



A young adult with nonverbal low-functioning Autism: A case review of readiness for independent living

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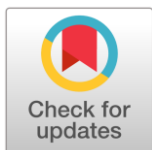
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Abstract: This is a case review of a male adult, GO, with nonverbal low functioning autism in his twenties. Previous psycho-educational assessment indicated that GO had a nonverbal IQ (NVIQ) of 73 within the borderline range, an adaptive behavior composite score at the extremely low percentile rank, and poor executive functioning (EF) capability with majority of the EF components falling in the performance range from borderline problem to problematic range. His family has expressed their concern if GO would be able to take care of himself when they are too old or no longer around to care for him. This short paper is an attempt to review all the previous assessment results and to find out if GO could be helped to improve in his daily living skills in order to lead a more independent life in the future.

Keywords: Adaptive Behavior, Autism, Executive Function.

1. Introduction

Autism spectrum disorder (ASD), also commonly known as autism, is a developmental disability whose onset takes place during toddlerhood around 2-3 years of age. Children with ASD face problems in social interaction, speech and nonverbal communication, and restricted and repetitive patterns of behaviors, interests or activities ([American Psychiatric Association, 2013](#)).

One of the main concerns of parents and/or caregivers of children with autism is that one day they (parents or caregivers) will get old and are no longer as physically fit as before to take care of their adult child with special needs. The question that has kept popping in their head is: "Will their adult

children be independent enough to complete their daily activities such as purchasing food, washing up, dressing up, and travelling from place to place?"

These daily activities constitute a portion of the overall adaptive behavioral skills, also known as social competence (i.e., responsibility and accountability), independent living, adaptive behavioral functioning, independence, or life skills that a person needs to perform everyday tasks. In fact, adaptive functioning is affected by three basic skill sets ([MentalHelp.net, 2019](#)): "(1) Conceptual – This includes reading, numbers, money, time, and communication skills; (2) Social – These skills help a person to get along

with others. These skills include understanding and following social rules and customs, obeying laws, and detecting the motivations of others in order to avoid victimization and deception; and (3) Practical life skills – These are the skills needed to perform the activities of daily living. This includes feeding, bathing, dressing, occupational skills, and navigational skills” (para.3-6).

2. Brief Background of GO

GO¹ is currently 25 years 4 months and was born into a Chinese family in Singapore. He has an older sister and his family communicates to him mainly in English. However, sometimes Chinese and/or the Hokkien dialect are used when talking to GO, too.

GO first showed signs of developmental delay at 6 months old when he did not look for the yarn when asked to, did not pass cubes from hand to hand, did not produce single syllable words and could not imitate speech sounds. He was later referred to a psychiatrist and a speech therapist at 3 years of age when he was found to have a severe speech delay.

The Bayley Scales of Infant Development-2nd Edition (BSID-2) (Bayley, 1993) was administered by a speech therapist when GO was 3 years 1 month old. The raw score for his mental development was 123. It was observed that he lacked social communication skills, imaginative play and had ritualistic behavior. At 5 years 5 months old, he was diagnosed with ASD after the Autism Diagnostic Observation Schedule (ADOS) (Lord et al., 1989; Lord et al., 2000), which is an instrument for diagnosing and assessing autism, was administered. His mother continued to send him for speech

therapy as well as other therapies such as occupational therapy and early intervention.

GO developed seizures at the age of 13 years and has since been on anti-convulsant medication. His mother and older sister have consistently observed him and they soon realize that his seizures are usually triggered when he is stressed, especially when it is due to changes in his surroundings and/or also when he does not have enough sleep.

GO is currently attending a learning center run by a voluntary welfare organization five times a week. During his time there, GO uses the Picture Exchange Communication System (PECS) (Bondy & L.A. Frost, 1994; Bondy & L.A. Frost, 2001), which he has been trained to apply in communicating with his coaches, and viewing and completing his daily and weekly tasks (e.g., meal preparations and newspaper collection). He makes choices independently whenever he is allowed to and gets rewarded with activities that he is fond of when he completes his tasks on time.

At home, GO is able to perform several daily chores independently (e.g., making his bed, washing up, getting dressed, bathing, cooking instant noodles, making beverages, cutting things with a knife and folding, hanging and keeping of clothes). He is also able to respond to single words such as ‘more’, ‘faster’, ‘gentle’, ‘on’, ‘off’, ‘open’, ‘close’ and ‘help’.

However, GO still needs guidance or supervision in brushing his teeth, knowing the exact amount of money to pay and is still unable to travel independently using the public transport.

3. Diagnostic Assessment

Several assessments were administered on GO in the past. Most of them were based on the Hierarchy of Abilities and Skills as postulated by Chia (Chia, 2012) and the framework is briefly described below (also see Figure 1):

¹ GO is the initials of the client’s name. His full name has been kept anonymous to abide with the requirements of the Personal Data Protection Act 2014 in Singapore.

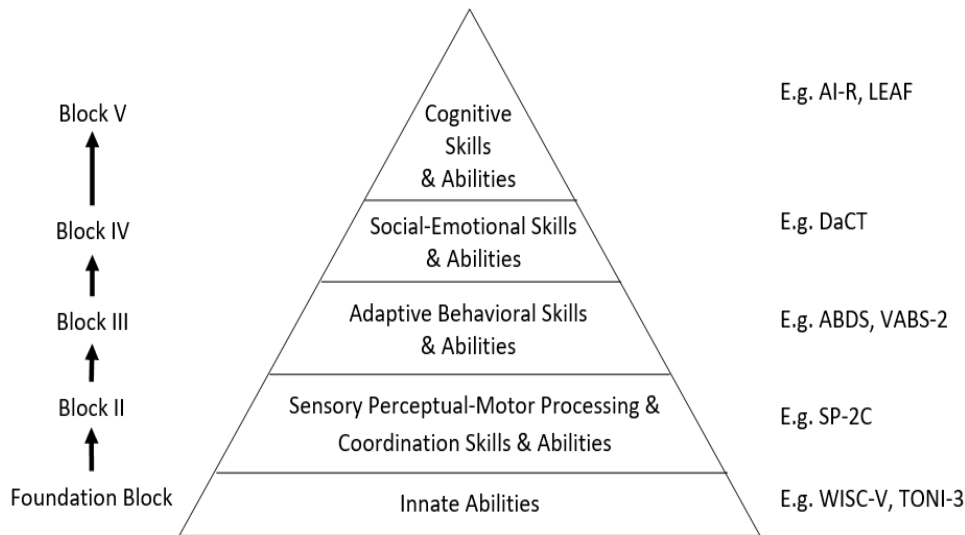


Figure 1: Hierarchy of Skills and Abilities

Table 1. Hierarchy of Building Blocks of Skills & Abilities

Hierarchy of Blocks	Skills & Abilities (S&A)	Primary Measure	Secondary Measure	Additional Measure
Block I	Innate S&A	TONI-3	--	--
Block II	Sensory Perceptual-Motor	SP-AA,	SP-SS,	--
	Behavioral S&A	SP-CQ	SP-Supple	
Block III	Adaptive Behavioral S&A	ABDS	--	--
Block IV	Social-Emotional Behavioral S&A	--	--	--
Block V	Cognitive Behavioral S&A	LEAF	--	--

- *Foundation Block of innate abilities (e.g., WISC-IV):* The Foundation Block refers to the core block of an individual's innate abilities which deal with the use of language to communicate, abstract thoughts and reasoning skills, memory retention as well as problem solving skills. An example of an assessment tool for this level is an IQ test such as Test of Nonverbal Intelligence-Third Edition (TONI-3) (Brown et al., 1997).
- *Block II of sensory perceptual-motor processing and coordination skills and abilities:* Block II focuses on the sensory-perceptual-motor coordination and related behavioral skills and abilities involving balance/motion of the body (vestibular) & position of body (proprioception). An example of an assessment tool for this level is the Sensory Profile (SP) (Brown & Dunn, 2002; Dunn, 1999; Dunn, 1999).
- *Block III of adaptive behavioral skills and abilities:* Block III concerns the adaptive

behavioral skills and abilities such as activities of daily living, social interaction, communication, self-help skills (e.g. toileting, dressing, bathing), personal hygiene and other related practical skills. An example of an assessment tool for this level is the Adaptive Behavior Diagnostic Scale (ABDS) (Pearson, 2016).

- *Block IV of social-emotional skills and abilities:* Block IV consists of socio-emotional behavioral skills and abilities which cover adaptive, internalizing and externalizing behavioral skills. This level of skills and abilities can also be determined by assessment tools such as ADHD Rating Scale-IV (DuPaul, 1998) and Gilliam Autism Rating Scale-3rd Edition (Gilliam, 2013).

Block V of cognitive skills and abilities: Block V focuses more on academic or educational attainments, which include higher levels of cognition, involving word knowledge (i.e. active and passive vocabularies), general knowledge, ability to count and perform operational functions involving numbers and ability to carry out activities using both verbal and nonverbal reasoning skills. Most of the assessment tools are academic attainment measures such as the Aston Index-Revised (Newton & M. Thomson, 1982) and Neale Analysis of Reading Ability-Second Edition (NARA-2) (Neale, 1997).

4. Results and Discussion

In this section, the results obtained over two years, i.e., 2018-2019, are briefly discussed in detail below.

4.1 Autism Diagnostic Observation Schedule - Generic (ADOS-G)

The ADOS-G (DiLavore et al., 1995) is a semi-structured, standardized assessment of four domains, i.e., social interaction, communication, play, and imaginative use of materials, for individuals suspected of having ASD. Its observational schedule consists of four 30-minute modules. Each module is

designed to be administered to an individual according to his/her level of expressive language.

GO was assessed by a clinical psychologist using ADOS-G at the Behavioral Intervention Centre for Children (BICC), which was managed by the Autism Research Centre in the National University of Singapore, and he was found to meet the criteria of autistic disorder. No other information was provided except a statement stating autistic disorder was present.

4.2 Autism Diagnostic Interview™-Revised (ADI™-R)

The ADI™-R (Rutter et al., 1994) was also used. This test is the 2003 revision of the ADI™. It involves interviewing the client's parents or primary caretakers with the knowledge about the individual's current behavior and developmental history. The questions in ADI-R address the triad of symptoms related to ASD: (1) Language Communications; (2) Reciprocal Social Interactions; and (3) Restricted, Repetitive, and Stereotyped Behaviors and Interests. The measure consists of 93 yes/no questions followed by probe questions that are scored on a scale of 0-2. The scores are then converted into diagnostic criteria based on the International Classification of Diseases-10th Revision (ICD-10) (World Health Organization, 1992).

As mentioned earlier above, the former and latter tests were administered by a clinical psychologist at the Behavioral Intervention Centre for Children (BICC) managed by the Autism Research Centre in the National University of Singapore. GO was then six years of age. The results showed that GO scored above the cut-off range of the autistic population in the areas of communication, social relations and restricted, repetitive behaviors on both ADI-R (Rutter et al., 1994) and ADOS-G (DiLavore et al., 1995). GO was confirmed with the diagnosis of autistic disorder. In addition, he exhibited short attention span and had undergone Integrated Playgroup Program offered at the BICC. Tables

2 and 3 below show his results for both the ADI-R (Rutter et al., 1994) and the ADOS-G (DiLavore et al., 1995).

Table 2. ADI-R Results

Category	Cut-off Scores	GO's Scores
Social Interaction	10	26
Communication	8	15
Repetitive Behavior	3	6

Table 3. ADOS-G Results

Category	Cut-off Scores	GO's Scores
Social Interaction	7	20
Communication	4	10

4.3 Test of Nonverbal Intelligence, Third Edition (TONI-3)

The TONI-3 (Brown et al., 1997) is a norm-referenced nonlinguistic problem-solving ability assessment tool used. It is suitable with individuals who have severe spoken language disorders, deaf or hearing impaired, non-English speakers, or English-language learners. It is used to assess the cognitive, language, or motor impairments due to neurological conditions. It also helps to identify individuals suspected of intellectual impairment. Since GO is non-verbal, the TONI-3 (Brown et al., 1997) was chosen to better understand his cognitive abilities. It was administered when GO was 24 years 2 months and the results are shown below in Table 4.

It was found that GO's NVIQ is 73 which falls in the borderline IQ range of 70 to 79 (Cooijams, 2005). This suggests that he faces some neurological challenges (Exkorn, 2005) which include problem-solving skills, attention, memory, mathematics, visual comprehension, reading, linguistic skills, and verbal comprehension. Hence, there is a limit to the

amount of knowledge that GO can learn and he would face difficulty with activities such as using the telephone, banking, filling up forms and identifying the correct bus service to get home unless being taught and given assistance from others which include but not limited to family members, coaches and community caregivers.

Table 4. TONI-3 Results

	Scores
Age Equivalence	7:00
Deviant Quotient	73
Percentile Rank	4%ile

4.4 Sensory Profile (SP)

The Sensory Profile-Adolescent/Adult (SP-A/A) (Brown & W. Dunn, 2002) and the Sensory Profile-Caregiver Questionnaire (SP-CQ) (Dunn, 1999) were both administered in

August 2019 and 30 March 2019 respectively. A Sensory Profile-Summary Score Sheet (SP-SS) (Dunn, 1999) and a Sensory Profile-Supplement (SP-Supple) (Dunn, 2006) were used to further compute the results of the SP-CQ (Dunn, 1999). Both the SP-A/A (Brown & W. Dunn 2002) and the SP-CQ (Dunn, 1999) measure the sensory processing on an individual's daily performance patterns by providing information about his/her tendencies to respond to stimuli and which sensory systems are likely contributing or creating barriers to functional performance.

The SP-CQ (Dunn, 1999) contains some 125 items that are organized into three main sections:

- (1) Sensory Processing: It contains six item categories that measure an individual's responses to possessing of sensory inputs via auditory, visual, vestibular, tactile and oral processes;
- (2) Modulation: It contains five item categories that measure the individual's ability to monitor and regulate information to generate an appropriate response to the situation; and
- (3) Behavioral and Emotional Responses: It contains three item categories that measure children's emotional and behavioral responses to sensory experiences.

The SP-A/A (Brown & W. Dunn, 2002) and SP-CQ (Dunn, 1999) allow us to understand GO's sensory processing patterns and their effects on his ability to perform daily activities. Both tests were completed by proxy involving his mother, the primary caregiver, and his sister who helps out in taking care of him.

Below is the tabulation of the results obtained from the administration of the following SP-A/A (Brown & W. Dunn, 2002) and the SP-CQ (Dunn, 1999).

GO showed typical performance for his sensory processing (A to F). He displayed probable differences, being less than others, in two sections of his behavior and sensory modulation, i.e., (H) modulation related to body position and movement, and (K)

modulation of visual input affecting emotional responses and activity level. This means he showed weaker proprioception (i.e. perception or awareness of the position and movement of the body) and hence poor sense of bodily awareness and, in turn, affecting his movement (for item H), and also his emotional state and activity level (i.e. his way of expressing his daily physical activity) were less affected by visual input.

GO's main problem (definite difference or "much less than others") could be seen in his very low (I) modulation of movement affecting his activity level. His poor proprioception indicates lower awareness of emotional and non-emotional internal bodily signals. This problem is associated with alexithymia (Luminet, 2018). However, evidence suggesting that alexithymia modulates body awareness at an external level is scarce (Luminet, 2018), and it is associated with difficulties perceiving some non-affective interoceptive signals, such as interpreting signals of hunger, arousal, proprioception, tiredness and temperature (Brewer, 2016). According to Brewer, Cook and Bird (Brewer, 2016), alexithymia is a sub-clinical construct, traditionally characterized by difficulties identifying and describing one's own emotions. Being non-verbal, GO could feel frustrated whenever he attempted to express his emotions and nobody understands him.

GO's low sensory seeking based on the 2018 SP-CG administration agreed with the 2019 SP-A/A administration while his sedentary disposition suggested that he is very much an autistic introvert (Xie, 2019), preferring to be left alone and to do his own things.

GO's overall scores based on the administration of Sensory Profile-Adolescent/Adult Version (SP-A/A) (Brown & Dunn, 2002) in August 2019 and the earlier Sensory Profile-Supplement Version (SP-Supple) (Dunn, 2006) in March 2018 were 37/75 under the category of "less than most people" (SP-A/A) (Brown & Dunn, 2002) and 83/85 under the category of "less than others with probable difference" (SP-Supple) (Dunn, 2006), respectively.

Table 5. SP-A/A Sensory Sub-Domain Results

Sensory Sub-Domains	Score	Percentage	Descriptor
A. Taste/Smell Processing	18/40	45%	Occasionally
B. Movement Processing	9/40	22.5%	Seldom
C. Visual Processing	20/50	40%	Seldom
D. Touch Processing	26/65	40%	Seldom
E. Activity Level	23/50	46%	Occasionally
F. Auditory Processing	28/55	50.9%	Occasionally

Table 6. SP-A/A Quadrant Results for Ages 18-64 years old

Sensory Quadrant	Score	Range of Scores	Descriptor
Low Registration	26/75	24-35	Similar to most people
Sensation Seeking	37/75	36-42	Less than most people
Sensory Sensitivity	29/75	26-41	Similar to most people
Sensation Avoiding	32/75	27-41	Similar to most people

Table 7. SP-CQ Sensory Processing Results

Sensory Processing	Scores	Percentage	Descriptor
A. Auditory Processing	31/40	77.5%	Seldom
B. Visual Processing	35/45	77.8%	Seldom
C. Vestibular Processing	55/55	100%	Never
D. Touch/Haptic Processing	82/90	91.1%	Never
E. Multisensory Processing	32/35	91.4%	Never
F. Oral Processing	50/60	83.3%	Never

Table 8. SP-CQ Sensory Modulation Results

Sensory Modulation	Score	Percentage	Descriptor
G. Sensory Processing related to Endurance Tone	41/45	91.1%	Never
H. Modulation related to Body Position & Movement	50/50	100%	Never
I. Modulation to Movement affecting Activity Level	35/35	100%	Never
J. Modulation of Sensory Input affecting Emotional Responses	16/20	80%	Seldom
K. Modulation of Visual Input affecting Emotional Responses & Activity Level	20/20	100%	Never

Table 9. SP-CQ Behavior and Emotional Responses

	Behavior and Emotional Responses	Score	Percentage	Descriptor
L.	Emotional/Social Responses	77/85	90.6%	Never
M.	Behavioral Outcomes of Sensory Processing	29/30	96.7%	Never
N.	Items Indicating Thresholds for Responses	15/15	100%	Never

Table 10. SP-Supple Section Summary

	Section	Score	Range of Scores	Descriptor
A.	Auditory Processing	31/40	38-30	Similar to others/ Typical performance
B.	Visual Processing	35/45	41-32	Similar to others/ Typical performance
C.	Vestibular Processing	55/55	55-48	Similar to others/ Typical performance
D.	Touch/Haptic Processing	82/90	88-73	Similar to others/ Typical performance
E.	Multisensory Processing	32/35	33-27	Similar to others/ Typical performance
F.	Oral Processing	50/60	59-46	Similar to others/ Typical performance
G.	Sensory Processing related to Endurance Tone	41/45	45-39	Similar to others/ Typical performance
H.	Modulation related to Body Position & Movement	50/50	50	Less than others/ Probable difference
I.	Modulation to Movement affecting Activity Level	35/35	35-34	Much less than others/ Definite difference
J.	Modulation of Sensory Input affecting Emotional Responses	16/20	20-16	Similar to others/ Typical performance
K.	Modulation of Visual Input affecting Emotional Responses & Activity Level	20/20	20	Less than others/ Probable difference
L.	Emotional/Social Responses	77/85	79-63	Similar to others/ Typical performance
M.	Behavioral Outcomes of Sensory Processing	29/30	30-29	Less than others/ Probable difference
N.	Items Indicating Thresholds for Responses	15/15	15-12	Similar to others/ Typical performance

Table 11. SP-Supple Factor Summary

Factor	Score	Range of Scores	Descriptor
1. Sensory Seeking	83/85	85-82	Less than others/ Probable difference
2. Emotionally Reactive	72/80	74-57	Similar to others/ Typical performance
3. Low Endurance/Tone	41/45	45-39	Similar to others/ Typical performance
4. Oral Sensory Sensitivity	35/45	44-33	Similar to others/ Typical performance
5. Inattention/Distractibility	28/35	32-25	Similar to others/ Typical performance
6. Poor Registration	40/40	40-33	Similar to others/ Typical performance
7. Sensory Sensitivity	20/20	20-16	Similar to others/ Typical performance
8. Sedentary	20/20	20-18	Less than others/ Probable difference
9. Fine Motor/Perceptual	14/15	15-10	Similar to others/ Typical performance

Most of the items scored for Sensation Seeking were scored “almost never” in SP-A/A (Brown & Dunn, 2002) or “never” in SP-CG (Dunn, 1999) based on the scores evaluated using the SP-Supple (Dunn, 2006).

The phrase “almost never” (in SP-A/A) (Brown & Dunn, 2002) means that when GO was “presented with the opportunity, he almost never responded in this manner (about 5% or less of the time)” (Brown & Dunn, 2002). The other phrase “never” (in SP-CG) (Dunn, 1999) means that when GO was “presented with the opportunity, he never responded in the manner, 0% of the time” (Dunn, 1999).

In other words, GO displayed “less than most people” in his sensation seeking. This means he has low sensation seeking. The opposite of low sensation seeking is high sensation seeking. According to (Zuckerman, 1978) and (Zuckerman et al., 1964), they hypothesized that people who are high sensation seekers require a lot of stimulation to reach their Optimal Level of Arousal. “When the stimulation or sensory input is not met, the

person finds the experience unpleasant” (p.223) (Larsen & Buss, 2008).

The term, Sensation Seeking, is a personality trait defined by the search for experiences and feelings, that are varied, novel, complex and intense (Zuckerman, 2009), and by the readiness to take physical, social, legal, and financial risks for the sake of such experiences (Masson et al., 2019). Risk is not an essential part of the trait, as many activities associated with it are not risky. However, risk may be ignored, tolerated, or minimized and may even be considered to add to the excitement of the activity (Zuckerman, 2009).

The concept was developed by Zuckerman, Eysenck and Eysenck (Zuckerman et al., 1978) for the Sensation Seeking Scale in order to assess this trait. This test assesses individual differences in terms of sensory preferences. So, there are people who prefer a strong stimulation and display a behavior that manifests a greater desire for sensations and there are those who prefer a low sensory stimulation. The scale is a questionnaire designed to measure how much stimulation a

person requires and the extent to which they enjoy the excitement. This measure was not available at the time of assessment for GO and hence, it was not done.

4.5 Adaptive Behavior Diagnostic Scale (ABDS)

The ABDS (Pearson et al., 2016) is “an interview-based rating scale that is used to assess adaptive behavior of individuals for ages 2 through 21 years ... [Its] function ... is to establish the presence and magnitude of adaptive behavior deficits” (p.1) (Pearson et al., 2016). The results of the ABDS administration provides both the therapist working with the client and the client’s parents a better understanding of the client’s daily functionality, especially relating to the practical tasks under the category of Daily Living Skills (Bal et al., 2015).

The ABDS provides information on the following three domains (Pearson, 2016) (p.23):

- (1) Conceptual Domain: It measures skills in language, reading, writing, mathematics, reasoning, knowledge and memory.
- (2) Social Domain: It measures empathy, social judgment, gullibility, communication skills, the ability to make and retain friendships, and similar interpersonal capabilities.
- (3) Practical Domain: It measures self-management personal care, home living, community use, job responsibilities, money management, recreation, and organizing school and work tasks.

Raw scores obtained in the ABDS are converted into domain index scores, percentile ranks and age equivalents. An adaptive behavior composite (ABC) index score is computed from the sum of the three domain index scores. The descriptive terms that correspond to the domain and composite scores are as shown in Table 12 below:

GO's ABC score of 35 lies within the extremely low range which implies that he would experience severe challenges in effective communication with his surroundings and needs close guidance and

monitoring when communicating with others and if he were to live on his own.

4.6. Socio-Emotional Skills & Abilities

Socio-emotional development includes a child's ability to engage with others to establish a positive relationship, as well as the child's experience, expression and management of emotions (Cohen et al., 2005). The emotional development aspect includes the ability to identify and comprehend not just one's emotions but also those of others in order to empathize them and to establish and maintain relationships with them. “It also encompasses the management of strong emotions and expressing them in a constructive manner, and to regulate one's behavior” (p.2) (National Scientific Council on the Developing Child Winter, 2004).

According to a study by Dyck, Ferguson and Shochet (Dyck et al., 2001), the empathy ability of children with Autism Disorder is the lowest when compared to children with Asperger's Disorder and those with no psychological disorder. In the studies of the Theory of Mind (ToM) which is the ability to attribute mental states of mind, Chia and Chua (Chia & Chua, 2014) suggests that one should view a person with an autistic mind as someone whose ToM has stronger mind-blindness (the inability to attribute mental states of mind which causes one to be unaware of others' mental states) and deeper mindlessness rather than a faulty ToM.

Although no test was administered, these studies suggest that GO will face challenges socio-emotionally but there might be a way to help with his poor mindsight and extremely weak mindfulness (Chia & Chua, 2014).

4.7. Learning, Executive and Attention Functioning Scale (LEAF)

The LEAF (Kronenberger et al., 2016) is an assessment tool that measures the neuropsychological abilities related to executive functioning and learning. The LEAF consists of 3 major areas used to assess the overall functioning of the child.

Table 12. Domain and Composite Scores and their Respective Descriptive Terms

Domain & Composite Scores	Descriptive Terms
>109	Above average
90-109	Average
80-89	Low average
70-79	Low
55-69	Very Low
<55	Extremely low

Table 13. ABDS: Domain Index Results

Subscales	Raw Score	Index Score	SEM	Percentile Rank	Descriptor	Age Equivalent
Conceptual Domain	78	40	(4)	<1	Extremely Low	4 - 5 years
Social Domain	73	40	(4)	<1	Extremely Low	2 - 8 years
Practical Domain	94	48	(4)	<1	Extremely Low	8 - 9 years

Table 14. ABDS: Adaptive Behavior Composite Index Score Results

	Sum of Index Scores	Composite Index Score	SEM	Percentile Rank	Descriptor
Adaptive Behavior Composite (ABC)	128	35		<1	Extremely Low

Table 15. LEAF Results

Subscales	Scores	Interpretation
A. Cognitive Learning		
1. Comprehension & Conceptual Learning	10	Problem
2. Factual Learning	10	Problem
B. Cognitive - Executive Functioning		
3. Attention	9	Borderline Problem
4. Processing Speed	10	Problem
5. Visual-Spatial Organization	2	No Problem

6. Sustained Sequential Processing	6	Borderline Problem
7. Working Memory	7	Borderline Problem
8. Novel Problem Solving	10	Problem

C. Academic

9. Mathematics Skills	5	Borderline Problem
10. Basic Reading Skills	11	Problem
11. Written Expression Skills	14	Problem

The first part is the Cognitive Learning where it looks into the conceptual and factual learning. The second part refers to the Cognitive-Executive Functioning where processing speed of the child, ability to solve novel problems and memory are assessed. The last part deals mainly with Academics like reading, writing and mathematics skills. Depending on the scores given, they are categorized under as no problem, borderline problem range to problem range. These descriptions give information with regard to the delays and disturbances (Kronenberger et al., 2016) in the executive functioning and learning of an individual.

The results above show that GO faces problems with comprehension and conceptual learning, factual learning, processing speed, novel problem solving, basic reading skills and written expression skills. Problems in these subscales indicate that GO will face challenges in literacy which in turn affects his reasoning and the way he processes information.

GO has borderline problems in attention, sustained sequential processing, working memory and Mathematics skills. A study by Kercood, Grskovic, Banda, and Begeske (Kercood et al., 2014) shows that individuals "with autism have been found to score lower on measures of working memory than do typical controls especially on task that require cognitive flexibility, planning, greater working memory load, and spatial working memory, and with increasing task complexity and in dual task conditions" (p.1316). It was also reported that "lower scores in verbal

working memory were associated with greater problems in adaptive behavior and more restrictive and repetitive behavior" (p.1316) (Kercood et al., 2014).

5. Discussion

Adaptive behavioral skills and abilities is an essential learning process which refers to "the effectiveness or degree with which an individual meets the standards of personal independence and social responsibility expected of his/her age and social group" (p.11) (Grossman, 1973). This broad spectrum of skills and abilities are learnt and acquired through the entire lifespan of an individual.

The adaptive behavioral process of learning affects one's sensory-motor skills, communication skills, self-help skills and social skills during infancy and early childhood (Dunn, 1997). At late childhood and early adolescence, with this block of skills and abilities, one would be able to apply the basic academic skills learnt in everyday life activities, apply appropriate reasoning and judgment of the environment and in his/her social skills. As he/she proceeds on to the later stage of adolescent and early stage of adulthood, he/she would have to acquire the skills and abilities concerning vocational and social responsibility and performance (Gilotty, 2002).

From the results of LEAF, it clearly indicates that GO will face issues communicating with people around him due to the challenges he faces in his academics as well as him being non-verbal. From the information

provided by GO's mother, GO, to some extent, could be considered quite independent and it also suggested that he could process information cognitively. However, the results must be taken with caution as there is a high chance of confirmation bias, i.e., an individual's tendency to search for, interpret, favor, and recall information in a way that affirms his/her prior beliefs/hypotheses. It is considered a kind of cognitive bias and a systematic error of inductive reasoning.

During an interview, GO's mother shared with these authors the following information:

- (1) Whenever she goes to bathe at night, GO would quickly cook a packet of instant noodles, not forgetting to crack an egg, and finishes it before she gets out of the bathroom. However, at times, before he finishes the noodles, he would clear his bowl and washes the utensils used upon hearing the bathroom door open.
- (2) He has a habit of soiling his pants in order to play with soap and water while washing his pants. He would always do it whenever she is in the bathroom.
- (3) Whenever he bumped onto his mother or sister, GO applies medicated oil or cream on their injury or when they told him that it was "pain" on a particular area.
- (4) Sometimes when they are having their meals, GO would observe how his family members eat or what they take and would "copy" them and do the same.
- (5) GO was able to stay calm whenever he listens to his favorite songs. He would usually be rewarded with some time spent at the relax corner with the radio at the learning center.

On another occasion, GO's sister also realized that whenever their mother sang the first line of "Old MacDonald had a farm", GO would quickly finish up what he was doing. However, when the song was not sung, he would continue to do what he preferred to do despite the constant prompt of "faster".

The above examples showed that GO is able to empathize², mentalize³, mirror⁴, systemize⁵, contextualize⁶, ruminate⁷ and dissociate/associate⁸ which are the factors used to train children and adults with special needs.

6. Conclusion

By comparing the results obtained from a broad range of standardized tests reported previously by Wong and the sharing of GO's mother, the authors of this paper concluded that GO continues to show himself to be sensitive to auditory triggers. Hence, music could be used as either (1) a reward for him whenever he does his task quickly or (2) a deterrent to stop him from doing something that is considered bad or negative.

Despite having an overall challenging issue in his executive functioning, GO is still able to follow instructions given pictorially (via PECS cards) at the learning center where he learns how to cook different dishes. Moreover, GO is able to remember or recall the steps taught by his mother to cook instant noodle independently. It suggests that GO is trainable, i.e., once he is familiar with the steps as in the cooking procedure, he is able to do it independently without any visual prompts.

² Empathizing is defined as the process of identifying another individual's emotions and thoughts, and responding to these with an appropriate emotion [42].

³ Mentalizing is defined as the process of attributing the mental states to others or another individual [42].

⁴ Mirroring (also known as mimicking) is defined as the process of observing an action and then performing an equivalent action [42].

⁵ Systemizing is defined as the process of analyzing the variables in a system, deriving the underlying rules that govern the behavior of the system in order to construct, reconstruct or deconstruct it [42].

⁶ Contextualizing (also known as context processing) is defined as an ability of contextual sensitivity in responding appropriately to a stimulus within its context [42].

⁷ Ruminating is repeated thinking or thoughts [42].

⁸ Dissociating is defined as the process of separating normally related mental/cognitive processes, resulting in one group of mental and/or cognitive processes functioning independently from the others or the rest [42].

In addition, GO is very good at mirroring others' actions which would enable him to pick up skills quicker than others who are weaker in this aspect. Hence, GO is able to learn and acquire vocational skills that would not only make him more independent, but, hopefully, with the necessary skills acquired, could prepare him in terms of vocational readiness and/or employability to get a job in the future.

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