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A Case Study of a Young Adult Autistic Savant Artist

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Abstract
This is a single subject case study of a young adult, YH, aged 23 years, diagnosed with autism spectrum disorder (ASD). Despite having a low IQ that places him in the category of intellectual disability with poor ability to communicate, he has an extraordinary talent in creating fantastic artworks - drawing thousands and thousands, if not millions or more, of tiny ants for hours to produce remarkable pictures of animals, places and portraits of well-known personalities. Several of his artworks have also been sold to well-wishers and art collectors at arts exhibitions. This paper takes a closer examination of the case. YH is identified as an autistic savant, highly talented in drawing, but that does not imply he has a high IQ. The phenomenon of YH's special talent in drawing has been termed as psychomotor and imaginational overexcitabilities.

Keywords: autism spectrum disorder (ASD), autistic savant, savant syndrome, talented skill

Introduction

There are many definitions of autism spectrum disorder (ASD) provided by different self-help groups and non-governmental organizations supporting people with autism. Perhaps the most well-known definition is the one provided by the American Psychiatric Association (2013) in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). The three diagnostic criteria mentioned in the DSM-5 are deficits in social interaction, communication and at least two repetitive behaviors. This latest definition has excluded Asperger Syndrome and Pervasive Developmental Disorder-Not Otherwise Specified (PDD-NOS). The latest DSM definition of ASD has put an end to the autism epidemic, whose international prevalence rate of 60 per 10,000 is applied across cultures (Chia, 2012).

Perhaps one most comprehensive definition of ASD is provided by Chia (2008): "a neuro-developmental syndrome of constitutional origin (i.e., genetic and epigenetic causes), whose onset is usually around first three years of birth, with empathizing or mentalizing deficits that result in a triad of impairments in communication, social interaction, and imagination, but may, on the other hand, display (especially by autistic savants) or hide (especially by autistic crypto-savants) a strong systemizing drive that accounts for a distinct triad of strengths in good attention to detail, deep narrow interests, and islets of ability" (p.10).

In this paper, the authors are presenting a case study of a young Chinese man, YH[1], (aged 23 years at the time of this study) suspected with ASD but who was never officially diagnosed. His parents referred him to the first two authors for a psycho-educational diagnostic assessment, evaluation and profiling to confirm his current condition.

Autistic Savantism: What is it?

Autistic savantism is considered a form of savant syndrome but closely related with ASD. Most individuals with ASD do not possess savant abilities (Treffert, 2009). Approximately 50% of the savant cases have ASD while the remaining 50% of the cases are associated with intellectual and developmental disorders (Treffert, 2014). Many autistic savants are intellectually challenged and have low IQs. In other words, "being a savant does not imply that because the individual is highly talented or gifted, high IQ is expected" (Lim & Chia, 2017, p.396). Only a handful of them are highly intelligent (Exkorn, 2005). According to Treffert (2014), "[T]he reality is that low IQ is not necessarily an accompaniment of savant

[1] The actual name of YH has been kept anonymous to ensure full confidentiality in adherence to the Personal Data Protection Act (PDPA) enacted in Malaysia in 2010.

syndrome" (p.564) and continued to say that "[G]enius and prodigy exist separately from savant syndrome and not all highly gifted persons have … *autism spectrum disorder*" (p.564; words in italics are added by the authors).

According to Exkorn (2005), there are 3 types of autistic savantism: (1) those with splinter skills – the most common type – associated with obsessive preoccupations with and memorization of trivia and obscure information (Siegel, 1996); (2) those with talented skills, highly developed and specialized, especially in the arts, or with superior memory that enables them to do lightning calculations mentally (Chia, 2008); and (3) those with prodigious skills, being the rarest, which according to the Better Health Channel (February 2007), about 25 of them in the world.

Psycho-Educational Assessment, Evaluation and Profiling (PEDEP)

Bishop et al. (2008) have previously proposed a 3-level screening protocol in identifying individuals with ASD: (1) to observe the individual at the behavioral level over a period of time to confirm the broad autistic phenotype; (2) to identify or trace the ASD endo-phenotypical markers for a possible teratological evaluation if needed; and (3) to confirm that all the identified endophenotypes do meet the diagnostic criteria for ASCs characterized by qualitative impairments in communication and social interaction alongside stereotyped behaviors and restricted interest.

In Malaysia, the authors have adopted the psycho-educational assessment, evaluation and profiling (PEDEP) protocol for ASD involves several standardized tests to identify an individual with autism spectrum conditions (ASCs).

Under the PEDEP protocol for ASD, there are 5 levels of standardized tests to be administered (see Table 1):

Level 1 is to assess for innate abilities with or without speech;

Level 2 is to assess sensory perceptual motor behavior;

Level 3 is to assess the level of functioning skills and speech, language and communication;

Level 4 is to determine the social behavioral profile; and

Level 5 is to administer an autism affirmative measure.

In this case, the Stanford-Binet Intelligence Scales-Fifth Edition (SB-5; Roid, 2003) – a test of general intellectual capacity – was the first on the PEDEP repertoire of standardized tests (at Level 1A) to be administered. The SB-5 has been widely used both for clinical and research purposes. In fact, until recently, the Autism Treatment Network (ATM) – the first network of hospitals and physicians in the United States dedicated to developing a framework of comprehensive medical care for individuals with ASD – required the SB-5 for assessment of cognitive functioning (Autism Speaks, 2010). For many years, "the SB-5 was the standard for individuals assessed at participating institutions" (Baum et al., 2014, p.2) that are ATN members. However, today, the ATN accepts several intelligence measures including the Wechsler Intelligence Scale for Children (WISC; Wechsler, 2003) and Differential Abilities Scales (DAS; Elliott, 1990).

Table 1: PEDEP Levels of Standardized Assessment for ASD

PEDEP Levels of Standardized Assessment	Examples of Standardized Assessment Tools
Level 1A: Innate abilities with speech	Stanford-Binet Intelligence Scales (SB)
Level 1B: Innate abilities without speech	Comprehensive Test of Nonverbal Intelligence (CTONI)
Level 2: Sensory perceptual motor behavior	Sensory Profile (SP)
Level 3A: Level of functioning skills	Vineland Adaptive Behavior Scales (VABS)
Level 3B: Speech, language & communication	Clinical Evaluation of Language Fundamentals (CELF)
Level 4: Social behavioral profile	Social Responsiveness Scale (SRS)
Level 5: Autism affirmative measure	Autism Diagnostic Observation Schedule (ADOS) with or without Autism Diagnostic Interview-Revised (ADI-R)

At the PEDEP Level 1B, the Comprehensive Test of Nonverbal Intelligence-Second Edition (CTONI-2; Hammill, Pearson, & Wiederholt, 2009) was administered to determine YH's nonverbal cognitive ability.

At the PEDEP Level 2, the Sensory Profile Self-Questionnaire (Adolescent/Adult) (Brown & Dunn, 2002) was done by YH's parents. The aim of profile is to ascertain if YH has any sensory-related processing problem that could have interfered with his thinking/learning. Moreover, it is also to find out YH's sensory perceptual motor registration, modulation, integration and response. In this profiling, the caregiver questionnaire was used as YH's parents wanted to find out his sensory problems in order to know how to manage his challenging behavior.

At the PEDEP Level 3, there are two sub-levels 3A and 3B. Vineland Adaptive Behavior Scales-Second Edition (VABS-II; Sparrow et al., 1984), which covers an individual's personal and social skills from birth through adulthood, was administered at Level 3A. The term adaptive behavior refers an individual's typical performance of the daily activities required for personal and social sufficiency. It was done with YH's parents providing the input. As there was no speech language therapist available at that time of testing, no assessment of speech, language and communication was done (at Level 3B).

At the PEDEP Level 4, the Social Responsiveness Scale (SRS; Constantino & Gruber, 2007) was not administered as YH was not socially responsive during most of the assessment sessions.

Finally, at the PEDEP Level 5, the Autism Diagnostic Observation Schedule-Second Edition (ADOS-2; Lord et al., 2012) – an observational assessment of ASD – was done with YH. It is a semi-structured, standardized assessment that presents various activities involving communication, social interaction, play, and restricted/repetitive behaviors. Through these activities, YH's behaviors were observed and directly related to a diagnosis of ASD. By observing and coding these behaviors, information obtained could be used to inform diagnosis, treatment planning, and educational placement.

The Artworks of the Autistic Savant

YH has produced many outstanding artworks and also participated in arts exhibitions in Malaysia. He would work continuously for hours drawing thousands and thousands, if not millions or more, of tiny ants (see Fig.3) to create remarkable pictures of animals (see Fig.1) and places (see Fig.2) as well as portraits of well-known personalities, such as Yeshua ben Yusof (Jesus, Son of Joseph) (see Fig.4), Mother Teresa of Calcutta, and Albert Einstein (Lim & Chia, 2017). This is a clear indication of psychomotor and imaginational overexcitabilities observed in YH's obsessive pursuit in his artistic endeavors.

Fig. 1: shows a lion and a lioness

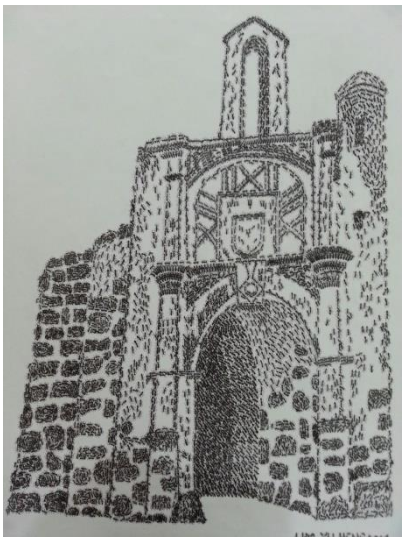

Fig. 2: shows Fort A. Formosa in Melaka

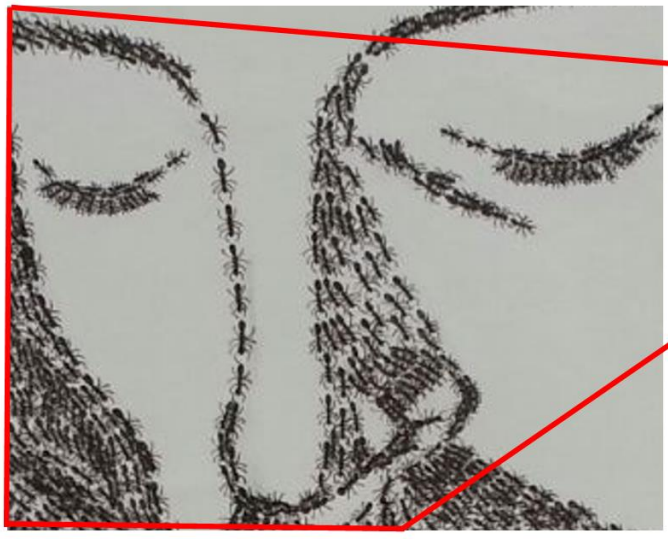

Fig. 3: shows the tiny ants that YH drew to create the face of Yeshua ben Yusof

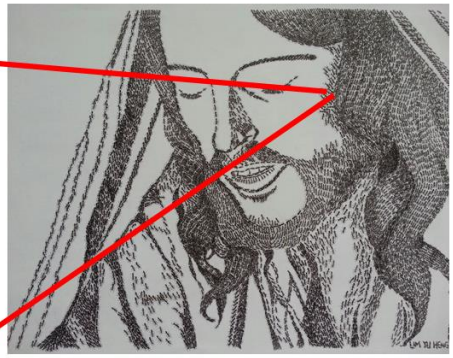

Fig. 4: shows a portrait of Yeshua ben Yusof

Results & Discussion

PEDEP Level 1A:

Table 2 shows YH's SB-5 results, where his NVIQ>VIQ by a difference of 31 points. According to Roid (2003), the minimum NVIQ-VIQ difference of 9-10 points is required for significance at the.05 level. This is not surprising as many individuals with ASD show significantly stronger nonverbal than verbal skills (Coolican, Bryson, & Zwaigenhaum, 2008). YH's FSIQ is 60 and individuals with FSIQ<70 had relatively weak verbal skills (Coolican, Bryson, & Zwaigenhaum, 2008). YH's FSIQ>AbIQ by a difference of 10 points. The minimum difference required for significance at the.05 level is 10-11 points as outlined in the SB-5 Test Manual (Roid, 2003).

Table 2: SB-5 Key Quotients

Quotients	Standard Scores	Percentile Rank	95% Confidence Interval
Nonverbal (NV) IQ	78	7	73-85
Verbal (V) IQ	47	<0.1	42-54
Full-Scale (FS) IQ	60	0.4	57-65
Abbreviated Battery (Ab) IQ	50	<0.1	47-63

In the Coolican study (2008) on children with ASD, 23.8% of the participants with ASD had AbIQ>FSIQ, only 3.2% had FSIQ>AbIQ, while 73.0% showed no difference. The AbIQ is used in this case study as its short administration time helps to minimize disruptive behavior and maximize attention. YH displayed a lot of self-stimulatory behaviors (vocal and motor) that interfered with the testing procedure. Hence, AbIQ offers a more valid estimate of YH's true intelligence and is representative of the full battery for him. However, Coolican, Bryson and Zwaigenhaum (2008) have cautioned that care should be taken when using AbIQ as it is "likely to overestimate true abilities" (p.196).

Table 3 shows YH's results of SB-5 nonverbal and verbal domains with NVIQ>VIQ. With regards to the NV subtests, the main finding was that YH demonstrated relative strengths in Visual Spatial, Knowledge and Working Memory (vs. Fluid Reasoning and Quantitative Reasoning). On the V subtests, the main finding was YH demonstrated no strength in any of the verbal skills and only scored slightly better in his Quantitative Reasoning skills (similar to the findings found in the Coolican study (2008). Harris et al (1990) had also reported a relative weakness in Quantitative Reasoning (using SB-4 then) among young children with ASD, very likely due to their younger age and immature verbal skills.

Table 3: Results of SB-5 Nonverbal & Verbal Domains

Nonverbal (NV) Subtests	Raw Score	Scaled Score	Standard Score
Fluid Reasoning	17	1	
Knowledge	23	10	
Quantitative Reasoning	14	2	
Visual Spatial	25	12	
Working Memory	21	8	
Total Sum of Scaled Scores		33	78
Verbal (V) Subtests			
Fluid Reasoning	6	1	
Knowledge	12	1	
Quantitative Reasoning	14	4	
Visual Spatial	5	1	
Working Memory	0	1	
Total Sum of Scaled Scores		8	47

PEDEP Level 1B:

Table 4 shows YH's nonverbal cognitive ability measured by the administration of CTONI-2 (Hammill, Pearson, & Wiederholt, 2009). The results show that YH's performance in Pictorial and Geometric Categories was in the below average range suggesting that his categorical reasoning, which involves classifying things, basic logical relations, familiarity with patterns of inference, and syllogism, is better the rest of his pictorial reasoning (analogical reasoning) (measured by Pictorial and Geometric Analogies) and general sequential reasoning (deductive reasoning) (measured by Pictorial and Geometric Sequences).

Table 4: Results of CTONI-2

Subtests	Raw Score	Age Equivalent	Percentile Rank	Standard Score	Descriptor
Pictorial Analogies	10	<6:00	5	5	Poor
Geometric Analogies	8	<6:00	2	4	Poor
Pictorial Categories	12	8:06	16	7	Below Average
Geometric Categories	10	<6:00	9	6	Below Average
Pictorial Sequences	11	<6:00	5	5	Poor
Geometric Sequences	6	<6:00	1	3	Very Poor

Table 5 shows YH's composite indices for Pictorial, Geometric and Full Scales. His PSIQ>GSIQ by 10 points is not statistically significant unless it is a difference of more than 13 points or clinically significant unless it is a difference of more than 18 points. His FSIQ (NV) of 63 places him in the mildly impaired or delayed range of nonverbal cognitive ability.

Table 5: Composite Indices from CTONI-2

CTONI-2 Scale	Sum of Standard Scores	Percentile Rank	Descriptor	Composite Index
Pictorial	17	3	Poor	71
Geometric	12	<1	Very Poor	61
Full	29	<1	Very Poor	63

PEDEP Level 2:
Table 6 provides a summary of YH's neurological threshold and behavioral responses/self-regulation based on the results of his Sensory Profile (SP) (Brown & Dunn, 2002) for adolescent/adult.

Table 6: Results of SP-Adolescent/Adult

Sensory Processing	Neurological Threshold		Behavioral Responses / Self-Regulation	
	Sensory Sensitivity & Sensation Avoidance	Low Registration & Sensation Seeking	Sensation Avoidance & Sensation Seeking	Low Registration & Sensory Sensitivity
	Low	*High*	*Active*	*Passive*
Taste/Smell Processing	√		√	
Movement Processing		√	√	
Visual Processing		√		√
Activity Level	√		√	
Auditory Processing		√	√	
Overall Sensory Preference	√		√	

Under the Neurological Threshold, "low" indicates that YH is easily activated and just requires lower amount/intensity of stimuli to initiate his awareness of or response to stimuli. On the other hand, "high" indicates that YH requires more intense stimuli for his central nervous system to respond. His functional performance relies on a balance between low and high neurological thresholds. Under Behavioral Response/Self-Regulation, "active" indicates that YH would choose to counteract neurological threshold because of his rigidity and would find particular environment difficult to accept. This also suggests that the environment has to change to meet YH's neurological threshold for that specific sensory processing. On the other hand, "passive" indicates YH's tendency to accept his environment as it is and would respond to environmental stimuli in accordance with his neurological threshold. It also suggests that YH's response or self-regulation could be unpredictable because his behavior is influenced by ever-changing environment.

PEDEP Level 3A:
According to Carter et al. (1998), "individuals with autism demonstrated a unique profile of adaptive behavior scores (based on VABS; Sparrow et al., 1984) across the domains of the VABS Composite … a relative strength in Daily Living Skills (DLS), a relative weakness in Socialization (SOC) and intermediate scores in Communication (COM)" (p.299), i.e., DLS>COM>SOC. In Table 7, the results show that YH displayed low level of adaptive functioning in terms of communication (Standard score=21±7), daily living skills (Standard score=52±8) and socialization (Standard score=20±7), matching the DLS>COM>SOC profile. His performance in motor skills could not be determined at the time of testing due to his high level of vocal/motor self-stimulatory behavior. In addition, YH has an elevated Maladaptive Behavior Index (MBI) with a scale score of 19±1 with the same scale score for both elevated Internalizing and Externalizing Behavior Indices of 18±2 and 18±1, respectively. The MBI is a composite of internalizing, externalizing and other types of undesirable behavior that interfere with YH's adaptive functioning (Community-University Partnership for the Study of Children, Youth, & Families, 2011). Although individuals with an ASD diagnosis may also have intellectual disability (ID), those with a primary diagnosis of ID may manifest symptoms of ASD because of their cognitive delay, without having the full ASD phenotype. Moreover, the symptomatological overlap of ASD and ID can complicate ASD diagnosis. For example, delays in verbal communication and symbolic play as well as repetitive behaviors (Vig & Jedrysek, 1999) are associated with ASD and ID and so cannot inform the differential diagnosis (Pennington, McGrath, & Peterson, 2009). The most reliable symptoms for differentiating between ASD and ID in clinical diagnosis are in the socialization (social cognition) domain. YH scored lowest on VABS-II socialization domain. Because social interaction skills emerge early in development, they can be assessed even in young children with delayed development. Individuals with ASD are more likely to manifest impairments in social skills, such as imitation, joint attention, and eye gaze (Vig & Jedrysek, 1999). For this reason, best-practice parameters recommended for ASD assessment should include an assessment of cognitive ability (CTONI-3 was done to determine YH's non-verbal cognitive ability), so that the behavioral symptoms can be interpreted within the context of an individual's developmental level (Ozonoff, Goodlin-Jones, & Solomon, 2005).

Table 7: Results of VABS-II

VABS-II Domains	Standard Scores (95% Confidence Level)	Percentile Rank	Adaptive Level
Communication	21±7	<1	Low
Daily Living Skills	52±8	<1	Low
Socialization	20±7	<1	Low
Motor Skills	--	--	--
Adaptive Behavior Composite	27±7	<1	Low

PEDEP Level 3B:
No assessment was done for YH in terms of his speech, language and communication as there was no speech-language therapist available at the time of testing. However, the results from SB-5, CTONI-2 and VABS-2 administration could be used to confirm that YH does manifested severe communication difficulties. Moreover, YH was unable to carry on a spontaneous conversation.

PEDEP Level 4:
Since YH would not be appropriately and/or socially responsive, the Social Responsiveness Scale (Constantino & Gruber, 2007) was not administered.

PEDEP Level 5:
Table 8 shows YH's ADOS-2 Module 2 (Lord et al., 2012) results suggesting he certainly has autism. For YH's chronological age, Module 4 should have been administered but it could not be done. The reason being that YH, at the time of testing, was unable to carry on a spontaneous conversation using sentences. He not only displayed very poor communication and social interaction but also a high level of vocal/motor self-stimulatory behavior. His algorithm score for Communication is 3 (ASD cut-off score=3, while Autism cut-off score=2); for Reciprocal Social Interaction is 16 (Autism cut-off score=6 while ASD cut-off score=4); and for Stereotyped Behaviors & Restricted Interests is 2 (for both Autism and ASD cut-off score=1).

Table 8: Results from ADOS-2 Module

Autistic Spectrum Conditions	**Algorithm Scores**	**Sub-Total Scores**
Social Affect		
1. Communication	3	19
2. Reciprocal Social Interaction	16	
Restricted & Repetitive Behavior	**Algorithm Score**	**Sub-Total Score**
3. Restricted & Repetitive Behavior	7	7
Overall Score	26	26
ADOS-2 Classification/Diagnosis	Autism	

Conclusion
According to Trafford's (2009) definition of a savant, the individual has "a rare but extraordinary condition" (p.1351) in which s/he "with serious mental disability, including autistic disorder, has some 'island of genius,' which stands in marked, incongruous contrast to overall handicap" (p.1351). YH has an extraordinary talent – in Exkorn's (2005) category of those with talented skills that are highly developed and specialized, especially in the arts – in producing his artworks by drawing tiny ants to create things, animals, places and portraits of well-known people. This has been termed as overexcitabilities, especially for YH, in the psychomotor and imaginational domains (Dabrowski, 1972; Chia & Lim, 2017).
Being a savant does not mean an individual with ASD, like YH, is highly talented or gifted with an expected high IQ (Lim & Chia, 2017). In fact, YH has a low FSIQ of 60 (SB-5) and a low NVIQ of 63 (CTONI-2) that confirm that he has an intellectual disability with relatively poor verbal skills.
The ADOS-2 results confirm that YH has autism. Both his VABS-2 profile of DLS>COM>SOC and SB-5 profile of NVIQ>VIQ profile – typical of individuals with ASD – indicate that YH is autistic. With the SB-5 profile FSIQ>AbIQ, YH belongs to a very small ASD group with such a rare profile. His relative strengths in the nonverbal Visual Spatial, Knowledge and Working Memory and a slightly better score in his nonverbal Quantitative Reasoning based on SB-5 agreed with the findings of the Coolican study (2008) on individuals with ASD. His below average performance in Pictorial and Geometric Categories suggests his categorical reasoning is better than his analogical reasoning and deductive reasoning.
In summary, the PEDEP results clearly point to the fact that YH is an autistic savant with intellectual disability and language impairment and whose specific talented skill is in creating artworks using tiny ants he draws with great obsession.

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