cognitive, emotion responsiveness and inattentive attitudes. The highest frequency is language responsiveness (19 counts or 40%). The second highest frequency is cognitive responsiveness (11 counts or 23%). Emotion responsiveness is higher than social responsiveness by 1%, i.e 9 counts or 19% whereas social responsiveness is listed at the bottom with 8 counts or 19%. HFA Inattentive attitude was found to decrease during the musical songs auditory stimulus learning sessions.
7.	Aina Mariana A.M. & Wong S.L. (2011)	Children with Learning Disabilities in the Paediatric Clinic, hospital Tunku Ja'afar Seremban: An Overview	To determine the prevalence of children with learning disabilities in the Paediatric Clinic, Tuanku Ja'afar Seremban Hospital. 2. To document the demographic data of	Patients who were born in 1996 to 2003 (ages between 5 to 12 years in 2008) attending the Paediatric Clinic were included in this study	355 /1320 patients (26.9%) had LD	NA	65.6% of males to 34.4% of females	NA	NA	From these patients, 355 (26.9%) were found to have learning disabilities. the most common was syndromes (27.6%), mainly Down syndrome. The next most common medical problem was Attention Deficit Hyperactive

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if avail able)	
			patients with learning disability. 3. To determine the age of detection for the learning problem. 4. To determine associated medical problems of the children with learning disability. 5. To determine the types of intervention received by the patients.							Disorder (ADHD) (12.8%) followed by epilepsy (11.3%). Other common causes included autism (7.2% - 6)
8.	Toh T. H., Wong S. C., Abdullah M.R. (2011)	Clinical Diagnosis and Non-Verbal Ability of Primary-One School Children with LD.	To study the clinical diagnoses and non-verbal ability of primary-one school children referred with LD after the paediatric assessment, as well as associated behavioural issues and socio-econominical background.	All primary-one school children referred by the schools to Lau King Howe Memorial Children Clinic for the year 2010.	Ninety-three of them (37.8%) were primary-one school children referred for LD.	Mean age: 7.09±0.36	NA	NA	NA	By ethnic group, there was no significant difference between the ethnicity and sex (p = 0.97).Majority of them had Borderline ID (n = 35, 37.6%), followed by Mild ID (n = 18, 19.4%), ADHD (n = 11, 11.8%) and Specific Language Disorder (include Dyslexia, n = 10, 10.8%). ASD 5 (5.4%)

No	Author(s)	Study Design			Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)	Intervention	Outcome
9.	Abdullah M.N., Mohamad W.M.Z.W., Abdullah M.R., Yaacob M.J. & Baharuddin M.S. (2012)	Perinatal, maternal and antenatal associated factors for autism: A case control study	To explore the Perinatal, antenatal and maternal associated factors for autism.	Autistic cdren aged 2 and 10 years old. Born at HPP or HBM. Exclusion criteria - incomplete data more than 30% in hospital record.	156	NA	NA	NA	NA	7 risk factors identified: multiple pregnancy, psychiatric disorder, birth asphyxia, parity between 2 and 3, maternal smoking, maternal age, race. Chinese X10 compared to Malay whilst India X5.

3.4.3   Intervention

No	Author(s)	Title	Study Design		Participant's characteristic				Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
10.	Norsiah F. & Mohd Mahayuddin N.A. (2014)	Brain Training to Improve Sociability and Behavior of Autism Spectrum Disorder (ASD) Children and Young Adults	This article details on the use of brain training device, Neuro feedback Training (NFT) device to improve the sociability and behaviour of ASD children and young adults.	NA	34 participants diagnosed as having symptoms of autism by medical doctor and psychologists were purposely selected from Kuching Autistic Association.	3-20 years	NA	NA	Neuro feedback Training (NFT)	The findings showed an overall improvement in total ATEC score. Sociability and behaviors are among ASD children and young adults. There is a difference between ATEC post-test score in behavior with the age of participants.
11.	Chiang E. F. & Ching S. L. (2012)	Communication Responses of an Indian Student with Autism to Music Education	To investigate the communication responses of a male subject with autism towards music intervention.	NA	1 boy with autism	6	Male	NA	15 Musical intervention	The subject had obvious improvement in his verbal and non verbal interaction as well as his reading and singing skills after intervention.
12.	Abd Rahim N., Sujud A., Yacob Y. & Zainon Hamzah Z. A. (2008)	Digital pictures to enhance Storytelling amongst special needs children	To investigate Asperger children's motivation level when using digital pictures in creating a short story in the task based English language classroom and in-vestigate the language use in the short story created by asperger children when using digital camera in the task based English language classroom	NA	4 children with asperger's syndrome	NA	7-15 years old	Aspergers' syndrome	NA	Overall, the nature, number and balance of interac tions do help to reveal certain aspects of the motivation levels

No	Author(s)	Title	Study Design			Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
13.	Othman A. & Kamarudin F.N. (2011)	Disability Learning Tool: Brushing-Teeth Using Music For Autism.	1. To investigate and analyze the acceptance of different types of music among autism children. 2. To develop a 3D animation that show steps in brushing teeth according to the beat of the selected music. 3. To analyze the effectiveness of the application in simulating remembrance brushing technique skills.	2 cycles of testing. The first group was the autism students with ranging ages from 5 to 12 years old. There were 8 students altogether. the other group was the teachers(3) who work at the autism centre/ school.	8 students and 3 teachers	Students 5-12 years old	NA	NA	Computer application for brushing teeth.	The system shows a positive result in increasing the independence among autism children.
14.	Bilkis B. & Jomhari N. (2013)	Interactive Stroller for increasing Focus Time and Participation in Learning Al Quran for Autistic Children.	To identify an environment that accommodates learning and hyperactive behavior of autistic children.	NA	Participant used for this study was Afiz. He is and has been diagnosed since the age of 3 years.	11 years old	M	Low functioning class	NA	Result of this study indicated that the level of participation in a stroller and car increased and it was more effective for gaining the child's participation compared to the sitting in the class.

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
15.	Norkamariah M., Tarveen K., Zainal Abidin Z., Asha Hasnimy M.H. & Halijah I. (2006)	Leaving no children behind': Investigation on gross motor skill among autistic children	To investigate the performance of gross motor skills among children with autism.	The children have medical records with their diagnosis	seven	12	NA	NA	NONE	Results indicated that the autistic children scored lower than their normal peers. The mean score of gross motor activities indicated that autistic boys perform better than autistic girls. The autistic children showed difficulties in performing non- locomotors movements as compared to locomotors movements.
16.	Chiang E. F. & Mohd Jelas Z. (2010)	Music education for children with autism in Malaysia	To enhance our understanding of the effects of teaching group music to 5 children with autism	Their attendance rate and three similar skill levels.	5 children with autism	NA	NA	NA	Group music education	Group music teaching was generally effective in improving verbal and non verbal communication, and the demonstration of both positive motor skill development as well as negative motor reactions among the subjects.
17.	Yap B. C., Salleh A. & Jusoff K. (2011)	Portrait Drawings Therapy: Windows of Hope for Children with Autism Spectrum Disorder	Reports the ability of a group of children with autistic spectrum disorders (ASD) in recognising face using potrait drawing technique.	NA	Eight students. Participants with ASD and non-ASD with unknown developmental problems were chosen from special education class while students with learning difficulties	aged between 9-12	2 girls and 6 boys	NA	NA	Portrait drawing can be used to establish communication among non-ASD children. The results imply that drawing technique has a potential to draw autistics children attention and teacing them to recognise faces.

No	Author(s)	Study Design				Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
					are selected from the typical classes that have the lowest results in the school.					
18.	Tan T.B. & Loh S.C. (2006)	Program Intervensi Kemahiran Membaling Bola Terhadap Pelajar Autisme Sekolah Menengah: Satu Kajian Kes	To examine the effectiveness of an intervention program on ball throwing skill and to explore autistic students' ability in throwing the ball right at the target.		3 males	14-18	3 males	All are enrolled in the Special Education Integrated Program in two secondary schools in K.Lumpur.	Intervention program on ball throwing skill	The results showed that the intervention program was effective in enhancing the ability of three autistic students in ball throwing. Subjects A, B, and C each demonstrated the ability to throw the ball right at the target with distances of 32 feet, 12 feet and 2 feet respectively.
19.	See C.M. (2012)	The use of music and movement therapy to modify behaviour of children with autism.	To study the impact of music and movement therapy on the behaviour fo children with autism.	The subjects were enrolled in a center for childrenwith autism.	41	2-22 year old	34 males, 7 females	NA	Music and movement therapy	The research findings indicated that most of the children (75.0%) in Group 1 and more than half of the children (61.9%) in Group 2 were less restless after they had undergone the music and movement therapy. Meanwhile, half of the children (50.0%) in Group 1 and 61.9% of those in Group 2 were less fidgety after they had undergone music and movement therapy.

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
20.	See C. M. (2014)	Use of Music and Movement Therapy to help persons with Autism	To examine the use of Music and Movement Therapy in training and improving motor and coordination skills amongst children with autism.	NA	41	ranging from 2 to 22	7 girls and 34 boys	NA	Music therapy. The participants were observed and evaluated over a 10-month period using a Motor and Coordination Performance Checklist that was developed specifically for this study. The motor and coordination performance of the children and adolescents were evaluated by the parents, facilitators and research assistant once a month, at every last session of the months.	The overall results from this study confirmed the effectiveness of Music and Movement Therapy in developing and training the gross motor, fine motor and coordination skills of persons with autism.

No	Author(s)	Title	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if available)		
1.	Nikmat A.W., Ahmad M., Ng L. O. & Razali S. (2008)	Stress and psychological wellbeing among parents of children with autism spectrum disorder.	To investigate the prevalence of parental stress and psychological wellbeing among parents with autistic children and their associations with dimensions of support system.	Those parents aged be-tween 30 and 60 years old, who had children with autism spectrum disorders aged between 2 and 12 years old were enrolled in this study. Exclusion criteria included parents with any history of psychological disorders such as depression or anxiety disorders and having any general medical conditions that might affect the study.	52	24 subjects (46.2%) falls within 21 to 30 years old and 28 subjects (53.8%) falls within 31 to 40 years old.	34 (65.4%) subjects were female and 18 (34.6%) were male.	Autistic Spectrum Disorders by experience child psychologists in Health Psychology Unit, Universiti Kebangsaan Malaysia (UKM)	Not relevant	More than half of the parents perceived that their child has average to high severity of autistic symptoms. Aa significant difference between gender and psychological wellbeing of the parents with autistic children. Moreover there was a significant difference between occupation and psychological wellbeing of the parents with autistic children. No significant difference between the levels of parental stress and occupation.There was no significant correlation between severity of autistic symptoms perceived by the parents and parental stress, psychological wellbeing, and dimensions of support system received by parents with autistic children.

No	Author(s)	Study Design		Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)		

No	Author(s)	Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	Intervention	Outcome
2.	Vetrayan J., Daud A. & Smily Jesu P. V. P. (2013)	Level of hopelessness among parents with autistic children	To identify level of hopelessness among paretns with autistic children	Parents with autistic children	33 parents with autistic children; aged 31-60 (mean 39 5 months)		10 moderate & 23 severe			Minimal level of hopelessnes.
3.	Shobana M. & Saravanan C. (2014)	Comparative Study on Attitudes and Psychological Problems of Mothers towards Their Children with Developmental Disability	To measure the prevalence of psychological problems among mothers of children with autism disorder, intellectual disability, and Down syndrome. The second aim was to assess the differences in mothers' attitudes and psychological problems among their children with intellectual disability, autism disorder, and Down syndrome. The third aim was to identify whether negative attitude was a predictor of psychological problems in these mothers.	112 mothers of children having mild and moderate levels of autism disorder, Down syndrome, and intellectual disability were assessed using the Parental Attitude Scale and General Health Questionnaire–28. autism disorder (AD), Down syndrome (DS), and intellectual disability (ID). 7excluded because did not meet criterion and 5 were unwilling to participate due to lack of time. Thus, 100 mothers of children with AD (n = 34), DS (n = 32), and ID (n = 34) were included in this study. Mothers who					NA	14 (41%) without psychological problem. Mothers of children with AD exhibited higher negative attitude (mean ± standard deviation score, 40.41 ± 7.79) compared with their counterparts with DS ($35.53 ± 6.53$; $p = 0.02$). attitudes of mothers of children with AD and ID no significant problem. negative attitude significant predictor of psychological problem. Parents who harbour negative attitudes towards their children experience.

No	Author(s)	Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if available)	Intervention	Outcome
			Study Design				**Participant's characteristic**			
				were unwilling to participate and those with children having severe disabilities were excluded. Children with severe and profound ID were excluded from this study as they might exhibit behavioural and organic problems.						
4.	Osada H., de Amorim A.C., Velosa A., Wong P. W., Lotrakul P. & Hara H. (2012)	Depression risks in mothers of children with developmental disabilities: A cross-cultural comparison of Brazil, Colombia, Malaysia and Thailand.	To examine the risks and actual presence of depression in these countries (Brazil, Columbia, Thailand, Malaysia) among mothers of children with developmental disabilities, and to describe their depressive features.	The participants were mothers of children with developmental disabilities.Their children received professional care, but the mothers themselves had never consulted with a mental health professional.	30/161 from Malaysia	mean 42.6	Mothers	ASD (37.5% of children)	Not relevant. They used the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977, 1991)	The numbers of mothers who were observed to have a high level of depressive symp-toms, there were significant differences among countries.Morbid depression is more common among mothers of children with disabilities in Latin America than in Southeast Asia. Due to small sample size, except for Colombia, it seems to be difficult to generalize our results for mothers of children with developmental disabilities.

3.5.2 Perceived support, coping strategies & quality of life of parents with children with ASD

No	Author(s)	Study Design			Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
5.	Poh C. S. & Siew H. T. (2012)	A Survey on Quality of Life and Situational Motivation among Parents of Children with Autism Spectrum Disorder in Malaysia	To find the association between different types of motivation and QoL of parents of children with ASD.	Inclusion: parents having a child with ASD.	47 parents who had at least a child with ASD	74% were age 36 or above	77% were female.	NA	NA	The results found that more parents with high intrinsic motivation to participate in the program have better social relationships than those with low intrinsic motivation, and more parents with high identified regulation to participate in the program have better physical health than those with low identified regulation. No such association was found in those parents who participated in the programs due to the external regulation and motivation.
6.	Clark M., Brown R. & Karrapaya R. (2012)	An initial look at the quality of life of Malaysian families that include children with disabilities	Reports initial exploration of the quality of life of Malaysian families that include children with developmental/intellectu al disabilities.	NA	Members of 52 families that included one or two children with disabilities	NA	NA	NA	Questionnaire data were collected using the Family Quality of Life Survey – Short Version.	Findings showed a consistent pattern of relatively strong perceived 'importance' ratings in each of life domains as compared to mean ratings for other family quality of life dimensions. Some dimensions of family quality of life, in particular 'opportunities', 'initiative' and 'attainment', demonstrated particularly strong associations with each other. Overall means of satisfaction with and attainment of family quality of life as well as global evaluations of quality of life and

No	Author(s)	Study Design			Participant's characteristic				Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
										satisfaction all demonstrated significant associations, although each of these correlations accounted for less than 50% of the common variance.
7.	Hasnah T., Yunus v., Mohd Hanafi M.Y. & Wan Md Zain W.N. (2013)	Support for Parents of Children with Disabilities in Malaysia	To understand the availability and type of support perceived by parents of children with disabilities in Malaysia	NA	20 parents of children with disabilities	5 males, 15 females	22 - 56 years old	NA	NA	Lack of comprehensive information and support for parents of disabilities in Malaysia. Supports for parents come from informal sources eg family, friends and other parents.
8.	Ting S.H. & Chuah H.K. (2010)	Parents' Recognition of Autistic Behavior and Their Coping Strategies: A Case Study at Sarawak Autistic Association.	Reports the parents' recognition of autistic behaviour of their children and the coping strategies they used to handle their children's behaviour.	Parents who sending their child to the Resource and Educational Centre, Sarawak Autistic Associatio, Kuching	12 parents with children registered at the Sarawak Autistic Association, Kuching.	Parents: aged 29 to 48	NA	NA	NA	The behavioural indicators of autism highlighted by the parents were stereotypic behaviour, sleep problems, hyperactivity and hypersensitivity to specific sounds. The autistic children also showed difficulty mixing with peers, liking to be hugged and lack of eye contact. However, it was the loss of speech ability and absence of speech development which alerted them to the possibility of autism. The study revealed that the parents handled their distress and anxiety mainly through religious means and family support.

3.5.3 Public awareness

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if avail able)		
9.	Jin K. K. & Chin C. G. (2012)	Narrative from the Care Givers of Autism Spectrum Disorder Children in Malaysia.	To hear the voice of the caregivers.	7 autistic children	Groups; Asperger's Syndrome group and a control group consisting of normal.	NA	NA	NA	Written records about the behaviour of the autistic children over 4 months and interview the caregivers.	Lack of awareness and understanding of children with autism among the gen eral public in Malaysia.

3.5.4   Parents' recognition of symptoms of ASD

No	Author(s)	Study Design		Population of study (n)	Participant's characteristic			Intervention	Outcome
		Title	Aim of study	Inclusion/ exclusion criteria		Age	Gender	Type of autism (if avail able)		
10.	Yeo K. J. & Lu Xi (2014)	Factors Associated with Diagnosis of Autism Spectrum Disorder (ASD) under the Age of 24 Months in Malaysia Diagnosis signs & symptoms.	1. To identify the first symptom found by mothers of children with ASD 2. To identify home and child related factors associated with early diagnosis of ASD under the age of 24 months.	Mothers of children with autism spectrum disorder (ASD) who were born within the period of 1998 to 2008 in Malaysia.	79 mothers	20-41 years	NA	autism spectrum disorder (ASD)	No inetrvention	Speaking problem is found to be the first symptom of autism by 60% of the mothers with children diagnosed with ASD under the age of 24 months, followed by playing alone (45%), communication with parents (40%), odd behavior (35%), and self injury (5%). diagnosed with ASD after the age of 24 months, the highest report on first ASD symptom is still difficulty in learning to speak (69.49%), followed by odd behavior (37.29%), playing alone (32.20%), communication with parents (30.51%), and others (8.47%).

3.6   Miscellaneous

No	Author(s)	Title	Study Design			Participant's characteristic			Intervention	Outcome
			Aim of study	Inclusion/ exclusion criteria	Population of study (n)	Age	Gender	Type of autism (if avail able)		
1.	Saiman K., Sinnatamby S., Mustafa L.M., Alias N. & Siraj S. (2013)	Impact of Video on Learning in Students with Autism in Malaysia: Future Prospects.	To obtain the views and consensus of experts on the impact of video on the learning of students with autism in Malaysia.	NA	Interviews involving 6 experts from Federal Territory, Penang, Malacca and Selangor aimed at developing the themes for the study. From the themes derived, a set of questionnaires was produced. The questionnaire was then distributed to 20 experts including the 6 experts interviewed earlier to identify the themes.	NA	NA	NA	The use of video by experts, identifying behavior of students with autism in their use of video and determining the limitations of video and ways to overcome them by using the Fuzzi Delphi technique.	Choosing videos suitable for the capability level of students with autism.

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