International Journal of Multidisciplinary Research and Development

Volume: 2, Issue: 8, 529-535
Aug 2015
www.allsubjectjournal.com
e-ISSN: 2349-4182
p-ISSN: 2349-5979
Impact Factor: 3.762

Patricia Ng Mui Hoon
Research Associate, Katong School, Singapore

Noel Chia Kok Hwee
Early Childhood & Special Needs Education Academic Group, National Institute of Education, Nanyang Technological University Singapore

Correspondence
Noel Chia Kok Hwee
Early Childhood & Special Needs Education Academic Group, National Institute of Education, Nanyang Technological University Singapore

Planning a neighborhood walk for students with Autism Spectrum Disorder (ASD): from virtual to actual journey

Patricia Ng Mui Hoon, Noel Chia Kok Hwee

Abstract
The paper sets a hypothetical context for special education teachers in planning a neighborhood walk (NW) for a small group of students with autism spectrum disorder (ASD) using the Google Map Streetview (GMS) as a virtual reality application. It begins by defining clinically what ASD is as well as highlighting its psychiatric and sensory processing challenges. Knowing these challenges, it is important for teachers to keep in mind potential issues of concerns when planning to take their students with ASD out for a a learning journey or walk in the neighborhood of their school. The administration of three assessment tools is also recommended for the design of the intervention. These are the Strengths and Difficulties Questionnaire (SDQ), the 6-Factor Analysis Structure for Sensory Processing Patterns (6-FASSPP), and the Neighborhood Environment Walkability Scale (NEWS) for the assessment of the psychiatric and sensory processing challenges each student might have, as well as the walkability of the neighborhood. The data obtained from these tools can be used in triangulation to identify the hotspots or trigger points for the students. A virtual walk using the GMS format can then be customized for training in a laboratory so that they can handle the hotspots that cannot be avoided in the journey. In this way, the students can practice the walk and be conditioned to manage their behavior at the hotspots without undergoing any real risks. The congeniality of this VR application suits the principles of universal design for learning and is therefore advocated for use as an intervention for a learning journey or NW.

Keywords: *Autism spectrum disorder, Learning journey, Neighborhood walk, Virtual reality*

1. Introduction
Teaching students with autism spectrum disorder (ASD) is never an easy task. One often has to tread carefully, making sure that trigger points are avoided in order that the students would not suffer meltdowns unnecessarily. Given that it is already hard enough to control the variables in a classroom, it would be absolutely imperative for many who are concerned to try to think of ways to help and support them in organizing a trip outdoors with these students. In this paper, the authors will present the concepts for understanding the disorder, as well as various tools and the underlying rationale for using the tools to help troubleshoot the issues that may crop up in such an activity.
Clinically speaking, autism spectrum disorder (ASD) is a neurodevelopmental disorder that is also known as Pervasive Developmental Disorder (PDD) in the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition/Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) [1]. There are five disorders classified under PDD, namely, autism (or autistic disorder), Asperger syndrome (AS), PDD not otherwise specified (PDD-NOS), Rett syndrome and childhood disintegrative disorder. These five disorders share the generalized characteristics under the diagnostic category of PDD of atypical behavior, as well as delays or abnormalities in communication and social skills. Although there are various diagnostic frameworks available, the DSM is by far the most commonly used framework used by clinicians worldwide.
However, with the newly released DSM-V (American Psychiatric Association, 2013) [2], all the subtypes of PDD would fall under the new category of ASD (McMorris & Perry, 2014) [24]. This fits well with the trend in referring to children and adults as being on the *autism spectrum* as the term is coming into wider international usage. However, there are concerns that individuals might be excluded due to good specificity but poor sensitivity of the new DSM-5 criteria (Kent *et al*., 2013) [15].

Psychiatric symptoms in ASD
There is however, a range of psychiatric symptoms found in many people with ASD that do not form part of the diagnostic criteria for ASD (Hofvander *et al*., 2009; Leyfer *et al*., 2006;

Simonoff *et al*., 2008; Totsika, Hastings, Emerson, Lancaster, and Berridge, 2011) [14, 18, 31, 34]. For instance, Simonoff *et al*. (2008) [31] found that 70% of the 12-year-old children with ASD in their study met the criteria for at least one additional psychiatric disorder, while 40% had two or more additional disorders. The psychiatric symptoms most commonly found in the study of 12-year-olds were anxiety disorders (in aggregate 41.8%); oppositional defiant disorder (ODD) (30.0%) and attention-deficit hyperactivity disorder (ADHD) (28.2%). It should also be noted that mood disorders such as these may increase with age (Hofvander *et al*., 2009) [14].

The persistence of co-occurring psychiatric symptoms in ASD and the identification of risk factors for their occurrence and stability were further studied by Simonoff *et al*. (2013) [30]. Using the parent-report Strengths and Difficulties Questionnaire (SDQ), the study showed that the co-occurring psychiatric symptoms are persistent and common as well in young people with ASD. As for the risk factors, lower IQ and adaptive functioning predicted higher hyperactivity and total difficulties scores. Other risk factors such as poorer maternal mental health, family-based deprivation and lower social class predicted greater emotional problems at 16. On the bright side, factors such as greater special school attendance and neighborhood deprivation predicted the improvement in conduct problems from 12 to 16 years. Simonoff *et al*. (2013) [30] thus pointed out that psychopathology ratings are important as a potential target for intervention, rather than being dismissed as uninformative.

Sensory processing deficits in ASD

Commonly reported symptoms in addition to the core social-communication features of autism also include those of sensory processing disorders. For example, a study conducted by Tomchek and Dunn (2007) found that 95% of the sample of children with ASD showed some degree of dysfunction in sensory processing on the Short Sensory Profile (SSP) Total Score. The sample consisted of age-matched (between 3-6 years) typically-developing children and those with ASD. The greatest differences between these children were reported on the Under-responsive/Seeks Sensation, Auditory Filtering, and Tactile Sensitivity sections of the SSP. These findings correspond to those (e.g., Dunn, 1997; Miller & Lane, 2000; Miller & Summers, 2001) [11, 25, 26] where the children seek sensory input or appear distractible as they seek to avoid sensory input in the environment, or they may be hypo-responsive and passive due to their failure to orient and respond to typical levels of sensory input in the environment.

In order to establish patterns of sensory processing unique to children with ASD, Tomchek, Huebner, and Dunn (2014) [33] conducted another study using an exploratory factor analysis. With a sample of 400 children with ASD (average age of 49.58 months or 5 years 1 month), a structure was established for assessing the sensory processing difficulties in children with ASD. This structure is based on the variance in the ASD sample on six parsimonious factors: Low energy/weak, tactile and movement sensitivity, taste/smell sensitivity, auditory and visual sensitivity, sensory seeking/distractibility, and hypo-responsivity. Investigations along these lines will allow for a better understanding of the influences of sensory processing to the variable presentation of individuals with ASD. This will then bring about implications for early diagnosis and intervention.

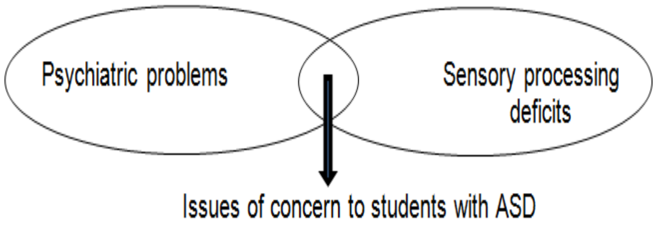

Fig 1: Two sets of challenges for students with ASD

2. Approaches in the assessment and diagnosis of ASD

In the early years of its discovery, ASD was considered an uncommon disorder. These days, however, with numerous epidemiological studies, there is concurrence that prevalence rate for all ASD is estimated to be 1% (Baird *et al*., 2006) [3]. This increase may be attributed to a greater awareness of ASD and the availability of assessment tools designed for the diagnosis of ASD. These tools vary in terms of the approach used for the assessment of children's behavior, i.e., direct or indirect. A direct assessment approach would involve the testing and observation of the child, while an indirect assessment approach would involve the use of forms or interviews to collect data from the child's parent, teacher, and/or therapist. The Childhood Autism Rating Scale (CARS: Schopler *et al*., 1988; CARS-2: Schopler, Van Bourgondien, Wellman, & Love, 2010) [27, 28] and the Autism Behavior Checklist (Krug, Akick, & Almond, 1980) [17] are examples of tools that use the direct assessment approach. Tools that use the indirect assessment approach are such as the Autism Diagnostic Observation Schedule (ADOS: Lord *et al*., 1989; ADOS-2: Lord *et al*., 2012) [19], and the Autism Diagnostic Interview-Revised (ADI-R: Lord *et al*., 1994).

3. Planning a neighborhood walk for students with ASD

In the planning of a neighborhood walk (NW) as a learning journey for students with ASD, teachers (be they from special education or mainstream schools) need to consider how the factors in the environment may affect the students, especially in terms of their co-existing psychiatric and sensory processing challenges as already briefly described earlier. To help teachers overcome a myriad of challenging issues arising from these problems, three kinds of frameworks are suggested here for this NW planning. They are (1) the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) [12]; (2) the 6-Factor Analysis Structure for the Sensory Processing Patterns (6-FASSPP) in children with ASD (Tomchek, Huebner, & Dunn, 2014) [33]; and (3) the Neighborhood Environment Walkability Scale (NEWS) (Cerin, Saelens, Sallis, & Frank, 2006) [9]. These three frameworks can be used in triangulation, so that the difficulties that may be triggered by the unpredictability of the event or elements in the environment can be pre-empted for pre-conditioning.

Using the Google Map at Streeview Level (GMS), which is a form of virtual reality technology (VRT) application, a virtual NW would be useful as a primer for predictability, and the responses displayed by these students in the virtual journey can be used as an assessment of their readiness for the actual journey.

The Strengths and Difficulties Questionnaire (SDQ)

To identify the co-existing psychiatric problems, students with ASD involved in the learning journey can be assessed beforehand with the SDQ (see Goodman, 1997) [12]. The SDQ is a brief behavioral screening questionnaire for individuals aged 4-16 years. This is tool would help teachers structure training activities with respect to the behaviors that have been found in precedence. In doing so, they pre-empt possible manifestations of challenging behaviors for intervention before and/or during the journey. To meet the needs of educationalists, researchers and clinicians, several versions of the SDQ have been developed. All versions of the SDQ have questions based on 25 attributes, some are positive while others are negative, and they are divided between 5 sub-scales as follows (see Table 1):

Table 1: Five SDQ Sub-scales

(1) Emotional symptoms (5 items)	*(1) to (4) added together to generate a total difficulties score (based on 20 items)*
(2) Conduct problems (5 items)	
(3) Hyperactivity/inattention (5 items)	
(4) Peer relationship problems (5 items)	
(5) Prosocial behavior (5 items)	

The 6-Factor Analysis Structure for Sensory Processing Patterns (6-FASSPP)

To identify the co-existing sensory processing deficits, students with ASD involved in the NW journey can again be assessed beforehand, this time by administering the 6-FASSPP. This is an effective tool for drawing out data, but the limitation is that it is based on reports by parents or significant others; hence not all potentially challenging behaviors can be predicted. Nevertheless, with available data, teachers can pre-empt the possible antecedents in order to plan for intervention by the removal of triggers if possible. Otherwise, operant conditioning by associating a certain behavior with pleasant consequences (a student's likes - to be used as reinforcements) can be used to condition a student before and/or during the journey.

To illustrate operant conditioning by using reinforcements, an example is shown here on "The Use of Invitational Equipment" from the Giant Steps-St. Louis program (Kim, Richardson, Yard, Cleveland, & Keller, 1998) [16]. In this program, the use of adapted techniques and equipment is called "invitational". The program attempts to "entice the children into using a specific piece of equipment by presenting it in a way that is exciting and appealing to the child" (Kim *et al.*, 1998, p.103) [16] to reduce avoidance behaviors. This encourages the exploration of objects and activities as they are presented in a non-threatening manner. The following account from Giant Steps-St. Louis program elaborates on the effectiveness:

> "There was a child who displayed some tactile defensiveness and could not tolerate simple touch, like a Band-Aid touching his skin or the feeling of certain shirts touching his skin, which interfered with his ability to focus. So, one therapist developed a game where the child was the 'sun'; he got to wear yellow tape stuck to his forehead, chin, and cheeks as 'rays of the sun'. He really enjoyed this game, which was exciting and nonthreatening to the child, so that gradually he was able to tolerate similar kinds of touch" (Kim *et al*., 1998; p103) [16].

Operant conditioning is therefore an attractive and viable option for helping these children overcome their weaknesses in the 6-FASSPP is shown in Table 2. Teachers should first get data on the child's likes in order to use it to shape behavior with creative formats of the behavior in operant conditioning. Here again, the virtual NW using GMS application can be the "invitational" equipment used in a creative and non-threatening format that appeals to the children's interest and develop a greater sense of engagement. "Virtual experience is similar to indirect experience in that both are a mediated experience" (Cai & Chia, 2014, p.9) [4]. It resembles direct experience because both are interactive in nature (Hoch & Deighton, 1989) [13].

Table 2: The Six Factors in the 6-FASSPP Instrument (adapted from Tomcheck *et al*., 2014) [33]

Factor 1: Low energy/weak	Factor 2: Tactile and movement sensitivity	Factor 3: Taste/smell sensitivity
• Seems to have weak muscles • Poor endurance/tires easily • Can't lift heavy objects • Has a weak grasp • Tires easily, especially when standing or holding particular positions • Props to support self	• Reacts emotionally or aggressively to touch • Withdraws from splashing water • Rubs or scratches out a spot that has been touched • Becomes anxious or distressed when feet leave the ground • Fears falling or heights • Has difficulty standing in line or close to other people • Dislikes activities where head is upside down • Expresses distress during grooming • Avoids going barefoot, especially in grass or sand • Prefers long-sleeves even when it is warm; or short when it is cold	• Will only eat certain tastes • Picky eater especially regarding food textures • Avoids certain tastes or food smells typically part of child's diet • Limits self to particular food textures/temperatures

Factor 4: Auditory and visual sensitivity	Factor 5: Sensory seeking/distractibility	Factor 6: Hypo-responsivity
• Can't work in background noise • Has trouble completing tasks when the radio is on • Holds hands over ears to protect ears from sound • Is distracted or has trouble functioning if there is a lot of noise • Responds negatively to unexpected loud noises • Is bothered by bright lights after others have adapted to the light • Covers eyes or squints to protect eyes from light • Watches everyone when they move around the room	• Becomes overly excitable during a movement activity • Seeks all kinds of movement and this interferes with daily routines • Jumps form one activity to another so that it interferes with play • Has difficulty paying attention • Enjoys strange noises/seeks to make noise for noise's sake • Touches people and objects	• Doesn't seem to notice when face and hands are messy • Doesn't respond when name is called but hearing is OK • Appears to not hear what you say • Leaves clothing twisted on body

Neighborhood Environment Walkability Scale (NEWS)

The walkability of a neighborhood can be measured using Geographic Information Systems data on dwelling density, intersection density, net retail area, and land-use mix. Such data has been used for the development of the Neighborhood Environment Walkability Scale (NEWS) to assess perceived neighborhood environmental attributes (Cerin, 2010; Cerin, Leslie, Owen, & Bauman, 2008; Cerin, Macfarlane, Ko, & Chan, 2007; Cerin, Saelens, Sallis, & Frank, 2006) [6, 7, 8, 9]. The attributes of a neighborhood for walking in the NEWS are residential density, proximity and access to stores and facilities, street connectivity, traffic hazards, infrastructure and safety for walking and cycling, aesthetics, and safety from crime.

4. Triangulating data from the three instruments

An actual NW journey is a good way helping students with ASD acquire the rich sensory experience. However, much thought has to be put into the planning because of the sensory processing and psychiatric challenges that can co-exist with ASD in these children. Even when there are positive attributes in low traffic hazards, good street connectivity and infrastructure, as well as safety and security for walking on pavement, there are many other sensory stimuli that can trigger undesirable behavior in these children. Data on residential density, stores and facilities for instance, can be analyzed for motor and human traffic conditions, as well as cycling behavior. Triangulating data on their sensory issues may implicate the need for conditioning with respect to the "hotspots" such as loud traffic noises that may be negative sensory triggers to students with ASD. Hence, the GMS application can be used in preparing the students with ASD what to expect in respect to the relevant sensory issues that would arise during the actual NW.

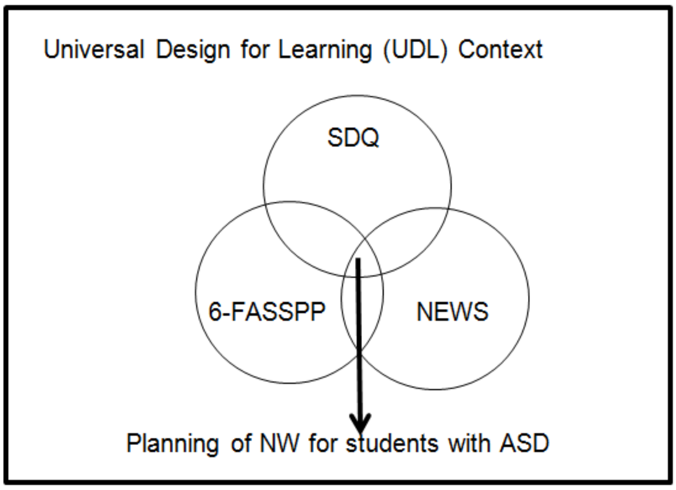

Fig 2: Triangulation of data from the three assessment tools

Co-existing psychiatric problems identified through the SDQ administration can be also analyzed in triangulation with the sensory issues. For instance, ADHD or conduct disorder in students with ASD in class would implicate the need to pay attention to the wandering behavior in particular. With respect to the sensory factors in the 6-FASSPP, although the low energy/weak factor may seem to be counter-intuitive to wandering behavior, the motor limitations of students with ASD in certain activities can actually drive them to move and explore their environment without an intended purpose (Tomcheck *et al*., 2014) [13]. Anecdotal accounts from teachers about school lock-down incidents when students with ASD go missing serve to indicate such wandering behavior even within school premises. As accidental drowning may also account for lethal outcomes besides the obvious road traffic hazards, teachers need to take note of the water features that they may encounter during the NW journey. The virtual NW using the GMS application can again be applied to the teaching and practice of explicit rules to elicit the desired behavior in avoiding accidents at hotspots noted during the virtual walk.

5. A universally designed neighborhood walk learning journey

To ensure that the GMS application used in the virtual NW is universally designed to meet the needs of students with ASD, the meaning of Universal Design for Learning (UDL) is to be first understood. According to the Center for Applied Special Technology (2014) [5], or CAST for short, the UDL set of principles is used for the development of curriculum such that all individuals with and without disabilities can be given equal opportunities to learn. Through UDL and innovative uses of technology, learning opportunities, especially for those with disabilities and at-risk learners, can be expanded. The focus of UDL is on the three primary brain networks that individuals bring to learning. The three are namely, (1) the recognition network, i.e., the *what* of learning (also known as *episteme*) (Chia, 2013) [10]; (2) the strategic network, i.e., the *how* of learning (also known as *techne*) (Chia, 2013) [10]; and (3) affective network, i.e., the *why* of learning (also known as *telos*) (Chia, 2013) [10]. Chia (2013) [10] has termed the interrelationship among epis*T*eme, *T*elos and *T*echne the Triple-T model of learning for students.

The recognition network: The what of learning

The recognition network governs how one gathers facts and categorizes what is seen, heard, and/or read. One person's recognition network may be wired differently from another person. This means that people may perceive and/or comprehend presented information differently. This is especially so for people with language or cultural differences, learning disabilities and sensory impairments such as deafness and blindness. In developing VR applications, the sensory processing difficulties in an individual with ASD would need to be identified for accommodations to be made to present information in a format that is compatible. For example, in creating a virtual NW simulation, the Sensory Profile of a student with ASD is required in order to prepare accommodations for him/her in a format that is compatible to his/her sensory needs.

The strategic network: The how of learning

The strategic networks individuals possess, can be different as well. Strategic tasks are planning and performing tasks. How individuals (and more so for students with ASD) go about organizing and expressing their ideas can be very different. Some may have strengths in written expression but not speech, and the reverse may be true for others. It should also be noted that a great deal of strategy, practice, and organization is required for action and expression. This can be particularly so for an individual with ASD. Therefore, it is essential to provide options for action and expression, so VR applications should be grounded in this aspect. Applied to the NW, a virtual simulation of the NW would offer the practice for action and expression in a safe environment. This would be ideal for students with ASD who may have severe sensory processing issues. Suffering a meltdown during the actual NW can also be traumatic for teachers, especially if they are new teachers or encountering such an episode for the first time. Therefore, the teachers can benefit from such an intervention as well.

The affective network: The why of learning

The affective dimensions of students with ASD can also be different in the way they are excited, challenged, or interested. For instance, some can be fired up by novelty and spontaneity while others can be frightened by those aspects, and prefer strict routines. Some may like group work, while others may prefer to work alone. Consequently, there is a need to provide multiple means of engagement in order to elicit the optimum performance from different students with ASD. The success of the Virtual Dolphin initiative (citation needed?) would provide the assurance that VR applications can appeal to the affective dimensions of individuals with ASD to be used as a means of engagement.

6. GMS application as a therapeutic and training tool

In planning the NW journey optimally, the triangulation of data has been discussed for pre-empting hotspots along the way. Strategies based on operant conditioning as mentioned earlier, can be used to help the students with ASD overcome the difficulties that may be encountered in the journey. With respect to the recognition networks, being immersed in a laboratory environment using the GMS application would present information about the learning journey in a format that would far transcend the compatibility and effectiveness of using just chalk and talk, plain images, miniature 3-D models of the environment or even video-modelling.

The success of experiential learning through video modelling for ASD sufferers would in fact form the platform for using VR applications to take it to the next higher level. Therapeutic and training applications in video-based modelling (VBM), as elaborated in a recent meta-analysis by Mason (2013) [22] includes Video Self-Modeling (VSM) where the target individual models the skill or behavior, as well as Video Modeling Other (VMO) where another individual is the model. A third format where no models are employed, but the entire task is shown before engaging the target participant in imitation, is known as video priming (McCoy & Hermansen, 2007) [23]. In priming, whether in-vivo or video, any student can preview a future event; hence, it becomes more predictable. This has been found to reduce or even eliminate the difficulties students with ASD have (Wilde, Koegel, & Koegel, 1992) [35]. VR technology-based applications can be used in similar ways and even elevate the learning experience with interactive elements that are absent in VBM and video-priming formats. Furthermore, avatars can also be used as an interactive source of engagement. To illustrate the effectiveness of priming for a NW journey to be taken, a video priming study by Schreibman and Whalen (2000) [29] is elaborated here as such a priming intervention can be improved with VR applications. In the study, one of the three subjects was a boy with mild to moderate autism named Lee (6 years 5 months; IQ 62). Lee's tantrum behaviors included dropping to the ground, screaming, crying, hitting, pinching, and pulling on his parents. He had engaged in tantrum behaviors in public settings, such as the shopping mall. Whenever his parents attempted to take him anywhere else in the mall other than his favorite store, he would engage in his tantrums. In each of Lee's treatment videos, a different entrance was used as the start. The journey went on through four or five stores in the mall before ending at his favorite store, which was a powerful reinforcer for him.

During video modeling treatment, the parents would praise Lee for watching the video; and then they would travel the same routes in the mall as depicted in the priming video. The results not only showed that Lee's problem behaviors were reduced, but were generalized to untrained transitions, and maintained during post-treatment and a follow-up probe one month later. From the UDL perspective, we can see that the cognitive format of video priming was compatible for Lee's cognition of the task, and the strategic dimension of practice and organization provided for his action and expression at the mall. Together with the journey ending at Lee's favorite store, which is a powerful, intrinsic reinforcer, the affective dimension was incorporated to elicit his cooperation. The design of the successful experiential learning format of a journey illustrated here can very much be enhanced and made more believable using VR applications to overcome the limitations of the fixed scenarios in a video.

There is basis for optimism that the GMS application of VR technology can help teachers overcome the challenges in managing the co-existing psychiatric and sensory processing challenges in bringing students with ASD out on a learning journey or NW. The success of VR technology-based interventions for special education such as that of the Virtual Dolphin initiative (citation needed?) is testament to this. With an understanding of their recognition, strategic and affective networks for the underpinning of UDL in GMS applications, students with ASD can be given the right support to achieve the objectives of an actual NW journey set out for them. Therefore, the authors strongly advocate the use of VR technology for the development of GMS-based NW simulation activities/games for therapeutic and training applications.

7. References

1. American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders (DSM-IV-TR) (4th ed., text revision). Washington DC: American Psychiatric Association.
2. American Psychiatric Association (2013). Diagnostic and statistical manual of mental disorders (DSM-V) (5th ed.). Washington, DC: American Psychiatric Association.
3. Baird, G., Simonoff, E., Pickles, A., Chandler, S., Loucas, T., Meldrum, D., & Charman, T. (2006). Prevalence of disorders of the autism spectrum in a population cohort of children in South Thames: the Special Needs and Autism Project (SNAP). Lancet, 368(9531), 210-215.
4. Cai, Y., & Chia, N.K.H. (2014, Fall). Virtual experiential learning study: Application of virtual reality technology in andragogic approach to professional development of mental healthcare practitioners. Unlimited Human!, 8-10.
5. Center for Applied Special Technology (CAST) (2014). About UDL. Retrieved December 10, 2014, from http://www.cast.org/udl/
6. Cerin, E., Sit, C.H.P., Man-chin, C., Sai-yin, H., Lok-chun Janet, L., & Wai-man, C. (2010). Reliable and valid NEWS for Chinese seniors: measuring perceived neighborhood attributes related to walking. International Journal of Behavioral Nutrition & Physical Activity, 7, 84-97. doi: 10.1186/1479-5868-7-84
7. Cerin, E., Leslie, E., Owen, N., & Bauman, A. (2008). An Australian version of the neighborhood environment walkability scale (NEWS): Validity evidence. Measurement in Physical Education and Exercise Science, 12, 31-51.
8. Cerin, E., Macfarlane, D.J., Ko, H.H., & Chan, K.C.A. (2007). Measuring perceived neighbourhood walkability in Hong Kong. Cities, 24, 209-217.
9. Cerin, E., Saelens, B.E., Sallis, J.F., & Frank, L.D. (2006). Neighborhood environment walkability scale: Validity and development of a short form. Medicine and Science in Sports and Exercise, 38(9), 1682-1691.
10. Chia, N.K.H. (2013). Modified lesson study within the integrated teaching-learning framework for professional development of special education teachers. Educational Research International, 2(1), 22-33.
11. Dunn, W. (1997). The impact of sensory processing abilities on the daily lives of young children and their families: A conceptual model. Infants and Young Children, 9(4), 23-35.
12. Goodman, R. (1997). The strengths and difficulties questionnaire (SDQ): A research note. Child Psychology & Psychiatry & Allied Disciplines, 38, 581-586.
13. Hoch, S.J., & Deighton, J. (1989). Managing what consumers learn from experience. Journal of Marketing, 53, 1-20.
14. Hofvander, B., Delorme, R., Chaste, P., Nydén, A., Wentz, E., Ståhlberg, O., et al. (2009). Psychiatric and psychosocial problems in adults with normal-intelligence autism spectrum disorders. BMC Psychiatry, 9, 35-43.
15. Kent, R.G., Carrington, S.J., Le Couteur, A., Gould, J., Wing, L., Maljaars, J., & Leekam, S.R. (2013). Diagnosing autism spectrum disorder: Who will get a DSM-5 diagnosis? Journal of Child Psychology and Psychiatry, 54, 1242-1250.
16. Kim, S., Richardson, L., Yard, G., Cleveland, M., & Keller, K. (1998). Giant Steps-St. Louis: An alternative intervention model for children with autism. Focus on Autism and Other Developmental Disabilities, 13, 101-107.
17. Krug, D. A., Akick, J., & Almond, P. (1980). Behavior checklist for identifying severely handicapped individuals with high levels of autistic behavior. Journal of Child Psychology and Psychiatry and Allied Disciplines, 21(3), 221-229.
18. Leyfer, O.T., Folstein, S.E., Bacalman, S., Davis, N.O., Dinh, E., Morgan, J., Lainhart, J.E., *et al.* (2006). Comorbid psychiatric disorders in children with autism: Interview development and rates of disorders. Journal of Autism and Developmental Disorders, 36, 849-861.
19. Lord, C., Rutter, M., DiLavore, P. C., Risi, S., Gotham, K., & Bishop, S. (2012). Autism Diagnostic Observation Schedule, Second Edition (ADOS-II). Los Angeles, CA: Western Psychological Services.
20. Lord, C., Rutter, M., & Le Couteur, A. (1994). Autism Diagnostic Interview-Revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. Journal of Autism and Developmental Disorders, 24, 659-685.
21. Lord, C., Rutter, M.L., Goode, S., Heemsbergen, J., Jordan, H., Mawhood, L., et al. (1989). Autism diagnostic observation schedule: A standardized observation of communicative and social behavior. Journal of Autism and Developmental Disorders, 19, 185-212.
22. Mason, R.A. (2013). Efficacy of point-of-view video modeling: A meta-analysis. Remedial and Special Education, 34, 333-345.
23. McCoy, K., & Hermansen, E. (2007). Video Modeling for Individuals with Autism: A Review of Model Types and Effects. Education and Treatment of Children, 30, 183-213.
24. McMorris, C.A., & Perry, A. (2014). Examining the criterion-related validity of the Pervasive Developmental Disorder Behavior Inventory. Autism: The international Journal of Research and Practice.

25. Miller, L.J., & Lane, S.J. (2000). Towards a consensus in terminology in sensory integration theory and practice: Part one: Taxonomy of neuropsychological processes. Sensory Integration Special Interest Section Quarterly, 23, 1-4.
26. Miller, L.J., & Summers, C. (2001). Clinical applications in sensory modulation dysfunction: Assessment and intervention considerations. In S. Smith Roley, E. Blanche, & R.C. Schaaf (Eds.), Understanding the nature of sensory integration with diverse populations (pp. 247-273). Los Angeles, CA: Harcourt.
27. Schopler, E., Reichler, R.J., & Renner, B.R. (1988). The childhood autism rating scale (CARS). Los Angeles, CA: Western Psychological Services.
28. Schopler, E., Van Bourgondien, M.E., Wellman, G.J., & Love, S.R. (2010). Childhood Autism Rating Scale (CARS-2) (Second ed.). Los Angeles, CA: Western Psychological Services.
29. Schreibman, & Whalen, L. (2000). The use of video priming to reduce disruptive transition behavior in children with autism. Journal of Positive Behavior Interventions, 2(1), 3.
30. Simonoff, E., Jones, C.R.G., Baird, G., Pickles, A., Happe, F., & Charman, T. (2013). The persistence and stability of psychiatric problems in adolescents with autism spectrum disorders. Journal of Child Psychology and Psychiatry, 54, 186-194.
31. Simonoff, E., Pickles, A., Charman, T., Chandler, S., Loucas, T., & Baird, G. (2008). Psychiatric disorders in children with autism spectrum disorders: Prevalence, comorbidity, and associated factors in a population-derived sample. Journal of the American Academy of Child & Adolescent Psychiatry, 47, 921.
32. Tomchek, S., & Dunn, W. (2007). Sensory processing in children with and without autism: A comparative study using the short sensory profile. The American Journal of Occupational Therapy, 61, 190-200.
33. Tomchek, S.D., Huebner, R.A., & Dunn, W. (2014). Patterns of sensory processing in children with an autism spectrum disorder. Research in Autism Spectrum Disorders, 8, 1214-1224.
34. Totsika, V., Hastings, R.P., Emerson, E., Lancaster, G.A., & Berridge, D.M. (2011). A population-based investigation of behavioral and emotional problems and maternal mental health: Associations with autism spectrum disorder and intellectual disability. Journal of Child Psychology and Psychiatry, 52, 91-99.
35. Wilde, L.D., Koegel, L.K., & Koegel, R.L. (1992). Increasing success in school through priming: A training manual. Los Angeles, CA: University of California.