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A Word from the EYRAS President

The publication of the inaugural journal of Early Years Research Association of Singapore (EYRAS) is of considerable significance. EYRAS was founded a few years back with the aim of providing a space for sharing relevant information and knowledge on Mind, Brain and Education (MBE) in the field of early years education for children in elementary school level. It is a very first of its own in Singapore to promote MBE. Recognising that every researcher earns his or her place and title through personal effort, yet no one has a complete knowledge when it comes to ever evolving field of neuroscience, education concepts & pedagogies. EYRAS has set up four sub chapters of which each functions like an interest group where its chapter leader could open up unlimited discussions relating to the field. The four chapters are Neuroscience, Early Years Education, Mindsets and Autism Spectrum Disorder. The production of this journal was concurred by all the Council Members. The members wanted the Association to have its own journal that can create some influence to the researchers in the space of MBE. The Constitution states the Association's aims as being:

- a) To maintain association with those interested in the early years education, mind, brain, education, pedagogies, developments and its variants.
- b) To promote and encourage the study of early years education, children

development, children psychology and related topics.

- c) To promote the preservation, security and accessibility of relevant public and private archival and other material, or other media.
- d) To publish and share early years research findings and other relevant information in the Association's journal or other appropriate publication in any form or support.

These objectives are broad and modest. It is broad enough to allow any member to share any research finding or topic they are interested in, within the space of MBE. It is modest enough as recognising of the extent of our ignorance is challenging.

I am very thankful to Dr Guo-Hui Xie who has made every effort in organising not only the Editorial Board but also for compiling the six articles for this electronic inaugural journal. This journal would not be possible without the concerted team effort of the Editorial Board and the writers, and with Dr Xie being the irreplaceable 'conductor' of this team.

Meng Kiat TAN
Honorary President
Early Years Research Association of Singapore

Hypothalamic Atrophy as a Probable Neuroprodrome to Autism: A Short Review

Guo-Hui XIE EdD, BCET, BCSE, BCRT, FCP, FCoT, HonFRSAS
Special Needs Consultant, EYRAS Council Member
Visiting Professor, Universidade de São José, Macau, PRC

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Abstract

Among the many neurodevelopmental disorders, the autism spectrum disorder (or autism for short) represents a daunting challenge for psychiatry, neuroscience and special education (including educational therapy) because of its high prevalence worldwide, prevailing phenomenon (or possibly even noumenon?), complicatedness as well as considerable heterogeneity. As such, facing with so many obstacles and gaps in the current knowledge and understanding of the autistic condition, Di Martino et al. (2014) argued strongly that “it certainly requires large-scale multidisciplinary efforts” (p. 659). For these reasons, despite the field of genetics having pioneered data sharing, neuroimaging had failed to keep up its pace. In this brief review, the main focus is targeted at only one specific area of the brain – hypothalamus – and the impact of two of its hormones – oxytocin (OXT) and arginine vasopressin (AVP) – on autism.

Key Words: Autism, Hypothalamic Atrophy, Hypothalamus, Oxytocin, Vasopressin

Introduction

Autism spectrum disorder (ASD; hereafter, autism) is one of the most heritable neurodevelopmental disorder (NDD)¹ with an early onset, with its typical symptoms being observed in the first three years of life in order to meet criteria for the triad of impairments or ‘core’ symptoms, i.e., difficulties with social interaction and communication, and by restricted and repetitive behavior, in its nosological classification system. “As such, the focus on identifying a prodrome over the past 20 years has been on pre-clinical signs or indicators that will be present very early in life, certainly in infancy” (Yirmiya & Charman, 2010, p. 432). A number of novel lines of investigation have been used to this end, including retrospective coding of home videos, prospective population screening and high-risk sibling studies; as well as the investigation of pre- and peri-natal, brain developmental and other biological factors. While no single prodromal sign is

expected to be present in all cases, a picture is emerging of indicative prodromal signs in infancy and initial studies are being undertaken to attempt to ameliorate early presentation and even ‘prevent’ emergence of the full syndrome (Yirmiya & Charman, 2010, p. 432)

The Hypothalamus

Though a small region of the forebrain in comparison with the rest of the brain, the hypothalamus is located below and in between the pituitary gland (see Figure 1) and the thalamus, which coordinates both the autonomic nervous system and the activity of the pituitary gland. The hypothalamus plays a vital role in the production of many important hormones as well as in the stimulation of many essential processes in the body, such as modulation of the body temperature, thirst, hunger, and other homeostatic systems, and also involves in sleep and emotional activity.

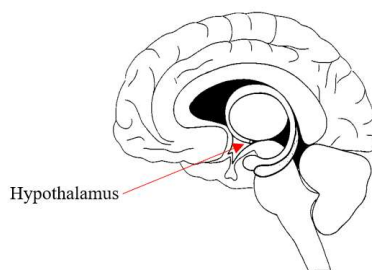


Figure 1. The Location of Hypothalamus

¹ Generally, neurodegenerative diseases (NDDs) involve the degeneration of selective neuronal populations, leading to characteristic symptoms that often lead to conditions, such as

Alzheimer’s Disease, Amyotrophic Lateral Sclerosis, Frontotemporal Dementia, Huntington’s Disease, and Parkinson’s Disease (Vercruyse et al., 2018).

The main function of the hypothalamus is to maintain homeostasis (e.g., glucose homeostasis), i.e., to keep our body in a stable, constant condition, and in other words, it means “a healthful, balanced bodily state” (Johnson, 2018, para. 4), or to establish a relatively stable equilibrium between interdependent elements, especially as maintained by physiological processes within our body, as much as possible.

As mentioned earlier, the hypothalamus responds to a wide range of internal bio-signals and external eco-signals (environment), such as body temperature, hunger and thirst, feelings of being full up after a meal, blood pressure (including hypertension and hypotension), and levels of hormones in the circulation. It also responds to stress and modulates our daily bodily rhythms (e.g., the night-time secretion of melatonin from the pineal gland²; the changes in the stress hormone known as cortisol; and regulation of our body temperature over a 24-hour period). Information collected and combined by the hypothalamus helps to put appropriate changes in place to correct any imbalances in our body. For instance, if a person feels thirsty or hungry, the brain will relay the information via the efferent neurons the need for more water or nutrients in order to achieve homeostasis.

The hypothalamus is like an intermediary between the endocrine system – a collection of ductless glands that produce hormones and secrete them into the circulatory system – and the central nervous system (CNS), which consists the brain, spinal cord, sensory organs and all the neurons to form a communication network between the various organs of the body, playing many essential bodily functions to achieve homeostasis, such as the following: appetite (hunger) and weight control, balancing bodily fluids, blood pressure and heart rhythm/rate, body temperature, childbirth, emotions and moods, production of digestive juices, sleep cycles, sex drive, and thirst.

When different parts of the body send their signals to the brain, they put the hypothalamus on alert, reporting any unbalanced factors that need to be addressed. The hypothalamus then responds quickly by releasing the right hormones into the bloodstream to balance the body. Imagine if the hypothalamus is malfunctioning as a result of atrophy or agenesis/dysgenesis, it can result in many challenging somatic problems that lead to a wide range of rare disorders including autism. In fact, “[T]here is growing interest in understanding the specific brain regions underlying the association between metabolic changes and a range of neurodegenerative diseases” (Ahmed & Farooqi, 2017, p. 1006). In the hypothalamic atrophy on one hand, the small region of hypothalamus critical to the regulation of energy balance has become degenerated. This has been observed in Huntington’s Disease (Douaud et al., 2006; Kremer et al., 1990; Petersén & Björkqvist, 2006) and Fronto-Temporal Dementia (FTD) (Bocchetta et al., 2015; Jacobson & Marcus, 2008; Piguet et al., 2011). In the hypothalamic dysgenesis on the other hand, it is found that the corpus callosum fails to develop fully resulting in callosal agenesis – “a congenital brain anomaly caused by embryonal hypogenesis of the corpus callosum” (Imataka et al., 2006, p. 160), with epilepsy and motor disturbance also being observed in some of these cases.

Primary Hormones of Hypothalamus

The hypothalamus, being highly involved in the functions of pituitary gland (see Figure 2), which consists of pars tuberalis, pars distalis, pars nervosa and pars intermedia, is the most essential of the endocrine system. When it receives a signal from the CNS, the hypothalamus secretes neurohormones that start and/or halt the pituitary gland to secrete certain hormones to the rest of the endocrine system in order to ensure that the internal processes of the body are balanced and functioning properly as they should, i.e., maintaining homeostasis (Sargis, 2021).

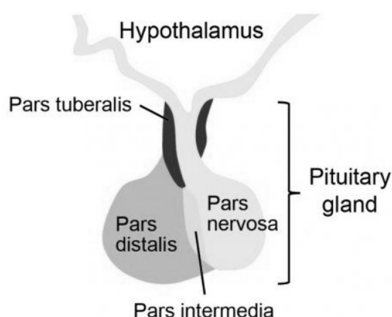


Figure 2. Hypothalamus and Pituitary Gland

² The pineal gland (also known as pineal body; epiphysis cerebri; epiphysis), where the body’s melatonin is produced, sits

deep in the middle of the brain, in an area known as the epithalamus, where the two hemispheres of the brain join.

The primary hormones, which are bio-chemicals synthesized and produced by the endocrine glands to control and regulate the activity of certain cells and organs, secreted by the hypothalamus include anti-diuretic hormone (ADH), corticotropin-releasing hormone (CRH), growth hormone-releasing hormone (GHRH) or growth hormone-inhibiting hormone (GHIH), gonadotropin-releasing hormone (GnRH), prolactin-releasing hormone (PRH) or prolactin-inhibiting hormone (PIH), and thyrotropin-releasing hormone (TRH). Each of these primary hormones is briefly discussed below.

ADH (also known as vasopressin), a neuro-secretary peptide hormone, plays an important role in regulating various physiological processes (e.g., prevention of the production of dilute urine, increased water absorption into the blood by kidneys) and several life-threatening conditions (e.g., bleeding abnormalities and septic shocks). Recently, a study conducted by Joo et al. (2004) found that oxytocin (OXT) “has an antidiuretic effect and increases the urinary excretion of aquaporin-2 (AQP2) in humans whose urinary concentration mechanism is preserved. The results suggest that AQP2 might have a regulatory role in the antidiuretic action of OXT in humans” (p. 2480). The antidiuretic effect of OXT in humans remains controversial. “Urinary excretion of renal aquaporin-2 (AQP2) can be used as an index of the action of vasopressin on the kidney” (Joo et al., 2004, p. 2480).

CRH, which is also known as corticotropin-releasing factor (CRF) or corticoliberin, is secreted by the paraventricular nucleus (PVN) of the hypothalamus in response to stress. An increase in the CRH production has been found to associate with Alzheimer's Disease (AD) and major depression (see Raadsheer et al., 1995, for detail), and the autosomal recessive hypothalamic corticotropin deficiency has multiple and potentially fatal metabolic consequences including hypoglycemia (low sugar blood).

GHRH (also known as somatotropin) is a 44-amino acid peptide hormone that stimulates the synthesis and release of growth hormone (GH) in the pituitary gland³. It is produced in the arcuate nucleus of the hypothalamus. Opposite of GHRH is the growth hormone-inhibiting hormone (GHIH). Its primary role is to prevent the production of other hormones as well as to stop the unnatural rapid reproduction of cells, such as those with excessive somatostatin levels resulting in a specific type of endocrine tumor

known as somatostatinoma. In the extreme suppression of the hormones normally inhibited by somatostatin (e.g., insulin), it can lead to major health problems. In addition, somatostatin also acts as a neurotransmitter and has a role in the gastrointestinal tract, i.e., it reduces gastric secretion as well as emits gastrointestinal hormones (e.g., secretin and gastrin).

GnRH, a tropic peptide hormone synthesized and released from GnRH neurons within the hypothalamus, is responsible for the release of (i) follicle-stimulating hormone (FSH), which regulates the development, growth, pubertal maturation, and reproductive processes of the body; and (ii) luteinizing hormone (LH), which triggers ovulation (Nosek, 1998) and development of the corpus luteum in females, and stimulates Leydig cell production of testosterone in males (Nosek, 1998). LH is called interstitial cell-stimulating hormone (ICSH) in males (Louvet, Harman, & Ross, 1975). Both FSH and LH from the anterior pituitary gland work together in the reproductive system (see Bowen, 2018, for detail).

Prolactin-releasing hormone (PRH) (also known as prolactin-inhibiting hormone (PIH) or dopamine) is produced in the arcuate nucleus and is released in the hypothalamo-hypophysial blood vessels that supply PRH to the pituitary gland to inhibit the production of prolactin. It is associated with reward-motivated behavior and motor control. Any dysfunction of the dopaminergic pathway can result in several neurological diseases, e.g., Parkinson's Disease “caused by the loss of dopamine-secreting neurons and it leads to motor impairment” (Conrad, 2018, para. 2). PRH prompts the anterior pituitary to stimulate breast milk production through the production of prolactin. Conversely, it also inhibits prolactin to stop milk production.

TRH is a hypophysiotropic hormone produced by neurons in the hypothalamus. Its role is to stimulate the release of thyroid-stimulating hormone (TSH), which regulates metabolism, energy, and growth and development, and prolactin from the anterior pituitary gland. TRH has been used clinically for the treatment of spinocerebellar degeneration and disturbance of consciousness in humans. Moreover, TRH has anti-depressant and anti-suicidal properties (Marangell et al., 1997) and it has been used to develop TRH nasal spray used in the US Army to prevent suicide amongst its ranks.

³ The pituitary gland (about the size of a pea) – located just beneath the base of the brain, behind the bridge of the nose – takes messages from the brain via hypothalamus to produce

hormones that affect many different parts of the body. It also stimulates other hormone-producing glands to produce their own hormones.

The Neuropeptides: Oxytocin and Arginine Vasopressin

In the hypothalamus, “the ratio of vasopressin to oxytocin was approximately 3:1” (Jenkins et al., 1984, p. 111). In the extrahypothalamic areas of the brain, the greatest amount of both neuropeptides can be found in the locus coeruleus, and also, to a lesser extent, in the periaqueductal grey, too. The arginine vasopressin (AVP) “only was found in the substantia nigra, and globus pallidus” (Jenkins et al., 1984, p. 111). The amount of OXT being greater than AVP can be found in the medulla, which includes the nucleus of the solitary tract, the dorsal nucleus of the vagus, and the nucleus of the spinal tract of the trigeminal nerve. Additionally, OXT predominated over AVP to an even greater extent in the spinal cord, “and reached particularly high values in certain segments of the intermediolateral grey column and dorsal horn” (Jenkins et al., 1984, p. 111).

According to Benarroch (2013), OXT and arginine vasopressin (AVP) are two closely related neuropeptides that are known for their peripheral hormonal effects. However, OXT and AVP as well as their receptors are also expressed in several areas of the central nervous system (CNS) with widespread neuromodulatory effects on homeostasis and behavior. As a result, “OXT and AVP have been referred to as social neuropeptides as they have a highly conserved role as mediators of complex social cognition and interaction in both animals and humans” (Benarroch, 2013, p. 1521).

Oxytocin

Oxytocin (OXT) – a hormone produced in the hypothalamus and released by the pituitary gland – has been a subject of interest in relation to autism. The key reason is the influence of this hormone in social behaviors, especially in people on the autistic spectrum with social difficulties (e.g., social awareness, social recognition and social interaction or communication) and repetitive behavior. OXT has been described as the “love drug” as “it creates a sense of well-being, such as calmness, relaxation, and alleviating anxiety.” (Deolinda, 2021, para. 4). As OXT can reduce anxiety levels and reactivity to stressors, it acts as a good buffer to social stress. This, in turn, helps to alleviate repetitive behaviors observed in individuals with autism. According to Deolinda (2021), when the plasma OXT is low or lacking, OXT processing defects are manifested in the social impairment of individuals with (and/or without) autism, but more so in those with autism.

Apparently, it seems that there is some kind of association between OXT and autism, since

OXT plays an essential role in developing social skills. Individuals with autism manifest social difficulties, which, in turn, trigger (social) anxiety in them. However, this “does not necessarily mean that lack of oxytocin is a cause” (Deolinda, 2021, para. 13). In fact, Deolinda (2021) explained that in both groups of individuals with autism and without autism, the lack of OXT in the brain can lead to an increase in anxiety and fear. This may explain why social ineptitude is often observed in children and adults with autism.

Vasopressin

The hormone vasopressin – also known as antidiuretic hormone (or ADH for short), arginine vasopressin (AVP), or argipressin – is a hormone synthesized as a peptide prohormone in neurons in the hypothalamus, and is converted to AVP. It is a small peptide that modulates several functions, such as blood pressure, water balance and thirst, and social behavior, such as social interaction and selection of mate in terms of preference and attachment (Hammock, 2019). Because of its effects on social behavior, the AVP system has been found to offer as a potential therapeutic treatment for easing social impairments in autism. In addition, it also “modulates territorial behaviors towards potential same-sex rivals, increases attraction, as well as sexual and reproductive behaviors” (Henderson, 2021, para. 8).

OXT/AVP Systems

Both OXT and AVP are structurally homologous peptide hormones synthesized in the hypothalamus. Together, the general role of OXT/AVP systems are to modulate social behavior and emotions, but they also participate in cognitive functioning. Moreover, the recent study done by Abramova et al. (2020) has found the OXT/AVP systems to be involved in “the formation of social, working, spatial and episodic memory, mediated by such brain structures as the hippocampal CA⁴² and CA3 regions, amygdala and prefrontal cortex” (p. 1). Additionally, the stress-induced imbalance of the OXT/AVP systems can result in an increased risk of various mental disorders (e.g., autism, borderline personality disorder, depression, schizophrenia, and social anxiety disorder) with cognitive deficits also being observed in these disorders.

Hypothalamic Atrophy in Autism

Research studies on the hypothalamus and its atrophy in autism have been sporadic. According to Wolfe et al. (2015), the reason is twofold: firstly, it is due to the small size of hypothalamus; and secondly, there are methodological constraints in the

⁴ CA stands for Cornu Ammonis, or Horn of Ammon found in the hippocampus.

current technology to study it. Despite the challenges, Wolfe et al. (2015) used the neuroimaging to examine the hypothalamic atrophy in individuals with autism in comparison to those who were typically-developing (TD) in the following way (p. 1017): Firstly, the grey matter (GM) density was directly measured by application of a region-of-interest (ROI) analysis in the Voxel-Based Morphometry (VBM), in a homogenous sample of participants controlled for age and IQ. Secondly, for generalization, the third ventricular volume – based on its position bilaterally surrounded by the hypothalamus, was measured by using Freesurfer (a brain imaging software package) in a heterogeneous sample of participants. The findings of Wolfe et al. (2015) showed a decrease in the hypothalamic GM density but an increased third ventricle volume in participants with autism compared to TD participants. Their results also provided neuroanatomical insights to socialization deficits in individuals with autism that might also be relevant for other psychotic disorders.

Interestingly, several neuroimaging studies (e.g., Callen et al., 2001; Ishii & Iadecola, 2015; Loskutova et al., 2010) that studied and observed hypothalamic atrophy in patients with Alzheimer's Disease (AD) have also found a decrease in the hypothalamic volume at the early clinical stages of AD in 10% and 12% in their respective cohorts (Callen et al., 2001; Loskutova et al., 2010). Although autism and AD are neurodevelopmental and neurodegenerative disorders respectively, with devastating effects, they share “the background of common associations like memory deficits, cognition changes, demyelination, oxidative stress and inflammation, an integral part of both disorders” (Khan et al., 2016, p. 390). Collectively, these factors contribute to the expression of autism and AD but the two disorders express at different stages of lifespan development involving certain susceptible genes, which is not within the scope of coverage in this paper.

Another interesting finding is that Amyloid Beta ($A\beta$ or Abeta), which denotes peptides of 36-43 amino acids, and whose normal function is still not well understood (Hiltunen, van Groen, & Jolkonen, 2009), constitutes the main component of the amyloid plaques found in the brains of people with AD. Studies (e.g., Bailey et al., 2008; Sokol et al., 2006; Westmarket et al., 2011) have also linked this peptide to autism and related disorders such as Fragile-X Syndrome. According to Wright (2012), “[T]he researchers also found amyloid plaques in the brains of two individuals, aged 51 and 52, who had autism, and one individual aged 39 with the 15q duplication. This suggests that the enhanced levels of amyloid-beta in these individuals are a precursor to Alzheimer's Disease” (para. 6).

Several other studies (e.g., Luo et al., 2003; Sadigh-Eteghad et al., 2014) conducted on animals have also suggested that the absence of $A\beta$ does not lead to any obvious loss of physiological function. Instead, several potential activities have been identified for $A\beta$: (i) activating kinase enzymes (Bogoyevitch et al., 2004; Tabaton et al., 2010), (ii) involving anti-microbial activity that is potentially associated with $A\beta$'s pro-inflammatory activity (Kagan et al., 2012; Li et al., 2018; Schluesener et al., 2012); (iii) functioning as a transcription factor (Bailey et al., 2011; Maloney, B., & Lahiri, 2011); (iv) protecting against oxidative stress (Baruch-Suchodolsky & Fischer, 2009; Zou et al., 2002); and (v) regulating cholesterol transport (Igbavboa et al., 2009; Yao & Papadopoulos, 2002).

Implications of Hypothalamic Atrophy in Autism Treatment

“OXT and AVP are emerging as targets for novel treatment approaches – particularly in synergistic combination with psychotherapy – for mental disorders characterized by social dysfunction, such as autism, social anxiety disorder, borderline personality disorder and schizophrenia” (Meyer-Lindenberg et al., 2011, p. 524).

According to Bartz and Hollander (2008) and Deolinda (2021), intravenous OXT administration (IOA) or OXT infusion therapy has been shown to promote trust and prosocial behavior, and, in turn, help to improve social learning and reduce repetitive behaviors in individuals with autism. It is available by prescription under the brand names Pitocin and Syntocinon. This is supported by the findings from a study done by Anagnostou et al. (2012): after a 6-week period of IOA, participants showed improved social cognition, reduced repetitive behaviors, relieve gastrointestinal discomfort, and improve emotional well-being for some of them. In terms of repetitive behaviors, IOA did not impact on higher-order behaviors (e.g., compulsive-like behaviors) but more so on lower-order behaviors (e.g., self-stimulatory behavior). One possible explanation is that since the self-stimulatory behavior is a pleasurable act, OXT may replace that act due to its feel-good effect.

There are also vasopressin drugs under the brand names Pitressin and Vasopressin, but currently, they are not used in autism treatment, but for other medical conditions (e.g., asystole, diabetes insipidus and gastrointestinal hemorrhage). In one study based on efficacy findings in the VANILLA (Vasopressin ANtagonist to Improve social communication in Autism) done by Bolognani et al. (2019), it was revealed that blocking AVP with a pill called Balovaptan (developed by F. Hoffmann-La Roche AG – a Swiss multinational healthcare company that

operates under Pharmaceuticals and Diagnostics divisions), which is a Vasopressin 1a (V1a) Receptor Antagonist (VRA) – an agent that interferes with action at the vasopressin receptors – with no known drug-related safety concerns identified to date, has shown to modestly improve social and communication skills in adults with autism. In fact, Keown (2018) reported that the U.S. Food and Drug Administration (FDA) called the drug a successful breakthrough for mediating and modulating key social behaviors in individuals with autism. In another study carried out by Parker et al. (2019), their findings suggested that delivering AVP via the nose increases social behavior scores in children with autism.

Concluding Remarks

More research is still needed to be done to understand diseases or disorders associated with the hypothalamus (also known as a hypothalamic disease/disorder), which include poor appetite, and sleep disorders (somnipathy) due to hypothalamic malfunctioning. Moreover, the hypothalamus and pituitary gland are so closely connected that it is often difficult to determine if a condition is linked to the hypothalamus or pituitary gland, especially hypothalamic-pituitary disorders. In fact, a physical injury to the head can impact the hypothalamus and

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- it is one of the most common causes of hypothalamic dysfunction (Sargis, 2021).
- While the exact root cause of autism continues to stay unknown, findings from recent research studies (Caria, Ciringione, & Falco, 2020; Chaminade et al., 2015; Wolfe et al., 2015) on the hypothalamus suggest that some form of hypothalamic disease may constitute a probable neuroprodrome (i.e., an early neurological symptom indicating the onset of a disease/illness) to autism could be caused by the atrophy of hypothalamus involving the OXT/AVP imbalance (Aoki et al., 2014; Baribeau & Anagnostou, 2015; Rutigliano et al., 2016). This discovery has added to the list of causality theories of autism, including environmental factors, exposure to pesticides and toxins, genetic factors and mutations, perinatal infections, mitochondrial dysfunction and social issues. In conclusion to this review, to put it succinctly, the causes of autism remain etiologically heterogeneous.
- Disclaimer:** The content of this paper is strictly for informational or educational purposes only, and does not substitute professional medical advice or consultations with healthcare professionals.
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Establishing a Child's Personality via the Projective Assessment Triad within the Four Levels of Mind

Chong Lee WONG MSc, MEd, FRASAS

Registered Special Needs Educational Therapist, EYRAS Council Member

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Abstract

In this short paper, the author explained the theoretical basis for the need to establish a child's personality using projective assessment triad within the context of the four mental levels of mind in terms of (i) conscious, (ii) preconscious, (iii) subconscious, and (iv) unconscious. The term *projective assessment triad* (PTA for short) used by the author refers to three different projective tests (e.g., projective drawing tests, incomplete sentence tests and word association tests) of personality, which according to Friedman and Schustack (2001), may involve some degree of ambiguity in the test instructions or stimuli in order to create opportunities for an examinee to structure his/her responses in terms of his/her individual personality characteristics. In this way, the examinee can provide authentic information about the nature of these characteristics.

Key Words: Mental Levels of Mind, Personality, Projective Assessment Triad

Introduction

Who am I? A frequently asked question especially so when we are in different situations in life and sometimes even puzzled why we think and act in a certain way. I am unique, I am special, I am me. This is but a very common statement often put forward by anyone in the street when the question on "Who am I?" is asked. Having self-knowledge makes one assured of himself. By knowing oneself and what stand in life gives us a strong sense of self-confidence. In view of this, knowing self is important. However, knowing oneself is *really* tough.

The Cambridge Dictionary Online (2021) defines the term *personality* as "the type of person you are, shown by the way you behave, feel and think" (para. 1). The next question must be: Why should anyone care? In a professional office environment, it is more vital than ever to understand the work environment and how one can fit into that community. Different personalities can be far more suited to certain positions than others. Some employers even administer personality tests to job applicants in order to see how they would fit into the company and meet its particular needs. For instance, human resource professionals require to be effective communication skills, excellent stakeholders' management skills and an organized way to deal with tasks in a structured and systematic way. Implementing inclusion and diversity requires the knowledge of how to help different personalities of people work effectively together, or understand why some do not. Hence, knowing one's personality is important since it gives insight into one's own nature and how one can fit into the current office or future employment.

Personality assessments are a means to measure personality traits and characteristics of the individual (Akee et al., 2018). Knowing an individual's personality does help to better understand oneself, social interactions and relationships and thus used to create stable working relationships with the surrounding people. In work place, personality assessments are used to obtain useful insights on how potential employees behave in a work context and thus can predict job performance and assess if an employee fits the company's culture. With the data obtained from these assessments, companies can then decide to hire the right candidate that will help to contribute positively in the working place.

There are numerous ways to find out the personality of an individual or a person, for example through the use of psychological tests or as proposed in this paper, the author would suggest the use of projective method as a means of knowing one's personality. There are many methods used to assess personality. The direct measures would include observations, interviews, rating scales, behavioral data and situational tests. The indirect measure would include projective assessment (e.g., projective drawing tests, incomplete sentence tests, word association tests) which is the main focus of this short paper.

In a projective test, it involves a person (examinee) responding to a certain kind of stimuli and thereby get to know the hidden emotions and personal conflicts that are revealed during the test.

According to Patra and Sharma (2020), unlike self-report tests where one is presented with structured test stimuli, projective techniques are indirect and

unstructured ways to find out the personality of a person. The term *projection* means that since the stimuli are unstructured, chances that a person may project his/her own undesirable traits, ideas, feelings and motives on the given ambiguous stimulus. As in the psychological testing of an individual's personality, a projective assessment can also be, a general sense, an approach for an examiner to gather from an examinee (or interviewee) in terms of his/her different life experiences, how the person may perceive, organize and interpret issues very differently and there is more to the list of information to be collected. Hence, it does give a perception into the individual's personality. In addition, the use of projective assessment depends largely on the psychoanalytic perspective which goes deeply into an individual's unconscious mental state of mind, thereby revealing the real nature of the person's personality (Patra & Sharma, 2020). The person may either be caught off guard or not even aware of his true personality while doing the projective assessment tasks. Thus, projective testing proves to be more effective in assessing the personality of the individual, child or adult.

Development of Personality in Early Childhood

Much has been talked about personality, especially of an adult. The next question that the author of this paper will be interested is: Does a child have a personality? If so, when does the personality develop?

All, if not most, preschool years literature is always associated with major developments in young children's socialization phase. Preschoolers begin their fragile to becoming adept at functioning on their own progressively. It is during the early childhood phase between ages 2 and 6 years old that children start to gain some sense of being separate and independent from their parents. According to Erikson (1950), preschoolers will start to develop autonomy, or self-direction, (ages 1–3), as well as initiative, or enterprise (ages 3–6) as they grow and mature gradually.

Eysenck (2018) takes personality to include those stable psychological characteristics that makes each human being as a unique individual. Children just like mini-adults possess personality traits (long-term characteristics, e.g., temperament) and states (changeable characteristics, e.g., moodiness). While there are a number of theories about the development of childhood personalities as well as several different trajectories it takes, invariably it boils down to an individual's personality, stating that it will highly be solidly established by the end of early childhood (Entwisle, 1995)

According to Freud (1950), the second year of childhood phase is the anal stage of psychosexual

development. This is where most parents will face many new challenges. One such challenge concerns toilet training their children. Any fixations at this stage may give rise to characteristic personality traits that may eventually lead to its uncalled negative emergence in adulthood. These personality traits include anal retention (i.e., excessive neatness, organization, and withholding), or anal expulsion (i.e., messiness and altruism). Freud (1950) believes that at any point in development, any conflicts that a child encounters must actually be resolved first so before s/he can move on successfully to the next stage. Hence, past conflicts that are not either properly resolved or amicably settled may impact the child in the future formation of his/her personality during the adulthood phase. Failing to successfully complete a stage, Freud (1950) warned, would cause that individual to remain essentially "stuck." He or she would become fixated at that point in his/her lifespan development. Freud also believed that such a fixation could result if a particular stage has left a dominant impression on an individual's personality.

A group of personality theorists had also explained on early childhood personality development. Several renowned learning theorists have clearly stated that personality can develop in terms of the following: e.g., the classical conditioning as postulated by Ivan Pavlov (b.1849-d.1936) in his learning theory by association; the operant conditioning put forth by B. F. Skinner (b.1904-d.1990) in his theory of learning by reinforcement and punishment, and also the observational learning as proposed by Albert Bandura (b.1925-d.-) in his theory of learning by imitation. This third or latter theory involves the identification or internalization, whereby children observe and adopt the values, ideas, and standards of their significant others. Cognitive psychologists, on the other hand, have stated that personality arises, in part, from the attitudes and biases expressed by the adults around them. Gender theorists have argued that personality is developed from what they have termed as "gender identification" and "gender socialization". Geneticists speculate that personality arises from *wired-in* genetic and biochemical influences rather than psychosocial ones.

Apart from the above varied explanations that deal with the complexities of the various processes of personality development, there are also other combinations involving psychosocial, parental, and biological influences factors that are responsible for the ultimate determination of the personality of a child (who will eventually turn into an adult). Hence, personalities are formed as a result of these experiences.

Nature of Projective Techniques in Personality Development

Having understood that children do and can form their own individual personalities, projective assessment methods offer a very useful approach in order to establish a better profile in understanding them; especially those who express difficulties in their emotions or show resistance or defense in managing their feelings. Hence, knowing and understanding the nature of such projective testing approach and how it impacts the minds of either children or adults will be very useful.

The term “Projective Test” as formed by Lawrence K Frank (1948). According to Frank (1948), the aim of such tests was to look into an individual’s mental process, focusing on the various pieces of unobservable psychological thinking that are running in the mind of an individual. Subsequently, the first projective test was devised in 1879 by Sir Francis Galton. This projective test was meant to measure word association; a test where several items were presented with a set of words and participants were supposed to give responses to the words. Carl Jung, the Swiss psychiatrist and Sigmund Freud enhanced the word association test in line with blood pressure indices. The purpose is to find out the group of feelings and thoughts which revolved on the numerous emotional issues and thereby giving information on the complexity of psychological condition of the individual.

The conventional personality tests consist of standard structured test stimuli that are useful to measure the characteristic patterns of traits that people would show in various situations. However, in projective tests the individual has to respond to unstructured or ambiguous stimuli. This works on the basis that the person doing the projective assessment would be unconscious of his feelings, needs, emotions, motives etc. on to the ambiguous stimulus ((Patra & Sharma, 2020). Projective assessments are particularly useful in addressing the mental health in children. According to Josephs et al., (2021), knowing the techniques on how to assess, formulate and treat a variety of presentations seen in children and young people using the various projective assessment tools and models are important since it helps to address specific problems encountered in children, young people and their families from different cultural backgrounds. It uncovers the inner feelings, desires and fighting conflicts that are all either hidden knowingly or unconscious from their awareness. It is precisely because of various ambiguous cues that counselors and therapists are able to take cues from the data of the assessments and uncover unconscious feelings that might be causing problems in the child’s life.

According to Rabin (1981), projective techniques involve tasks that come with unstructured set of stimuli and the participant is given a list of open-ended questions. The various tasks involve participants to draw do not come with stimulus. When the tasks are done, the therapist would focus on the interpretation of perception of the stimuli given and the way the response is presented. Since projective assessment is a set of unstructured or ambiguous stimuli, it can be subjective in its interpretation. This is where the skills of a trained therapist are called for in order to interpret the work done by the participant correctly. Rabin (1981) argues that the stimuli presented in projective assessments can be interpreted in different forms. The extent of the ways in which the interpretation can make sense can be addressed in different ways. Hence, there will be a need to have a step-by-step guide or training in making meaning on the responses based on the stimuli.

In order for all projective assessment to be a fully meaningful activity, the participants need to input ideas, own drawings, colorings or images so as to have eidetic or iconic as well as verbal responses. As more and more stimuli are given or more drawings are required to be done, it will generate more open-ended questions so as to clarify the work done. Bellak (1975) added that it is important that the interpreter has skills and an approach in order to evaluate on the various pieces that the drawer has given. The interpretation, according to Wallendorf and Brucks (1993), requires it to be consistent when analyzing other unstructured tasks. Interpretation work to those projective tasks is often challenging. The whole process can very complicated and often consist of interrelated processes where the drawer’s conscious and unconscious motivations and attitudes are often revealed. In addition, analysis of the projective assessments will also reveal aspects of emotion, desires and cognition that the drawer does not wish to be expose. These unconscious revelations of the responses may be associated with one’s privacy. Making known of such privacy can be seen as a form of invasion and thus can cause embarrassment. Roger (2008) pointed out that the issue on faking and malingering by the drawer could actually happen during personality assessment though it will be lesser of a chance to happen in projective assessment since the drawer may not be aware of what is going on during the drawing process. Nevertheless, it is lesser of a problem in projective assessment since the drawer does not really know much of the reason behind these projective tests. The “fakeability” of projective tests, nevertheless, remains inadequately researched upon (Roger, 2008).

The use of projective assessment can be challenging since elicitation of the drawer’s responses has have

to contain specific information in order to produce a sufficient story content for meaningful interpretation (Teglasi, 1993). Another challenge for projective assessment is the skills needed for interpretation on the various pieces of work done by the drawer. Although guidelines can be given for understanding on the given drawings, Ballack and Hersen (1998) argue that it requires the interpreter to have certain level of trained inference while doing the interpretation of responses on the projective test to the point where the evidence gathered from the drawings need to be informative and giving sound evaluation on the pieces of work done by the drawer. Moreover, in order to have meaningful interpretation of the pieces of drawing, the interpreter needs to link the various respond elements in the drawing collectively rather than relying on isolated parts of the drawing and do a piecemeal meaning making of the drawer's messages. The latter approach is often inaccurate since it is but a mere speculation process of interpretation. During the interpretation process, apart from doing the interpretation, inferences are needed so as to understand the drawings even better based on the drawer's behavior during the drawing process as well as the drawing piece used for analysis. Any changes in the drawer's behavior or emotional reactions are always noted and used as part of the whole interpretation process.

As mentioned above, projective assessment is an indirect method of assessing the feelings and intentions of a person (Jeong et al., 2019). Through the use of several stimuli, it allows the person to reveal his/her feelings, desires and needs that the person is currently facing. Contrasting to the test thinking attitudes, during the process of doing the projective assessment, the person thinks, feels and acts that is according to the unconscious mind. Since projective assessment relies so much on the unconscious mind to reveal information on the person, understanding the mind on how it operates will be very useful.

Projective Representations of the Mind

The online Cambridge Dictionary Online (2021) defines *mind* as "part of a person that makes it possible for him or her to think, feel emotions and understand things" (para. 1). Having the ability to think, feel emotions and understand things are extremely important in a person's daily living. Unless a person is suffering from brain fog or momentary blank out, psychological mindedness enables a person's ability to look around his/her surroundings and reflect on his/her internal life. Vaidyanathan et al. (2018) cited from Hall (1992) who has defined psychological mindedness as "capacity for self-examination, self-reflection, introspection and personal insight" (p. 131). That would mean a person has the ability to understand

the different types and levels of emotions and meaning of words as well as relating to the person's past and present experiences. It also includes higher levels of knowing one's personal and others' motives and intentions.

A person's psychological mindedness can affect a person's mental well-being in terms of what the person does, behaves, his/her reasons for performing certain actions and in certain ways. Except for Preconscious and Subconscious which Chia and Lee (2017) argued that they are different from each other, all these four mental levels of mind are operating within the psyche of a person: (i) Conscious, (ii) Preconscious, (iii) Subconscious, and (iv) Unconscious. In order to understand how projective assessment is linked to this psychological mindedness, the author has attempted to describe it within the context of the four mental levels of mind in the following section of the paper.

The Conscious Mind

According to the Loar (1999), the conscious mind is one that is aware of the surrounding and has the ability to react or respond to the different stimuli. It has all the thoughts, memories and feelings that a human is aware of at any time. It is a time when we can think and give our thoughts in a logical fashion since our minds are able to do the mental processing very well. At this point, a person can actually use his or her memory to recollect past incidents and now brought into awareness. An example of a conscious mind at work is when a person is hungry, he or she will go and look for food to solve his hunger. According to Chia and Lim (2017), when the conscious mind is at work, a person will be defensive state when he or she is in a disadvantage position. As the goal of a projective assessment is to uncover the hidden conflicts that are trapped in a person, trying to use such assessment on a person with a conscious mind may not be reaped much useful information for psychotherapy treatment since the person may control his or her thoughts and feelings without doing a full disclosure on the presenting issues.

The Preconscious Mind

The preconscious mind, according to Chia and Lee (2017) as the "threshold level of mindfulness just below the level of conscious awareness, from which consciously suppressed memories emotions can be recalled." According to Freud (1900), in the preconscious mind, all things stored in that level can actually be pull into the conscious level of awareness. An example of the preconscious mind at work are memories from childhood. The person may not be thinking of it all the time. But it can be evoked when call upon to awareness. The person can talk about it when asked about those childhood incidents. The preconscious also acts as something of a guard,

controlling the information that is allowed to enter into the conscious awareness state.

The Subconscious Mind

Chia and Lee (2017) as the “threshold level of mindfulness where it stays right below the preconscious mind. It can be impactful in that it can influence a person’s actions and feelings when brought to the level of consciousness. It is a storage where it retrieves a person’s beliefs, past experiences, memories, things that were done or seen. The conscious mind acts rationally and sends out the instructions while the subconscious mind will execute the instructions accordingly. In this way, there is a synchronized way of working between the person’s behavior and emotional thoughts and feelings.

The Unconscious Mind

Unlike the rest of the minds mentioned above, the unconscious mind is a pool of feelings, thoughts, urges, and memories that are out of the scope of a person’s conscious awareness. Freud (1900, 1905) had stated that the unconscious mind is largely inaccessible, and that it can, at times, out of a sudden, appear in dreams or spoken views in a form of feelings especially in slips of tongue. Moreover, the unconscious mind has a higher possibility to reveal feelings of pain, anxiety or conflict. Weston (1999) added on by stating that the unconscious mind shows repressed feelings, automatic skills, subliminal perceptions, thoughts, habits and automatic reactions, as well as complexes, hidden phobias and desires. The projective assessment is developed in such a way that it is an indirect method to assess personality; one that assess the unconscious motives, feelings and conflicts (Jeong et al., 2019). The assessment works well with the unconscious mind because projective techniques interpret an examinee’s responses according to the ambiguous cues, which can yield a wealth of information to an examiner (e.g., psychoanalyst or counselor) who aims to uncover those unconscious feelings that is causing the problems in the person’s life.

The mental state of a human mind is complex. It is beyond the scope of this paper to go on and describing the 4 states of mind and how the mind affects a person’s behavior, actions, thinking, moods and feelings. There is still a lot more awaiting to be explored in how the state of mind s operation affecting the process of a projective assessment that reveals a person’s true feelings, thinking and intentions.

Limitations of Projective Assessment

Projective assessment, by nature of its assessing method, is very subjective (Patra & Sharma, 2020). Projective tests have a weakness in that it lacks

standardization. It requires a great deal of experiences of the assessor to administer and interpret. Different ways of interpretation may yield different results. However, some tests, such as the Rorschach and the Thematic Apperception Test (TAT), have more standardized methods of interpretation than others, such as the House-Tree-Person test or techniques such as free association and dream interpretation. Nevertheless, projective tests are generally considered less reliable than other standardized, objective, psychological tests.

According to Harder (1979), projective tests have always been asked for their validity or accuracy of measure. Projective tests can be challenging to interpret since it connects to the individual’s most recent experiences, rather than their deepest subconscious desires. The latter can be obtained unless it comes with proper techniques of interpretation. Another criticism on projective techniques is that the test makes poor diagnostic measures as it may focus solely at an individual’s behavior, rather than symptoms. Since behaviors can be very different, even for people with the same diagnosis, they may not give an accurate diagnostic assessment.

Concluding Remark

No assessment methods are perfect. In the case of projective assessment, this method of drawing can be a very enriching tool in order to find out the inner world of an individual; be it from the social and emotional aspect or the perspective of that individual. The drawn piece of work is not just another piece but instead when interpreted with care and proper guidance, it can actually reveal rich information on what is actually happening in the individual’s world without the individual’s knowing. It is precisely this nature of projective assessment on how it works makes the entire assessment unique and to some ways a mysterious way to unravel the hidden truths, which otherwise will go unnoticed.

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Alimentary Management via Food Supplements for Young Children with Autism: A Review

¹Boon Hock LIM PhD, FCCT, HonFRSAS

²Guo-Hui XIE EdD, BCET, BCSE, BCRT, FCP, FCoT, HonFRSAS

³Ban Ming LEE BAcc, HonMRSAS

¹Special Education Consultant, BH Lim Consultancy, Melaka, Malaysia

²Special Needs Consultant, EYRAS Council Member

^{1,2}Visiting Professors, Universidade de São José, Macau, PRC

³Educational Therapist & Associate, BH Lim Consultancy, Melaka, Malaysia

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Abstract

The primary traits of autism spectrum disorder (ASD) consist of the inability to socialize, communicate and use imagination, and/or manifestations of stereotypical behavior. A disruption in the development of an autistic brain has been widely accepted in explaining the neurodevelopmental causes linked to ASD, but the association between the brain and the condition remains unclear. In this regard, a majority of young children with ASD have been observed to manifest gastrointestinal (GI) problems with a rise in intestinal permeability contributing to the pathogenesis of severity of ASD symptoms. According to Hsiao (2014), the GI abnormalities, given their reported prevalence and correlation with the severity of key ASD-related behavioral abnormalities and the development of autism-related endophenotypes (e.g., immune dysregulation, hyperserotonemia, and metabolic dysfunction) are of particular interest in this paper. This review discusses the GI pathologies seen in ASD individuals and the association of particular GI conditions with known deficiencies in vitamins and minerals. With emerging evidence for a gut-brain connection in ASD (van De Sande, van Buul, & Brouns, 2014), vitamins and minerals have been widely used in nutritional or dietary treatment for ASD.

Key Words: Autism, Mineral, Nutrition, Treatment, Vitamin

Introduction

Autism spectrum disorder (ASD) is often defined in terms of the *triad of impairments* – the phrase was first coined by Lorna Gladys Wing (b.1928-d.2014) and her associate, Judith Gould, in their pioneering work on autism as the central plank of the construct of ASD (see Wing & Gould, 1979): (i) impaired communication, (ii) impaired social skills, and (iii) a restricted and repetitive way of being-in-the-world. Garcia (2021) has defined the triad of impairments more or less along the same line, i.e., (i) difficulty in communication or language, (ii) social and emotional deficits, and (iii) inflexibility in thought and imagination, to describe the difficulties that those with ASD encounter on a daily living routine. According to Cashin, Sci and Barker (2009), “[T]he actual triad of impairment is static and ubiquitous unlike the variable and fluctuating behavioral manifestation. The actual triad of impairment in autism is visual as opposed to linguistic processing, impaired abstraction, and lack of theory of mind. The actual triad is central to all diagnosis that together makes up the autism spectrum” (p. 189). The triad of impairment referred to at present in the autism-related literature is a behavioral triad. Cashin et al. (2009) have extended the triad of impairment model to the triad that

underlies the behavioral manifestation: The real triad of impairment.

With the publication of the Diagnostic and Statistical Manual of Mental Disorders-5th Edition (DSM-5; American Psychiatric Association, 2013), the triad of impairments has been replaced with the dyad of impairments (see Figure 1), i.e., [A] impairment in social communication and interaction, and [B] restrictive and repetitive pattern of behavior, and taking into account [C] the challenging sensory issues (i.e., deficits or impairments in sensory processing, modulation and response, resulting in what is known as sensory integration disorder, also known as sensory processing disorder) in the diagnostic assessment of ASD. The sensory issues constitute as a collective symptom under the restricted/repetitive behavior category, and it can be either hyper- or hypo-reactivity to stimuli (e.g., lights, sounds, tastes, touch, etc.) or unusual interests in stimuli (e.g., staring at lights, spinning objects, etc.) (APA, 2013). In addition to the dyad of impairments, the DSM-5 (APA, 2013) has also included the following categories of symptoms mentioned in the Behavior Assessment System for Children-Third Edition (BASC-3; Reynolds & Kamphaus, 2015a): “C.

Symptoms must be present in the early developmental period (but may not become fully manifest until social demands exceed limited capacities or may be masked by learned strategies in later life). D. Symptoms cause clinically significant impairment in social, occupational, or other important areas of current functioning. E. These disturbances are not better explained by intellectual disability (intellectual developmental disorder) or global developmental delay. Intellectual disability and autism spectrum disorder frequently co-occur; to make comorbid diagnoses of autism spectrum

disorder and intellectual disability, social communication should be below that expected for general developmental level” (also see Reynolds & Kamphaus, 2015b: BASC-3 Autism Spectrum Disorder 299.00 (F84.0), pp. 1-2). A severity assessment scale (levels 1-3) based on level of support needed for daily function has also been included in the diagnostic manual. The three levels are: Level 1 – requiring support; Level 2 – requiring substantial support; and Level 3 – requiring very substantial support (also see Camulli & Goh, 2018, p. 188, for detail).

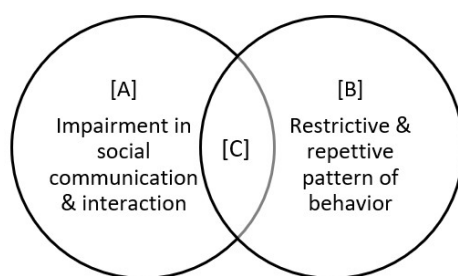


Figure 1. DSM-5 Diagnostic Criteria for ASD

Causes of Autism Spectrum Disorder (ASD)

Being a heterogeneous condition, ASD is not autism per se but a wide range of varieties or subtypes and specific subtypes. The cause of ASD is not one but many. Nobody knows exactly what causes autism, whose term was first coined by Paul Eugen Bleuler (b.1857-d.1939) in his 1911 book on schizophrenia (Bleuler, 1911/1950). Bleuler (1911/1950) used autism to describe a signature characteristic of adults with what was then known as dementia praecox (a group of schizophrenias) – “a severe mental illness: a state of insulation from reality so complete that it excluded other human beings” (p. 63).

Much later in 1943, Leo Kanner (b.1894-d.1981) used the term early infantile autism to describe the condition. A year later, Han Asperger (b.1906-d.1980) published a paper on some atypical neurological disorder resembling autism, which was named Asperger Syndrome (Asperger, 1944) after him. Still very little was known about ASD until the last few decades when more research has been carried out to study the enigmatic condition. Even today, there is a great deal of ASD that remains unknown, despite recent studies that have identified dozens of genes associated with the condition by studying so-called de novo mutations, i.e., newly arising changes to the genome found in children but not their parents (Alvarez, 2018; also see An et al., 2018, for more detail). To date, most de novo mutations linked to ASD have been found in protein-coding genes, but there are also autism-associated mutations in non-coding regions of the genome that

have yet to be identified (Alvarez, 2018). This constitutes the *unknowable unknown* (a term borrowed from D’Souza & Renner, 2014) domain that requires “deep knowledge and specific focus of research *that* may limit *our* perspective” (words in italic are the authors’ addition; D’Souza & Renner, 2014, p. 39) in the vast field of autism research.

This unknowable unknown in the current knowledge of ASD has been termed as “biological dark matter” (BDM for short; see Ross, 2016, for detail) – an informal term to describe an unclassified or poorly understood genetic material, which, in turn, may refer to genetic material produced by unclassified microbes. The term BDM can also be extended to include an un-isolated microbe, whose existence can only be inferred from the genetic material that it produces. In fact, some of the genetic material may not come under the three existing domains of life: bacteria, archaea and eukaryote. Hence, there is a possibility of a fourth domain of life may yet to be discovered (Lopez, Halary, & Baptiste, 2015; Wu et al., 2011). However, the current tools that are used to investigate strongly interacting species and folded proteins are still not advanced enough to image, detect and understand the BDM and its working (Ross, 2016). This means better and more advanced investigative tools are urgently needed now and in the future.

Because the disorder is so complex and no two individuals with autism are exactly alike, there are

probably many causes for autism. It is also likely that there is not a single cause for autism, but rather that it results from a combination of causes. Researchers (e.g., Amaral, 2017; Jick & Kaye, 2003; Ratajczak, 2011) in the field of autism are still investigating a wide range of possible varied causes of or contributors to ASD. These causes include the following: genetic mutations (Gaugler et al., 2014; Pinto et al., 2010), epigenetic interference (from the environment) (Hallmayer et al., 2011; Landrigan, 2010), hormonal disturbance (Berbel, Navarro, & Román, 2014; Xie, 2021), gastrointestinal and/or metabolic dysfunctions (Frye et al., 2015; Madra, Ringel, & Margolis, 2020), nutritional and dietary deficiencies (Herndon et al., 2009; Levy et al., 2007), breakdown in neurological connections (Wass, 2011; Zikopoulos & Barbas, 2013), and anomalous brain development (Chia, Lim, & Lee, 2017; Courchesne, Redcay, & Kennedy, 2004), and the list can be endless with more new hypotheses being proposed each year.

The main focus of this paper lies in the nutritional and/or dietary deficiencies in young children with ASD. As young children (as well as adults) with ASD may display significant abnormal or impaired metabolic or biochemical processes, vitamins and/or minerals have been recommended and are most widely used nutritional or dietary treatment for ASD. As such, high doses of vitamin (e.g., Vitamin A, Vitamin B6, Vitamin B12, Vitamin C) and/or minerals (e.g., magnesium and zinc) as well as other food supplements (e.g., Omega-3 fatty acid, dimethylglycine or DMG for short) may have been used to correct for this condition.

Vitamins and Minerals for Autism Treatment

Vitamins and minerals are most widely used in nutritional or dietary treatment for children (as well as adults) with ASD (Adams, 2015; Adams & Holloway, 2004; Zhou et al., 2013). According to the curriculum of the Autism Case Training (ACT)⁵ (see Hyman et al., 2020, for detail), both the vitamin/dietary supplements and exercise-based therapies have been applied in ASD treatment for children. In the former, a list of vitamins and minerals (i.e., food supplements) with respective precautionary notes (e.g., side effects due to overdose and toxicity) used in nutritional or dietary treatment for children with ASD are provided below (Farrell, Rappaport, Sell, & Tang, 2011):

Vitamins are organic substances (made by plants and/or animals) while minerals absorbed by plants or eaten by animals are inorganic elements that come from soil and water. To grow normally and stay healthy, young children as well as adults need both

- (1) Carnosine, Vitamin E and Zinc (Zn): These are given together for antioxidant activity and production of the inhibitory neurotransmitter GABA (Chez et al., 2002). However, an overdose could cause irritability and hyperactivity;
- (2) Dimethylglycine (DMG): It is based on the theoretical belief that DMG can help to decrease inflammation and increase immune function. More research is needed to show its efficacy (see Lin et al., 2016, for more detail);
- (3) Melatonin: It is given to help with sleep onset and maintenance (Melke et al., 2008; Rossignol & Frye, 2014). No precautionary note has been provided;
- (4) Omega-3 Fatty Acids: These are given to reduce blood pressure and low-density lipoprotein cholesterol level (Amminger et al., 2007). An overdose or interaction with other anti-coagulants could result in hemorrhage;
- (5) Probiotics: It is given to counteract gastrointestinal bacterial and fungal overgrowth in the alimentary canal or gut system (especially between the pylorus and the anus). More research needs to be done to show the benefits of probiotics to individuals with ASD (see Navarro, Liu & Rhoads, 2016, for detail);
- (6) Vitamin A (cod liver oil): It is given to improve immune function and vision (see Lai et al., 2021, for more detail). It could cause hepatotoxicity and increased intracranial pressure;
- (7) Vitamin B6 (pyridoxine) and Magnesium (Mg): The vitamin is given to help in neurotransmitter production with the supportive effect of Mg (Nye & Brice, 2005). There is a risk of Vitamin B6 toxicity causing peripheral neuropathy as well as Mg toxicity;
- (8) Vitamin B12 (cobalamin) and Folinic Acid: It is given intramuscularly with oral Folinic Acid (also known as Leucovorin) to counteract decreased plasma antioxidant concentrations (Al-Farsi et al., 2013; Moretti et al., 2005; Zhang et al., 2016). There is currently no mention of risk of Vitamin B12 toxicity; and
- (9) Vitamin C (ascorbic acid): It is given to decrease stereotypic behaviors often seen in individuals with ASD (Dolske et al., 1993). Vitamin C toxicity could cause nephrolithiasis and gastrointestinal upset.

vitamins and minerals. However, better absorption of vitamins and minerals often comes from plants. According to Arkopharma Laboratories (2021), “[P]lant-based vitamins and minerals are better assimilated by a living organism, e.g., up to 150% improvement in the assimilation of Vitamins B3 and

⁵ This is a seven modular developmental-behavioral pediatrics curriculum – developed by the American Academy of Pediatrics (AAP) Council on Children with Disabilities Autism

Subcommittee serves to educate future healthcare providers on fundamental components of identifying, diagnosing, and managing ASD through real life scenarios.

B6! Vitamins and minerals derived from plants are associated with natural complexes called co-nutrients” (para. 2-3). However, not all nutrients can be found in plants. According to Ramirez (2020), there are those that are not plant-based, such as the following: Vitamin B12, Vitamin D3, creatine, carnosine, heme iron⁶ (found in meats), DHA and taurine.

Selected vitamins (e.g., multivitamin and megavitamin therapies) and minerals as food supplements have been used in ASD treatment (Adams, 2015; Adams & Holloway, 2004; Zhou et al., 2013). Adams (2015) cited from Golnik and Ireland (2009) to argue that “among the most widely recommended medical interventions for autism, and are recommended by 49% of physicians for children with autism” (p. 2376) is the use of vitamin/mineral supplements. For the rest of this paper, the term *alimentary management* will be used in place of vitamin/mineral supplement in ASD treatment.

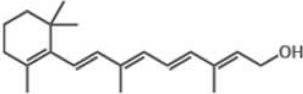
Many published studies (e.g., El-Ansary et al., 2017; Frustaci et al., 2012; James et al., 2004) have reported on biomarkers of increased oxidative stress in children with ASD. As vitamins and minerals are important anti-oxidants, Frustaci et al. (2012) suggested that children with ASD might have decreased levels of vitamins/minerals and/or increased need for them. Adams (2015) cited three studies (i.e., James et al., 2004, 2006, 2009) to show that children with ASD “have increased oxidative stress, impaired methylation (decreased S-Adenosyl methionine⁷ or SAM for short), and decreased glutathione, compared to neurotypical children ... and that certain vitamins and minerals can be helpful to them” (p. 2376).

In 2014, Professor James B. Adams of Arizona State University with his team founded the non-profit Autism Nutrition Research Center (ANRC) and came up with guidelines (see ANRC, 2020, for

updated detail) designed to provide optimal nutritional support for most children and adults with ASD. Known as the ANRC Essentials, it is a comprehensive multi-vitamin/mineral supplement containing over 30 ingredients, at doses that are determined to be optimal based on the ANRC research studies for individuals with ASD (see Adams, 2015, for detail). Special ingredients in the ANRC Essentials include the following (see Adams, 2015, p. 2377-2378): (i) Vitamins B1, B2, B3, B5, B6, B12, biotin, folate, C, D, and K, whose doses are relatively high (above the Recommended Dietary Allowances or RDA for short) but are thought to be important for children with autism; (ii) Folate as methyltetrahydrofolate (instead of folic acid as it is seen as unhelpful to children with ASD) (James et al., 2004); (iii) MSM (a good source of sulfate which is low in many individuals with ASD (Adams et al., 2011a); and (iv) Low-dose lithium (low in many children with ASD and their mothers), but the recommended quantity is about equivalent to typical RDA, and also far below the levels when prescribed as a psychiatric medication (Adams et al., 2011a).

Table 1 shows a list of selected vitamins (with ANRC-recommended dosages) that have been used in the alimentary management of ASD (with cited studies): Vitamins A (Lai et al., 2021; Liu et al., 2017), B1 (Lonsdale, 2004; Smart et al., 2019), B2 (Kałużna-Czaplińska, Socha, & Rynkowski, 2011), B3 (Melillo, 2016a; Willyard, 2021), B5 (Melillo, 2013, 2016b), B6 (Kałużna-Czaplińska, Socha, & Rynkowski, 2011; Martineau et al., 1985), B9 (Nuttall, 2017), B12 (Pineles, Avery, & Liu, 2010; Zhang, Yu, & Liu, 2018), C (McGinnis, 2004; Rafee, Burrell & Cederna-Meko, 2019), D3 (Cannell, 2017; Feng et al., 2017) and E (Daniells, 2009; Morris & Agin, 2009) ... in addition to several minerals such as calcium, choline, copper, iron, lithium, magnesium, manganese, potassium, selenium, and zinc, to name some of them here.

Table 1. Essential Roles of Selected Vitamins used in Alimentary Management of ASD

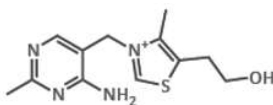
Vitamin	Chemical Structure	Essential Role
Vitamin A (Retinol) Recommended dosage: 8000 IU (ANRC, 2014) ⁸		<ul style="list-style-type: none"> • Essential for vision • Strengthening of immunity • Keeping skin & connective tissues healthy

⁶ There are two types of iron: (i) heme iron is found in meats; and (ii) while non-heme iron is found in plant-based foods. “Our bodies absorb heme iron at a higher rate compared to non-heme iron. If a person is a vegetarian (or vegan), s/he has to keep in mind that his/her body can only absorb 2-20% of non-heme iron. Heme iron from animal-based sources has a 15-35% absorption rate” (words in italic are authors’ substitution; see Brennan, 2020, para. 10).

⁷ S-Adenosyl methionine (SAM), most of which is produced and consumed in the liver, is a common co-substrate involved in anabolic reactions (e.g., methyl group transfers, transsulfuration, and aminopropylation) that take place throughout the body.

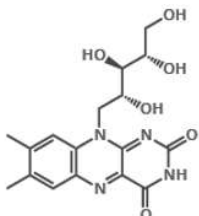
⁸ Formulation of ANRC Essentials (2014) as cited in Table 2 (Adams, 2015, p. 2378).

Vitamin B1
(Thiamin)
Recommended dosage:
30mg (ANRC, 2014)



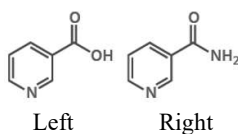
- Keeping nerves & muscle tissues healthy
- Processing of carbohydrates (CH₂O)_n & some proteins

Vitamin B2
(Riboflavin)
Recommended dosage:
40mg (ANRC, 2014)



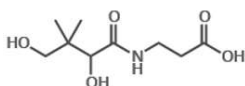
- Essential for body growth
- Production of erythrocytes
- **Keeping the eyes healthy**
- Processing of carbohydrates (CH₂O)_n

Vitamin B3
(Niacin: on the left -
Nicotinic Acid; & on
the right -
Nicotineamide)
Recommended dosage:
50mg (ANRC, 2014)



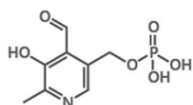
- Essential for digestion & keeps digestive system healthy
- Processing of carbohydrates (CH₂O)_n

Vitamin B5
(Pantothenic Acid)
Recommended dosage:
30mg (ANRC, 2014)



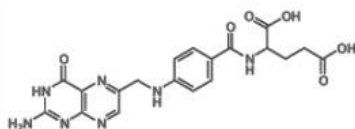
- Production of erythrocytes
- Processing of carbohydrates (CH₂O)_n
- Keeping the digestive system healthy

Vitamin B6
(Pyridoxal Phosphate)
Recommended dosage:
20mg (ANRC, 2014)



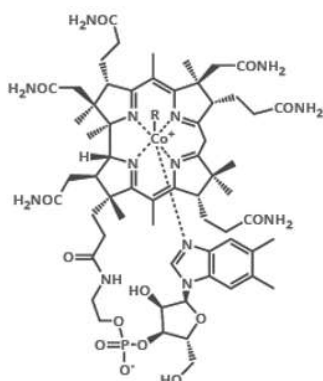
- Essential for making neurochemicals
- Essential for normal brain function
- Production of erythrocytes
- Production of granulocytes or immune system cells

Vitamin B9
(Folic Acid)
Recommended dosage:
not provided



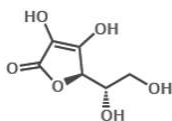
- Essential for growing tissues
- Essential for brain function & mental health
- Production of DNA & RNA

Vitamin B12
(Cobalamin)
Recommended dosage:
600mcg (ANRC, 2014)



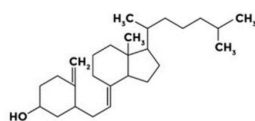
- Essential for health of nervous system
- Production of erythrocytes
- Production of DNA & RNA

Vitamin C
(Ascorbic Acid)
Recommended dosage:
500mg (ANRC, 2014)



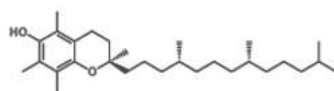
- Essential for healthy immune system
- Production of collagen needed for making connective tissues
- Absorption of non-heme iron
- Wound healing
- Protective effects against many cancers

Vitamin D3
(Cholecalciferol)
Recommended dosage:
1500 IU



- Beneficial to mood, heart health & weight loss
- Absorption of calcium (Ca) & phosphorus (P)
- Strengthening of bones
- Keeping immune system healthy

Vitamin E
(Alpha-Tocopherol)
Recommended dosage:
100mg



- As an antioxidant to help prevention of damage to cells
- Production of erythrocytes
- Preventive role in cancer

According to Bjørklund et al. (2019), “[I]nsufficient intake of vitamins and minerals through poor food habit has been considered as one of the main contributing factors to numerous child health problems such as anemia, scurvy, hypothyroidism, rickets, and so on due to lack of iron, vitamin C, iodine, and Vitamin D, respectively” (p. 374). The same has been also observed in children with ASD, especially in vitamin deficiency, resulting in challenging issues – weak digestion capacity, poor absorption, abnormal or impaired metabolic or biochemical processes – such that high doses of vitamins B1, B2, B3, B5, B6, B12, C, and D become critical for children with ASD (Adams, 2015; Bjørklund et al., 2019) and are best included in their alimentary management. For instance, vitamins B2 and B6 are essential in helping to decrease dicarboxylic acids ($\text{HO}_2\text{C}(\text{CH}_2)_n\text{CO}_2\text{H}$) level in the

urine of children with ASD (Kałużna-Czaplińska, Socha, & Rynkowski, 2011). Duvall et al. (2013) also reported of a case of a child with severe ASD who displayed limp, tachypnea, cough, hypoxin and tachycardia-induced pulmonary hypertension due to inadequate levels of vitamins B1, B6, B12 and D, and also undetected Vitamin C level. In another instance, DeSoto (2016) hypothesized and reported the supportive role of Vitamin K in neural development as earlier studies (e.g., Adams et al., 2011b; Johnson et al., 2008) found that children with ASD frequently suffered from Vitamin K deficiency more than neurotypical children, and Hyman et al. (2012) recommended for inclusion of Vitamin K in nutrient supplement for children with ASD. Table 2 below provides a summary of selected studies supporting the inclusion of selected vitamins in the alimentary management for children with ASD.

Table 2. Selected Vitamin for Inclusion in Alimentary Management of ASD

Vitamins (Selected)	Studies supporting the inclusion of vitamins in the alimentary management for children with ASD
Vitamin A	<ul style="list-style-type: none"> • Increase in the oxytocin level via the CD38 process pathway⁹ in individuals with ASD (Riebold et al., 2011) leads to significant increase in brain activity and social abilities (Gordon et al., 2013)
Vitamin B1	<ul style="list-style-type: none"> • Improves symptoms of children with ASD (Lonsdale, Shamberger, & Audhya, 2002) • Essential in apoptotic factors, neurotransmitter system and oxidative stress; impacts positively on basic myelin protein glycoprotein synthetase kinase-3β, alpha-1 antitrypsin, and glyoxalase 1 (Khanh vinh quốc Lương & Lan Thi Hoàng Nguyễn, 2013)
Vitamin B2	<ul style="list-style-type: none"> • Supplementation of Vitamin B2 helps Vitamin B6 and magnesium to reduce excretion of urinary dicarboxylic acids in autistic children and increase excretion of carboxylic acids is related to excessive bacterial overgrowth, which has been related to ASD resulting in an impairment in the gut-brain axis (Gałtarek et al., 2020; Kałużna-Czaplińska, Socha, & Rynkowski, 2011)
Vitamin B3	<ul style="list-style-type: none"> • Vitamin B3 (niacin) is required in folate metabolism; abnormalities in folate metabolism have been linked to ASD (Frye, Slattery, & Quadros, 2017)
Vitamin B6	<ul style="list-style-type: none"> • Vitamin B6 and magnesium (with Vitamin B2 supplementation) help to reduce excretion of urinary dicarboxylic acids in autistic children, increase excretion of carboxylic acids related to excessive bacterial activity in the gut (called bacterial

⁹ “CD38 (cluster of differentiation 38) is encoded by the CD38 gene. It acts as an enzyme in several cellular reactions involved in calcium (Ca²⁺) mobilization and signaling” (Kelly, 2019, para. 7).

Vitamin B12	<p>overgrowth known to associate with ASD) which is an impairment in the gut-brain axis (Gałtarek et al., 2020; Kałużna-Czaplińska, Socha, & Rynkowski, 2011)</p> <ul style="list-style-type: none"> • Essential for brain or cognitive development (Hendren et al., 2016; Morris et al., 2007) • Better management of depression and anger (Fraguas et al., 2006; Fava & Mischoulon, 2009)
Vitamin C	<ul style="list-style-type: none"> • Essential for a healthy immune system in which some children with ASD are suffering due to Vitamin C deficiency (Rafee, Burrell, & Cederna-Meko, 2019) • Supplementation of Vitamin C contributes to a reduction in the stereotypical behaviors such as rocking, flapping hands, and pacing seen in children with ASD (Dolske et al., 1993), but further research is needed
Vitamin D3	<ul style="list-style-type: none"> • Essential for neurodevelopment and gene regulation (Tovey, 2021) • Reduction in the risk of ASD (Saad et al., 2018)
Vitamin E	<ul style="list-style-type: none"> • Strengthening of strengthen bone and teeth formation in babies (Bowles, 2017) • Essential for combating inflammation and oxidative stress observed in children with ASD (Pangrazzi, Balasco, & Bozzi, 2020) • Combination of omega-3 fatty acids and vitamin E may improve speech in autistic children with verbal disorders (Morris & Agin, 2009) • Combination of omega-3 fatty acids and Vitamin E may improve behavior in children with neurodevelopmental disorders such as ASD (Gumpricht & Rockway, 2014)
Vitamin K	<ul style="list-style-type: none"> • Essential for neural development in young children (Adams et al., 2011b; DeSoto, 2016); Hyman et al., 2012)

Besides vitamins, minerals (e.g., calcium, magnesium and zinc) have also been found to play an essential role in the alimentary management of children (as well as adults) with ASD (Babaknejad et al., 2016). According to Babaknejad et al. (2016), “[I]n comparison with healthy individuals, autistic patients, have different levels of trace elements like copper, magnesium, and zinc (Dufault et al., 2009; Morris & Agin, 2009)” (p. 2). A trace element (also known as minor element) is a chemical element whose concentration is very low (i.e., a trace amount) (Bhattacharya, Misra, & Hussain, 2016). These elements can be placed under two categories; (i) essential and (ii) non-essential. It is the former that are required for important physiological and biochemical processes in both plants and animals. They “have been proven to influence the brain neurotransmitter metabolism significantly” (Babaknejad et al., 2016, p. 2). Not only do trace elements play a role in biological processes, they also function as catalysts engaging in oxidation and reduction mechanisms (see Wada, 2004, for detail).

According to the late Professor Bell Freedman (b.1950-d.2015) of Dalhousie University, Halifax, in Canada, “[T]race elements that are most often associated with environmental toxicity are the heavy metals cadmium, chromium, cobalt, copper, iron, lead, mercury, nickel, silver, tin, and zinc, as well as the lighter elements aluminum, arsenic, and selenium. Some cases of elemental pollution are natural in origin” (Freedman, 2018, p. 426). In fact, toxic elements (e.g., lead and mercury) and deficiency of nutrients as well as trace elements are

known as environmental factors that appear as “one cause of those epigenetic changes in wild and laboratory animals” (Leitch, 2021, para. 6) and Kelley et al. (2021, p.) have warned that humans are not immune to the effect of harmful environmental chemicals.

Among the several important trace elements in cell signaling, zinc (Zn) “plays a vital role in enzyme function, nucleic acid metabolism, growth, and finally cellular repair, most importantly in pregnant women and newborns” (Babaknejad et al., 2016, p. 2). Zn deficiency (especially when measuring Zn levels in the plasma, hair, and nails) has been found high in children diagnosed with ASD (Faber et al., 2009) and it constitutes a major factor in the etiology of behavioral and mood disturbances (Sayehmiri et al., 2015, p. 2). Zn also plays a role in immune system functioning (Prasad 1995), protein synthesis (Prasad 1995), wound healing (Heyneman 1996), DNA synthesis (IOM/FNB 2001), and cell division (Prasad 1995). In addition, according to Prasad et al. (1997), Zn is required for proper sense of taste (gustatory) and smell (olfactory), which can be determined via the administration of the Sensory Profile (Dunn, 1999).

Another important trace element is copper (Cu). Bjørklund (2013) reported that a disturbance in the copper (Cu) and zinc (Zn) metabolism is found in children with ASD in the following ways: (i) Zinc deficiency; (ii) excess Cu levels; and (iii) low Zn/Cu ratio; these issues of Zn/Cu imbalance are common in children diagnosed with an ASD.

Given the importance of Zn/Cu metabolism for healthy neurological functioning and detoxification of heavy metals (including Hg), Faber et al. (2009) argued that these two trace elements may contribute in the pathogenesis of ASD.

Another essential trace mineral is iron (Fe) – a constituent of hemoglobin and myoglobin – that plays a vital role in the transport of oxygen (O₂) in the body. Iron deficiency (ID), with or without anemia, can impair cognition and affect and is associated with developmental slowing in infants and mood changes and poor concentration in children with ASD (Latif, Heinz, & Cook, 2002). Although studies done on the association between ID parameters and clinical symptoms of ASD have been sporadic, high prevalence of iron deficiency (ID) and iron deficiency anemia (IDA) has been reported in children with ASD (Bilgiç et al., 2010; Dosman et al., 2006; Latif, Heinz, & Cook, 2002). However, a recent study done by Gunes, Ekinci and Celik (2017) found the hemoglobin levels of children with ASD were lower than neurotypical children and argued that it was not sufficient to result in anemia. They postulated that the IDA in children with ASD might be associated with intellectual disability instead of ASD symptom severity.

Selenium (Se), another trace mineral, is essential to good health. Se plays vital roles in DNA synthesis, thyroid hormone metabolism, reproduction, as well as protection from oxidative damage and infection (Ross et al., 2012). Its major dietary source can be found in plants, where its concentration generally reflects the concentration of the trace element in soils. However, some meats and seafood can also contribute dietary Se. Se is frequently used in the alimentary management of children with ASD, where the imbalance of Se is believed to cause the metabolic or psycho-metabolic disturbances. According to Skalny et al. (2018), “the mechanisms of the proposed Se neuroprotective effect in ASD may involve inhibition of oxidative stress, neuroinflammation, and microglia activation. In addition, synaptic dysfunction and gut-brain axis disturbances might be modified” (p. 193). However, more studies are needed to understand and highlight the mechanisms of the potential neuroprotective effects of Se in ASD as well as its efficiency in clinical trials. The efficiency of Se used in alimentary management of ASD remains unclear. “Moreover, data on the role of Se metabolism in ASD are insufficient and contradictory” (Skalny et al., 2018, p. 193).

There are still many other minerals that are not discussed in this paper. Interested readers can always search in the Google Scholar for these papers on specific minerals, their key roles and how they can affect children with ASD.

Conclusion

Children with ASD are often reported by their caregivers to have food selectivity and restricted diets, putting them at risk for nutritional deficiencies (see Reynolds et al., 2012, for detail). Previous studies (e.g., Dosman et al., 2007; Herndon et al., 2009; Lindsay et al., 2006) have raised concerns about dietary insufficiency – in terms of the intake of iron, B vitamins, Vitamin D, vitamin K, calcium, and Zn – in one-third of children with ASD (Reynolds et al., 2012)

Food supplements or dietary nutrients – both vitamins and minerals – can induce epigenetic changes and these gradually “culminate in changes of the expression of genes through transcription and translation” (Björklund, 2013, p. 225). The interaction between food supplements/dietary nutrients and nuclear receptors can trigger the signaling pathway, leading to modulation of epigenetic change and gene expression. Different signaling pathways are attained by specific vitamin receptors for different vitamins and in turn affect gene expression. For instance, “Vitamin A serves as substrate for the biosynthesis of several retinoids that are essential for cell growth and cell differentiation as well as for vision” (Amann et al., 2011, p. 1405). Its signaling pathway is mediated by retinoid X receptor (RXR) heterodimerization with two orphan receptors: NGFI-B and NURR1¹⁰. The Vitamin A regulation of gene expression is a well-characterized illustration of direct nutrient regulation of gene expression, and McGrane (2007) explained that “[T]he downstream metabolites of retinol, all-trans and 9-cis retinoic acids are the bioactive components that bind and activate their cognate nuclear receptors to regulate target genes” (p. 497). It is not within the scope of this paper to delve into this complicated signaling process. Recently, Cheng et al. (2021) have found that deficiency in Vitamin A increases the risk of gastrointestinal comorbidity and exacerbates core symptoms in children with ASD.

However, there remains the ‘dark matter’ (unknowable unknown) of the human genome that has limited the current understanding of ASD. This is what the authors of this paper have come to the other side of the learning journey as they cross the bridge of exploration, in this example, on Vitamin A and its effect on individuals with ASD. The food

¹⁰ **Nurr1**, whose antiapoptotic functions are vital for the development and survival of dopaminergic neurons, “is a member of the **NGFI-B** nuclear orphan receptor family which includes

two other members, **Nur77** and **Nor-1**” (Zhang et al., 2009, p. 1408). However, the antiapoptotic mechanisms by which **Nurr1** mediates these effects remain largely unknown.

supplements will not be able to address the condition of ASD in its entirety. There are too many biological dark matter ‘particles’ in the present attempt to search for a probable solution using alimentary management via food supplements of the heterogeneous condition of ASD.

Disclaimer: The content of this paper is strictly for informational or educational purposes only, and does not substitute professional medical advice or consultations with healthcare professionals.

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A Brief Exploratory Review of Mandala Drawing & Coloring in Promoting Mental Health/Well-being among Young Children during the Covid-19 Pandemic Lockdown

Wujing LIU

Dialogic-Diagnostic Art Therapist, Crossland Education & Enrichment School, Singapore

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Abstract

As the Coronavirus Disease-2019 (Covid-19 for short) pandemic continues ravaging throughout the world, no country is spared from the catastrophic pestilence, and no one regardless of age, gender, race, nationality, religion, socio-economic status, occupation, health status ... can avoid or be exempted from it. Despite the stringent measures and strong advisories issued by the governments of respective countries, the number of Covid-19 cases continues to climb drastically instilling fear in the heart of everyone. As a result, schools, colleges and universities have to shut down, factories and offices come to almost a standstill, tourist attraction places are completely empty, tourism and recreation come almost to a complete halt due to entry restrictions imposed ... the list of mandatory do's and don'ts increases, affecting the mental well-being of the people and driving many of them (both adults as well as youths and children) to stress, anxiety and depression. The author's aim of this paper is to provide a brief exploratory review on the use of mandala drawing and coloring as a diagnostic-therapeutic approach to promote mental health or well-being in young children.

Key Words: Covid-19 Pandemic, Mandala Drawing and Coloring, Mental Health/Well-Being

Introduction

The last time the world experienced a "major global outbreak of disease world was the influenza pandemic (H1N1)¹¹ in 2009. That was the first pandemic of the twenty-first century" (Rogers, 2020, para. 1). The disease was first detected in Mexico in February 2009 and spread rapidly to the United States by April in the same year. Soon other parts of the world were also infected by people traveling out of Mexico and the United States. In June of that year, the World Health Organization declared the outbreak a pandemic.

Ten years later, in 2019, in a wet market in the city of Wuhan in China, a new pandemic was about to occur. A young Chinese doctor¹² noticed a new contagious disease was infecting many people and alerted his colleagues about it. However, the local authorities chose to hush up the doctor and even threatened him with jail. The failure to contain the spread of the unknown disease within the city of Wuhan soon ravaged across the Chinese mainland and then spread throughout the world. Many people across the world lost their lives to what is now known as Covid-19 pandemic. Authorities in different countries are still struggling to contain its spread through implementation of stringent measures (e.g., safe-distancing, frequent use of hand

sanitizer, wearing a protective mask, serving quarantine or home-stay notice, implementing of rules to limit social gathering, traveling or movement from place to place, working from home, online learning, mandatory vaccination against Covid-19 infection, etc.). Despite all the advisories or measures being put in place, the success to reduce the number of Covid-19 cases is often short-lived.

As the Covid-19 pandemic continues to spread from country to country even when their borders are officially closed, more and more people are continuously infected and millions of them have also died from it. Research institutes and pharmaceutical companies have also begun to rush into developing vaccines to fight against this contagious coronavirus. However, Covid-19 continues to mutate over time and now there are many other variants or subtypes of Covid-19. As a result, more frequent lockdowns (short- or long-term) or curfews as well as other mandatory restrictions are implemented to slow down the spread of the pandemic, but such measures have also disrupted the activities of daily routine of many people. Among the most affected are children whose studies and school attendance have also become erratic/irregular or been very much affected (OECD, 2020). Stress and anxiety become a common experience (OECD,

¹¹ It is also known as the swine flu.

¹² "Dr. Li [Wenliang] warned in an online chat group on WeChat that he had seen a report showing positive test results of SARS for 7 patients. However, he did not formally report the outbreak

to the authorities. Dr. Zhang Jixian is considered the first doctor to report the novel coronavirus before its outbreak" (Li, Cui, & Zhang, 2020, p. 782).

2020) due to school closures, and more so for students who are preparing for national examinations. Depression may also become a consequence of stress and anxiety. Mental well-being becomes an important issue of concern for this group of young individuals as well as others (Merckx et al., 2021; Meredith, 2021; Nava, Varner, & Beier, 2021). For instance, the Little Hoover Commission (LHC; 2021), the independent movement watchdog in the state of California, USA, concluded its investigation into the impact of Covid-19 on children's mental health even before the pandemic began. In its Report #262, "[T]he pandemic created a perfect storm of stress, anxiety, and trauma that amplified preexisting challenges to young people's mental health. California now faces a looming tsunami of children's mental health needs. The pandemic will likely impact some young

people's mental well-being for years to come" (LHC, 2021, para. 2). As reported in the Los Angeles Daily News, "[E]scalating rates of suicide and self-harm, now combines with stress, anxiety, and trauma from the pandemic, have resulted in what experts call a looming tsunami of unmet need among youth" (Nava, Varner, & Beier, 2021, para. 2). In Europe (e.g., Araújo et al., 2021; Caffè, Scandrollo, & Asta, 2020; Cowie & Myers, 2020) and elsewhere in the east, i.e., East and West Asia as well as South-East Asia (e.g., Kumar, Sharma, & Imahashi, 2021; Lay, 2021; Wang et al., 2021), similar experiences due to the impact of Covid-19 pandemic on the mental health of adults, adolescents and children have been reported, too. Similarly, Australia and New Zealand also share the same challenging problems, too (e.g., Flack et al., 2020; Meiring et al., 2021; Tan et al., 2020).

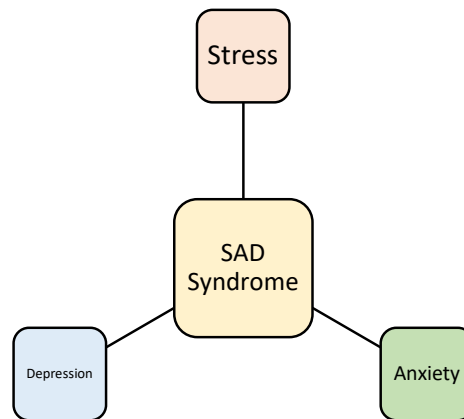


Figure 1. The SAD Syndrome

Among the several approaches (e.g., online counseling and pediatric psychiatric consultation) used by counselors, teachers and therapists to help young children to manage their stress and anxiety as well as depression (what is termed as the SAD syndrome comprising of Stress-Anxiety-Depression; see Figure 1 above), especially during the Covid-19 pandemic lockdown period, is the use of mandala drawing and coloring. In this paper, this author is interested in exploring the use of mandala drawing and coloring as a diagnostic-therapeutic tool to help young children struggling to cope with stress and anxiety during the mandatory lockdown and movement restriction as reported in the mass media.

What is a Mandala?

A *mandala*, whose Sanskrit word which literally means "a circle", is a geometric configuration of

symbols, or as described by Noor et al. (2017) as "[M]andalas (plural) are circular geometric shapes considered to be universal symbols for spiritual growth or a form of visual meditation" (p. 904). It represents a symbol of an ideal universe or it also symbolizes the womb, motherhood, and nurturing. In most cultures, the mandala is a symbol of unity, wholeness, and oneness. According to the Merriam-Webster Online Dictionary (2021), a mandala is defined as follows: (1) "a Hindu or Buddhist graphic symbol of the universe; *specifically*, a circle enclosing a square with a deity on each side that is used chiefly as an aid to meditation"; and (2) "a graphic and often symbolic pattern usually in the form of a circle divided into four separate sections or bearing a multiple projection of an image" (para. 1-2). Figure 2 below shows nine different mandalas.



Figure 2. Mandalas

In several Eastern spiritual traditions and religions (e.g., Buddhism, Hinduism, Jainism, Shintoism and Taoism), mandalas may be employed for focusing attention of practitioners and adepts, as a spiritual guidance tool, for establishing a sacred space and as an aid to meditation and trance induction (Buchalter, 2012; Ratcliffe, 1992). It is used as a map representing deities, or especially in the case of Shintoism, paradises, kami¹³ or actual shrines (Tanabe, 2001). A mandala generally represents the spiritual journey, starting from outside to the inner core, through layers. In Taoism, the mandala is expressed in terms of yin-and-yang interaction that constitutes a circular design comprised of two halves with black and white division (Fang, 2012). This Taoist concept creates a contrast within the circular design to signify two opposing forces to bring a complimentary and harmonious nature of the world (Fodor, 1991).

Findings from several studies have indicated the benefits of mandala drawing tasks (Liu et al., 2020; Smitheman-Brown & Church, 1996) and coloring activities (Carsley, Heath, & Fajnerova, 2015; Curry & Kasser, 2005), such as (i) improvement in the attention span and decision-making as well as a reduction in impulsive behaviors in children with

attention deficit-hyperactivity disorder (ADHD) (Smitheman-Brown & Church, 1996); (ii) improvement in social interaction skills in an individual with autism spectrum disorder (ASD) (Kim & Ong, 2018); and (iii) a reduction in anxiety among pregnant women in their third trimester before delivery through mandala drawing and coloring (Amelia, Satiadarmma, & Wati, 2020) and university students in their studies through mandala coloring (Noor et al., 2017).

Closer to mandala drawing and coloring is the use of various circle stencil tools and shaking and looking into a kaleidoscope to see colorful circular patterns being formed. These tools can be used in pre-mandala creating activities and are certainly useful in getting young children to be excited and interested in mandala drawing and/or coloring activities.

Circle Stencil Tools: Creating Mandalas

According to Oliver (n.d.), mandalas can be created or developed in many ways using basic tools such as a sheet of paper and a pencil. If mandalas with mostly geometrical forms and symbols are preferred, a drawer will need a good pair of compasses (see Figure 3) and a large set square (see Figure 4) to cover the full width of an A4 paper.



Figure 3. A Pair of Compasses

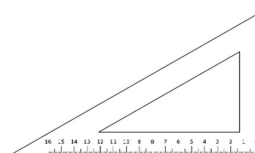


Figure 4. A Set Square

¹³ The word *kami*, in Japanese, is often referring to mean "gods", though the concept is more involved than that) are the spirits,

phenomena or "holy powers" that are venerated in the religion of Shinto (Tamura, 2000).

Mandalas can be designed and/or edited on a computer or laptop with the CorelDraw or PhotoImpact software. However, Oliver (n.d.) pointed out that many mandalas are often devised on paper: “The sketches are then scanned in and turned into vector graphics ... continue to work on them on the computer and generate the PDF templates for the website” (In FAQ, para. 2).

To create a mandala, Oliver (n.d.) recommended it to start with a big circle. It constitutes the outer boundary. Two further shapes are added inside the big circle (e.g., a square and a circle), making sure that the lines of both cross each other. “A mandala has a number of regular segmentations with enough points of intersection that can be used as a guideline for further additions” (Oliver, n.d., para. 4). Figures 5, 6 and 7 are examples of mandalas with their respective intersections of points.

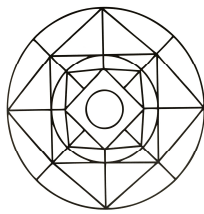


Figure 5.

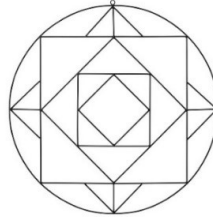


Figure 6.

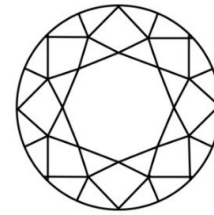


Figure 7.

All the drawer has to do is to use his/her imagination in designing a mandala. In fact, there are no limits when refining the design of a mandala. The drawer can add more forms (e.g., triangles, squares, pentagons, ellipses, circles, lines) to the mandala (Oliver, n.d.). Besides the standard stencils one can use to create or design mandalas, there are also many

everyday objects (e.g., boxes, baking molds, coins, compact discs) that anyone can use as stencils, too, to create mandalas of limitless design.

Kaleidoscope: A Tool of Creating Mandalas

Another interesting tool that one can use to introduce mandalas is the kaleidoscope (see Figure 8 below).



Figure 8. A Kaleidoscope

The word *kaleidoscope*, first coined by its Scottish inventor Sir David Brewster (b.1781-d.1868) in his book on *The Kaleidoscope: Its History, Theory, and Construction with Its Application to the Fine and Useful Arts* published by John Murray in 1858, is derived from the Greek words, *kalos* (i.e.,

“beautiful, beauty”), *eidos* (i.e., “that which is seen: form, shape”), and *skopeō* (i.e., “to look to, to examine”). Hence, in short, the kaleidoscope to Brewster (1858) means an observation of beautiful forms/images (see Figures 9, 10 and 11 for examples of kaleidoscope images).

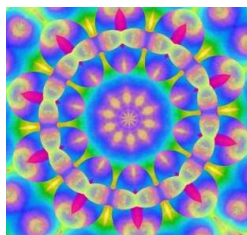


Figure 9.



Figure 10.



Figure 11.

The kaleidoscope was first published in the patent¹⁴ that was granted on July 10, 1817. The kaleidoscope is an optical tool “with two or more reflecting surfaces (usually, mirrors) tilted to each other at an angle, so that one or more (parts of) objects on one end of the mirrors are seen as a regular symmetrical pattern when viewed from the other end, due to repeated reflection” (Wikipedia Contributors, 2021, para. 2).

The beautiful kaleidoscope images will certainly capture the imagination of any child who takes a peek into the optical tool. These magnificent forms will captivate the child’s mind leaving him/her in awe and wonder.

Mandala as a Diagnostic-Therapeutic Tool

Dr Carl Gustav Jung (b.1875-d.1961), a Swiss psychiatrist and psychoanalyst who founded analytical psychology, has been credited for bringing a Western version of the mandala to psychotherapy. Jung (1959) saw the mandala as the psychic nucleus, which constitutes the center of one’s personality from which the “Self” develops. It is also a reflection of the process of individuation¹⁵ that can transform one’s psyche by bringing the personal and collective unconscious into conscious (Miller, 2005). In addition, Jung (1959) also saw the mandala as a space for the unconscious to surface through archetypal symbols. Today, Jungian mandalas are used in art psychotherapy (Miller, 2005; also see Slegelis, 1987, for detail).

Joan Kellogg, an art therapist and researcher, who worked at the University of Maryland at a time when many well-known therapists there were conducting groundbreaking psychological research, developed the Mandala Assessment Research Instrument (MARI) – a Jungian instrument that is based on symbols and colors that are chosen intuitively (Kellogg, 1991; Takei, 2015). When displayed on the developmental template of the Great Round of the Mandala, “these symbols and colors reveal a visual picture of one’s psyche” (Takei, 2015, p. 41), which develops through 12 stages encompassing different developmental tasks. Symbols surface when an individual experiences unconscious conflict related to the corresponding stage (Kellogg, 1991).

In practice, mandala drawing and coloring have shown the therapeutic usefulness in providing clients the following benefits (Fincher, 1991; Prendes, 2015) in terms of: (i) relaxation, self-

soothing and meditation (Curry & Kasser, 2005; DeLue, 1999); (ii) self-insight and individuation (Bonny & Kellogg, 1976; Jung, 1959; Kellogg & DiLeo, 1981); and (iii) healing and self-expression (Henderson et al, 2011; Schrade, Tronsky & Kaiser, 2011). Prendes (2015) has provided a brief description for each of these below.

(i) Relaxation, Self-Soothing and Meditation:

Creating or designing mandalas by young children or coloring structured mandalas that are provided by a professional is one useful approach to promoting relaxation and/or encouraging meditation. “Maṇḍalas are now perceived as ‘aids’ or ‘tools to meditation’ and designated as ‘meditation diagrams’ and ‘meditational art’” (Bühnemann, 2017, p. 263). The main goal is to bring about relief of anxiety symptoms. Examples of research studies include mandala making to elicit a parasympathetic response in a group of children, age 5-10 (DeLue, 1999), and coloring structured mandalas and plaid forms have been found to be more effective than free-form drawing in reducing anxiety symptoms (Curry & Kasser, 2005).

(ii) Toward Self-Insight and Individuation:

Mandalas, whether they are drawn by clients or pre-drawn ones, can help a client to delve into one’s insight and the individuation process of becoming aware of oneself, of one’s make-up, and the way to discover one’s true, inner self. Mandala drawing and coloring can provide a client a better understanding of his/herself through insightfulness and individuation. However, this author feels that this second approach is more beneficial to adolescents and adults who are more verbal and cognitively aware rather than young children, who are still in the process of growing up or maturing and have yet to acquire life experiences. The main goal is to interpret the mandala making and/or coloring in raising a client’s awareness or mindfulness. Examples of research studies include the qualitative case studies of mandalas drawn or colored by individuals (Jung, 1959; Bonny & Kellogg, 1976); studies on use of color, shape, space and number in mandalas (Jung, 1959; Kellogg & DiLeo, 1981); and increase measures of self-awareness and psychological well-being in a population of college students (Pisarik & Larson, 2011).

(iii) For Self-Healing and Self-Expression:

Client-drawn mandalas are used in promoting unconscious self-healing and also for self-expression of one’s inner feelings. This approach is

¹⁴ Repertory of Patent Inventions, and Other Discoveries and Improvements in Arts, Manufactures, and Agriculture, The (1817, July 10). Selected from the Philosophical Transactions and Scientific Journal of all Nations. Intelligence Relation to the Useful Arts, Proceeding of Learned Societies and Notices of All

Patents Granted for Inventions. London, UK: Repertory Office, Hatton Garden. London, T. London, T. and G. Underwood [etc.], Various Years.

¹⁵ Individuation is believed to have a holistic healing effect on the person, both mentally and physically.

useful for those who are “victims of trauma, individuals with developmental disabilities or cognitive impairments, people with difficulty in verbalizing their feelings” (Prendes, 2015, p. 1). Through mandala drawing and/or coloring, a client sets the pace of unconscious self-healing (Prendes, 2015). The main goal is to provide an individual with the opportunity to process his/her trauma, and this can those who have experienced or are still suffering from stress, anxiety and depression. Through mandala drawing and/or coloring, young children can talk or share about their thoughts and/or feelings spontaneously (rather than deliberately and becoming too conscious for comfort in sharing thoughts and feelings), and this is self-expression. In this way, the focus is on bringing an order to the psychic confusion or chaos. Examples of research studies include a significant reduction in hypertension during mandala-making in an attempt to process interpersonal conflict in adults with intellectual disability (Schrade, Tronsky, & Kaiser, 2011); mandala-drawing was found to have a greater impact than writing on symptoms of trauma (Henderson et al., 2011).

Conclusion

Today, many medical as well as healthcare and allied professionals (e.g., counselors, psychologists, therapists, special educators) are more convinced that through mandala drawing and/or coloring, fine motor movements of the hands are engaged, and this provides numerous benefits on stress reduction. The key reason behind the enhanced therapeutic effects of mandala drawing and/or coloring is the application of repetitions of fine motor movement that provides an individual the ability to stay focused on the activity at hand while subconsciously leading him/her to mindfulness or ‘being in the present moment’ (see Potash, Chen, & Tsang, 2016, for detail). What the end result that one wishes to achieve from the mandala therapy, hopefully, would be “positive physiological changes and a relaxation effect within the body” (Olesen, 2013, para. 2).

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The Mandala Effect

"You have power over your mind, not outside events.
Realize this, and you will find strength."

Marcus Aurelius
Stoic Philosopher
(b.AD121-d.AD180)

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Understanding a Young Child's Socio-emotional Behavior through His Projective Drawings: A Biblio-Analytical Case Study

Qi WANG BBA

Centre Manager & Dialogic-Diagnostic Art Therapist, Crossland Education & Enrichment School, Singapore

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Abstract

Parenting a young child is never easy nor simple though it appears that young children should be easy to manage. Children are children, and they should never be treated as miniature adults. They are young and inexperienced, still growing, developing and maturing over a period of several years from birth through infancy, toddlerhood, childhood (early, middle, late) and adolescence (early, middle, late) until they arrive at the early adulthood. This paper begins with defining what parenting is and the challenging problems encountered in parenting. However, this paper is about a case study of a young boy aged 4+ years who went through a battery of standardized tests to determine his intellectual/cognitive, sensory and adaptive behaviors to understand the child's current developmental profile, and the challenges that his parents are facing in their parenting. The main focus is on the boy's projective drawings in relation to the lessons that can be acquired from the 1971 movie "Willie Wonka and the Chocolate Factory" or 2005 movie of the same book title adapted from "Charlie and the Chocolate Factory" written by Roald Dahl (1964).

Key Words: Parenting, Projective Drawing, Psychosocial Development, Sensory Profile, Social-Emotional Behavior

Introduction

Parenting (also known as child rearing) is an art, and not rocket science. Its main purpose is to promote and support necessary support to a child from the moment s/he is born until adulthood in terms of physical, socio-emotional and intellectual development. To better understand what parenting is all about, we need to have a clear definition what it is and what it is not. As mentioned earlier, parenting is never simple and defining it is equally difficult, too. According to Darling and Steinberg (1993), it is important to have a clear definition of the term *parenting*. They argued that past research studies had provided different indicators for parenting resulting in confusion and poor clarity of what parenting entails. Darling and Steinberg (1993) then introduced their integrative parenting model that involves three different categories of parenting: (i) parenting goals; (ii) parenting style; and (iii) parenting practices (or behavior). They went on to provide a review of the historical development of the parenting style construct, giving careful attention to the processes through which the style of parenting has been thought to influence child outcomes. Below are some selected definitions of parenting:

- Morrison (1978) defined parenting as "the process of developing and utilizing the knowledge and skills appropriate to planning for, creating, giving birth to, rearing and/or providing care for offspring" (p. 3). In other words, the implication of Morrison's definition of parenting is that it commences the moment it is planned for, involving not just bringing up the children but also providing care for them.

- Galinsky (1987) asserted that parenting involves parents growing and changing as they move from one stage of parenthood to the next. Hence, to understand what exactly parenting is, there is a need to look at it from the child's current phase of development. In other words, being a parent or parenting parallels a child's growth and development. According to Galinsky (1987), there are six distinct stages in the life of a parent (i.e., mother, father or both) in relation to the growing child: (i) image-making, i.e., from the time of conception until the child is born; (ii) nurturing, i.e., between the birth of a newborn and until s/he is about 18 months to two years; (iii) authority, i.e., between two and five years of age; (iv) interpretive, i.e., preschool until around puberty; (v) interdependent, during the period of adolescence; and (vi) departure, i.e., "when the child is leaving home for a long period of time" (Chia, Kee, & Lim, 2015, p. 156).
- Darling and Steinberg (1993) defined parenting as "a constellation of attitudes toward the child that are communicated to the child and that, taken together, create an emotional climate in which the parent's behaviors are expressed" (p. 488). In addition, these parenting behaviors also include (i) the specific, goal-directed behaviors through which parents perform their parental duties (i.e., parenting practices) and (ii) non-goal-directed parental behaviors (e.g., gestures, changes in tone of voice, or the spontaneous expression of emotion).

- Chan (2004) simply defined parenting as "the process or the state of being a parent" (p. 182). She went on to say that "[O]nce you have a child, you are involved in the process of parenting" (Chan, 2004, p. 182).
- According to Brooks (2012), parenting refers to the intricacies of raising a child and not exclusively for a biological relationship.
- More recently, parenting is seen as a "nurturing connection that parents can develop with their children. That nurturing connection is ... the ideal way to raise secure, independent, and empathetic children" (Alli, 2020, para. 3). This is known as attachment parenting (see Sears & Sears, 2001, for detail), in which "a secure, trusting attachment to parents during childhood forms the basis for secure relationships and independence as adults" (Alli, 2020, para. 3).

According to O'Connor and Scott (2007), "[T]he various ways that parents shape their children's development have been a regular source of theorizing by scientists, philosophers and, central stage, by parents themselves. Within the scientific perspective, much of the empirical work linking parental behavior to developmental outcomes in children has been produced by those working in psychology, sociology and criminology. But other disciplines have contributed both theories and methods including historians, anthropologists and biological sciences" (p. 1).

Challenges in Parenting

Today, being a parent is no longer an easy task. Parenting has become a daunting call of responsibility for most parents with children due to the fact that the current dynamic lifestyle with newer challenging demands being instilled into their daily lives. "Gone are the days when fathers had to go out for work while mothers had to stay back at homes, looking after household duties and raising kids ... The ratio of women staying back at home to look after their kids has seen a decline over the last few years" (Parenting Challenges, 2017, para. 1). In the recent years, especially in this new millennium, everything has been changed rapidly. Keeping a balance between parenting duties and work has become fairly stressful for working parents. Hence, many parents find parenting rather challenging these days, not to mention during the partial or full lockdown and/or movement restrictions during the Covid-19 pandemic. Moreover, there are many novel parenting styles proposed by different published authors who are also gurus in their respective fields or parent education, and these

different parenting styles are being adopted by the parents depending on their preferences. "To fulfil the newer demands and requirements and to accomplish the economic stability of the family, both fathers and mothers have to work as a result of which their attention towards their kids become divided" (Parenting Challenges, 2017, para. 1).

Parenting, therefore, as a process exerts a very important influence on a wide range of developmental outcomes of our children, affecting their brain development, cognitive maturity, socio-emotional behavior, motor coordination, and adaptive behavioral development, and also including psychopathology, school adjustment, and later delinquency (Belsky & deHaan, 2011; Hoeve et al., 2009; McLeod, Weisz, & Wood, 2007). That is why "[P]arenting behaviors are clinically very important because of their potential for modification" (Totsika et al., p. 422).

In this paper, the author has taken a case study approach to focus on understanding from a child's perspective via his projective drawings in terms of his awareness as well as interaction or relationship with his parents through their respective fathering and mothering (parenting) styles. The author also did a biblio-analytical comparison of the child's drawings with a children's book – "Charlie and the Chocolate Factory" written by Roald Dahl (b.1916-d.1990) – to understand how the child perceived parenting and his relationship with his parents through his drawings.

A Case Study

This is a case study about a 4+ year-old boy, whose parents had made a self-referral to an educational therapist in private practice to evaluate their child's cognitive maturity, sensory modulation¹⁶ and general developmental well-being in important areas, such as communication, physical ability, social skills, and problem-solving skills.

AA (pseudonym for the child) was described by his parents as a lively child, who adored his mother, showed his care and love for his younger brother of a few months old and enjoyed playing with his father. He was quite attached to his mother and always called for her attention in small tasks or things he did. However, the child's behavior as depicted by his mother can be summed up in three key attributes (see Figure 1): (1) egocentrism; (2) manipulateness; and (3) selective empathy (shown only to certain people known and close to the child).

¹⁶ Sensory modulation is defined as "the ability to self-organize and regulate reactions to sensory inputs in a graded and adaptive manner. The ability to self-organize

inhibitory and excitatory sensory stimulation and adapt to environmental changes" (Champagne, 2011, p. 252).

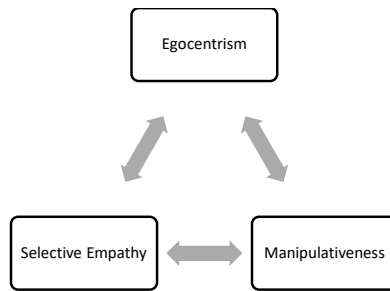


Figure 1. The Child’s Three Key Behavioral Attributes

• **Egocentrism**

According to Mrunal (2018), egocentrism is quite normal in early childhood. Clarke (2021) defined an egocentric child as one “who is self-focused and unable to imagine any other perspective than their own” (para. 4). Hence, it is important that AA’s parents should not be too quick to jump into conclusion that their child had some behavioral issues of concern. “Toddlers have a different perception of the world around them. They believe that things should go according to what they feel is

right. S/he may feel dreams come alive at night or his/her imaginary friend is real ... Egocentrism is one of the main characteristics of a child’s thought process till around the age of 6 or 7” (Mrunal, 2018, para. 1). It only becomes an issue of concern beyond that age of 6 or 7 if a child continues with such an attribute of being or becoming too self-centered. Hence, parents have to be mindful of the following five key points raised by Mrunal (2018) that parallel the first five stages in the psychosocial development (Erikson, 1950/1993) (see Figure 2):

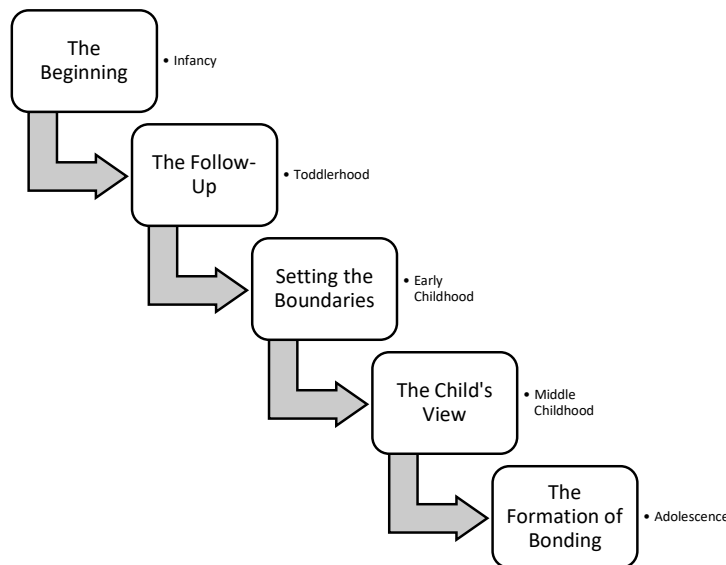


Figure 2. Mrunal’s (2018) 5 Key Points parallel Erikson’s (1950/1993) 5 Psychosocial Development Stages

(1) The Beginning [Infancy Stage]:

According to Mrunal (2018), “[D]uring the first few months after birth, the child will be the center of his universe. Everyone around him will also fuel his desires. After crossing the six-week mark, he will yearn for social interaction. He will scream out, “Hold me, feed me, burp me!” – these are only some of the examples of egocentrism in toddlers” (para. 2). When the child gets positive vibes from certain people (especially the mother), he will form bonds.

This is also the infancy stage or the first phase of psychosocial development (birth to 2 years of age), whose virtue to acquire is hope (Erikson,

1950/1993), which is a protective factor against the development of chronic anxiety (Michael, 2000). A baby’s cry, ignored or neglected too long, will soon experience a sense of abandonment that can lead to separation anxiety or social insecurity later on in life as s/he grows up. “Michael (2000) found that hope correlates significantly and negatively with anxiety, while also protecting against perceptions of vulnerability, uncontrollability, and unpredictability” (cited in Houston, 2021, para. 18). The challenging psychosocial conflict is trust vs. mistrust (see Erikson, 1950/1993, for detail). The significant person at this point of the child’s development is the child’s mother.

(2) The Follow-Up [Toddlerhood Stage]:

When the child or toddler starts to walk, he begins to explore the spaces around him. It is also during this stage that the child becomes aware “of self as separate from mother” (DiLeo, 1977, p. 154). According to Mrunal (2018), “Everything from tidbits around the house to even the electrical outlets will be touched or looked at. He will be curious about his surrounding and connected to the ‘big people’ who care for him” (para. 3). However, the child will show a streak of rebellion when the same people who care for him start to put limits on his behavior, and that should not surprise his parents as having a disruptive behavior or conduct. The child “definitely would not like other people cramping his style! This stage of development is usually seen in kids around the age of 18 months” (Mrunal, 2018, para. 3).

This is also the toddlerhood stage or the second phase of psychosocial development (2 to 3 years of age), whose virtue to acquire is will (Erikson, 1950/1993), which is connected to making one’s free choice but with responsibility. The challenging psychosocial conflict is autonomy vs. shame/doubt. If a child in this stage is encouraged and supported in his/her increased independence, s/he becomes more confident and secure in his/her own ability to survive in the world. If the child is criticized, overly controlled, or not given the opportunity to assert him/herself (e.g., making his/her choice), s/he may begin feeling inadequate in his/her ability to survive, and then becoming overly dependent on others, lacking of self-esteem, and feeling a sense of shame or doubt in their abilities. The significant persons at this point of the child’s development are the parents (both father and mother must come into play) (see Erikson, 1950/1993, for detail).

(3) Setting Boundaries [Early Childhood Stage]:

“Egocentrism in young children or toddlers needs to be nipped in the bud, even if in stages” (Mrunal, 2018, para. 4). Hence, one way to do it is by setting boundaries and the child should be aware of the limits s/he can move. The child will rebel if anyone goes against his/her ideas of the world. Mrunal (2018) argued that “[N]o matter how loudly s/he protests, setting limits will keep him/her secure and safe. When the toddler says ‘no’, it deserves a firm response from the parent’s end. A temper tantrum should never go unnoticed to curb egocentrism” (para. 4).

This is also the early childhood stage or the third phase of psychosocial development (3 to 6 years of age), whose virtue to acquire is purpose (Erikson, 1950/1993). Sense of purpose is the motivation that drives a child toward a satisfying future (Ho, 2021). Hence, the sense of purpose helps the child

get the most of life and it helps him achieve what matters most to him. Most importantly, it feeds intrinsic motivation and it creates meaning from life. Purpose is anybody’s driving force (see Ho, 2021, for detail). The challenging psychosocial conflict is initiative vs. guilt. Children can develop initiative through social interactions, and by planning and commencing in play and other activities. If their pursuits fail or are criticized, their feelings of self-doubt and guilt may arise. The significant persons at this point of the child’s development are the child’s family (i.e., parents, siblings, grandparents and anyone living with the child) (see Erikson, 1950/1993, for detail). The family as an entity offers an essential role in supporting the child’s growing-up and the child must recognize his/her purpose and role in the family.

In the case of AA, the child has already begun the third stage of his psychosocial development now, and the earlier two key points (i.e., beginning and follow-up levels) are important for his parents to take note in order to monitor his progress in this domain.

(4) The Child’s View [Middle Childhood Stage]:

According to Mrunal (2018), “[Y]oung children or toddlers will always tend to focus on their wants and needs. Their egocentric views mean that their perceptions are clouded by things that are most obvious” (para. 5). For most toddlers, including Abraham, seeing is believing. The child might believe that since he can see gifts, for instance, he should be able to have them. Childhood egocentrism needs to be dealt with effectively by the child’s parents.

(5) Formation of Bonding [Adolescence]:

“The young child’s egocentric views are challenged when they are introduced to kids their own age. When the child has to play with his friends, he is forced to accept other toddlers’ opinions” (Mrunal, 2018, para. 6). Through this exercise, he will be pushed to understanding that other young children or toddlers also have a perception of reality that could be different from his. “When the child exhibits signs of an egocentric personality, it is time to introduce him to a playgroup, where he can learn to interact, communicate and play with others” (Mrunal, 2018; reviewed by Prakash, 2018, para. 6).

AA has not arrived at the middle childhood stage (or the fourth stage) nor the adolescence stage (or the fifth stage) in Erikson’s psychosocial development and hence, it is not within the scope of this paper to delve on these last two points of Mrunal (2018).

- **Manipulativeness**

Manipulativeness, according to Kloppers (2021), is “a form of behavior that involves minimizing its effects on others” (para. 5). Manipulativeness can be

a part of the normal routine for a child to control his/her acquaintance's (especially parents) perceptions of and reactions to him/her. According to Lehman (2019), a manipulative child may use his/her charm, play the victim, make another person (normally his/her parents or another adult/person) seem to be the one who caused a problem which s/he began but would not take responsibility for. Such a manipulative child can be passive-aggressive or nice one minute and standoffish the next, to keep the other person guessing and to prey on the other person's fears and insecurities. The child may often make the other person defensive. The child being egocentric and manipulative can be a narcissist in making.

According to Lehman (2019), manipulative children can recognize and deal with people in different ways almost from birth. As an infant, s/he responds differently to his mother, a caregiver or a family friend. This continues into childhood and adolescence. The child can recognize the differences in parents (i.e., mother and father), and those differences often fall into two categories:

- (i) Which between the two parents has power and which between them does not have power?
- (ii) Which between the two parents can the child manipulate with bad behavior and which between them can s/he not manipulate?

As the child grows up, s/he recognizes which of the two parents cannot follow through on consequences, which one can accept his/her excuses for inappropriate behavior and which one buys him/her things to win his/her allegiance (Lehman, 2019). The child learns which parent (father or mother) is always making excuses for him/her and which one sets limits. This is not a healthy psychosocial attribute and can constitute what is known as Jekyll-and-Hyde Complex or Syndrome, which is often described more in the elderly (than children) who cyclically improve with hospitalization (including

the following conditions: stabilization, rehydration, and appropriate medication), and mentally as well as physically deterioration at home (Segen, 2012).

The child targets at one parent by acting out is an indication that s/he has learned s/he can feel powerful at the expense of that parent (be it father or mother, a grandparent, brother or sister). On the surface, the parents will not see the child getting anything out of this targeted behavior. It is not like the child is getting out of a consequence by calling his/her parent/s abusive names. The child does it because s/he feels like a zero, and when s/he can bully his/her parent/s, s/he feels more in control (or powerful). However, the child feels weak and shaky about him/herself when s/he lacks self-confidence. When the child puts his/her parent/s down, s/he gets a sense of self-confidence. It is a simple, basic behavioral dynamic – a struggle of power between the child and the parent/s (father or mother or both).

• Selective Empathy

Finally, “[S]elective empathy (also known as selective compassion) is an empathy restricted to particular groups — typically those the child belongs to or identifies as similar to himself” (Davenport, 2020, para. 1). Refusing empathy to the “others” is centuries old and still rampant in every country resulting in all kinds of social malice (e.g., racism, terrorism, fascism).

The three childhood personality traits - Egocentrism, Manipulativeness and Selective Empathy – can change over a period of time as the child grows up and might also develop the triad of dark personality traits (see Figure 3): (i) Narcissism (i.e., excessive self-love); (ii) Machiavellianism (i.e., a manipulative attitude); and (iii) Psychopathy (i.e., lack of empathy) (Lyons, 2019; Paulhus & Williams, 2002).

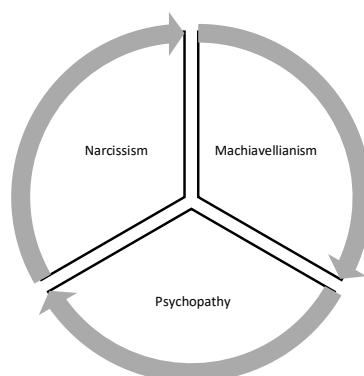


Figure 3. The Triad of Dark Personality Traits

Projective Drawing Assessment

In AA's case, a projective drawing assessment was administered to find out the child's intellectual capacity and/or cognitive maturity. It is part of the hierarchy of abilities and skills (Chia, 2008, 2012) to establish a child's psychosocial¹⁷ profile so that his parents could be properly advised and an appropriate arts-based intervention program, if necessary, could be accorded to AA. The model of the hierarchy of abilities and skills consists of six blocks or levels. In this paper, it covers only the first block of two in the hierarchy of abilities and skills (Chia, 2008, 2012), i.e., Foundation Block-Innate Abilities¹⁸ and Block II-Sensory Abilities and Skills¹⁹: (i) Draw-a-Person Intellectual Ability Test for Children, Adolescents and Adults (DAP-IQ; Reynolds & Hickman, 2004); (ii) Ages and Stages Questionnaire-3rd Edition (ASQ-3; Squires, Bricker, Twombly, & Potter, 2009); and (iii) Sensory Profile (SP; Dunn, 1999a) which includes the Sensory Profile-Caregiver Questionnaire (SP-CQ; Dunn, 1999a), Sensory Profile-Supplement/Summary (SP-S; Dunn, 2006), Short Sensory Profile (SSP; Dunn, 1999b), and (iv) Sensory Profile-2nd Edition-Child Version (SP-2C; Dunn, 2014). The results from the other standardized tests (except DAP-IQ) will not be discussed here as they are beyond the scope of this paper.

In this paper, the author has chosen to focus on the findings based on the DAP-IQ administration to study, analyze and understand AA's projective drawings. In addition, the drawings were also scored using the Goodenough DaP (Goodenough, 1926; Scott, 1981) and the Goodenough Draw-a-Man for Toddlers (Tan, 2004). The child also did two other free drawings prompted by the author.

The Draw-A-Person Intellectual Ability Test for Children, Adolescents, and Adults (DAP-IQ; Reynolds & Hickman, 2004) provides an objective scoring system that is applied to a standardized method for obtaining a drawing of a human figure, from which an IQ estimate is then derived. The test is untimed, but most examinees (children and adults) can complete the drawing in 5 minutes or less. The test may be administered individually or in groups, the latter being primarily for screening purposes. The DAP-IQ provides a common set of scoring criteria across its full age range of 4 years through 89 years and is the first draw-a-person projective test to do so. This not only eases the burden on the

assessor but allows for more direct, continuous measurement of a common construct across the age range. The DAP-IQ showed higher correlations with the Performance IQ of the Wechsler Intelligence Scale for Children-Third Edition-Revised (WISC-III-R) than with the Verbal IQ (Fabry & Bertinetti, 1990). Hence, the DAP test was evaluated as "a useful addition to the test battery" (Wisniewski & Naglieri, 1989, p.346) and as an appropriate screening test for intellectual ability in children (Prewett, Bardos, & Naglieri, 1989).

The DAP-IQ was the choice of the IQ test administration to determine AA's level of cognitive maturity and his cognitive capacity. These two terms are not synonymous and have to be clearly defined. The former term (i.e., cognitive maturity) refers to the ability to respond to the environment being aware of the correct time and location to behave and knowing when to act, according to the circumstances and the culture of the society one lives in (Hunt, 1941; Wechsler, 1950). Understanding the purpose in life concept, which concerns cognitive maturity, emphasizes a clear comprehension of life's purpose, directedness, and intentionality, which contributes to the feeling that life is meaningful (Adler, 1997). The latter refers to one's intellectual ability.

The two key markers in cognitive maturity are: (1) Socio-emotional & cognitive markers: Although psychological maturity is specifically grounded in the autonomy of one's decision-making ability, these outcomes are deeply embedded in not only cognition, but also in lifelong processes of emotional, social and moral development; and (2) Biological & evolutionary markers, where (i) maturity is an earned status that often carries responsibilities, immaturity is then defined in contrast by the absence of serious responsibility and in its place is the freedom for unmitigated growth; and (ii) this period of growth is particularly important for humans, who undergo a unique four-stage pattern of development (infancy, childhood, juvenility, adolescence) that has been theorized to confer a number of evolutionarily competitive benefits (Locke & Bogin, 2006). The latter (i.e., cognitive capacity) – also known as intellectual capacity – refers to an individual's ability (competence) to do or perform a task or an act (performance), or the amount of it that s/he is able to do. This form of capacity refers to an individual's ability to adapt, think, rationalize, change, learn,

¹⁷ The term *psychosocial* "relates to one's psychological development in, and interaction with, a social environment. The individual needs not be fully aware of this relationship with her or his environment. It was first commonly used by psychologist Erik Erikson in his stages of social development" (STANDS4 Network/Definitions.com, 2021).

¹⁸ This Foundation Block refers to the core block of a child'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 (Chia, 2008, 2012).

¹⁹ Block II focuses on the sensory-perceptual-motor coordination and related behavioral abilities and skills involving balance/motion of the body (vestibular) and position of body (proprioception). An example of an assessment tool for this level is the Sensory Profile (Dunn, 1999a).

analyze and act. When the term – cognitive/intellectual capacity – is expressed in a single word, it refers to the development of the cognitive sense of an individual.

AA did the Single Human Figure Drawing (SHFD) based on the DAP-IQ administration (see Figure 4). The child with a raw score of 8 obtained an average

standard score of 107 (at 68%ile rank) with an age equivalent of 4 years 6 months or a grade equivalent of less than the kindergarten level. According to Cooijmans (2013), an individual with such a standard score (100-109) is able to learn from written materials. This also means that AA at the time of assessment was considered an average learner.

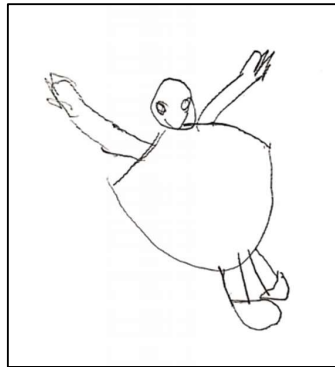


Figure 4. AA's Projective Drawing of a Person

Besides the administration of DaP-IQ, the Goodenough Draw-a-Person/DaP (Goodenough, 1926; Scott, 1981) scoring scheme (from chronological age of 3:03 to 12:09) – taken from Class B, i.e., all drawings that can be recognized as

attempts to represent the human figure, with each point is scored plus or minus and one credit for each point scored plus and no half credits given (see Table 1 below) – was also used to determine the child's mental capacity in the following subdomains:

Table 1. Goodenough DaP Scoring Scheme (for 3:03 to 12:09)

Subdomain	Score	Subdomain	Score
Gross Detail	4	Joints	0
Attachments	2	Proportion	0
Head Detail	2	Motor Coordination	1
Clothing	0	Fine Head Detail	0
Hand Detail	0	Profile (Overall)	0
SUB-TOTAL SCORE:	8	SUB-TOTAL SCORE	1
TOTAL SCORE	9	MENTAL AGE	5 years 3 months

AA's mental age was found to be at 5 years 3 months (see Table 1) at the time of testing and evaluation. When using the Malaysian pediatrician Dr Tan Poh Tin's version of the Goodenough Draw-a-Man Test for Toddlers aged 3-6 years (Tan, 2004) with the formula $[3 + (\frac{1}{4} \times \text{number of points})]$, his mental age

was calculated to be 4 years 9 months. All the mental ages (MA) computed from the three projective DaP/DaM techniques were compared and recomputed to give an average mental age of 4 years 10 months or a drawing quotient of 116 (high average).

Table 2. Comparison of DaP/DaM Results

Projective Drawing Techniques	(A) DAP-IQ (Reynolds & Hickman, 2004)	(B) Goodenough DaP (Goodenough, 1926; Scott, 1980)	(C) Goodenough DaM for Toddlers (Tan, 2004)
Raw Scores	8	9	7
Mental Age	4:06	5:03	4:09
Drawing Quotient	107	126	114
Descriptor	Average	Superior	High Average
Difference between		<i>Flynn Effect:</i>	
• (A) and (B)	19 points	Average difference:	--
• (C) and (B)	--	$(19+12) \div 2 = 15.5$ points	12 points

There is a high possibility of Flynn effect when considering the earlier version of Goodenough DaP Test (Goodenough, 1926; Scott, 1980) to the current versions of DAP-IQ (Reynold & Hickman, 2004) and Goodenough DaM for Toddlers (Tan, 2004). The Flynn effect between projective drawing tests (B) and (A) or (C) is at the average difference of 15.5 points. The Flynn effect refers to the substantial and long-sustained increase in both fluid and crystallized intelligence test scores that were measured in many parts of the world over the 20th century (Baker et al., 2015). When intelligence quotient (IQ) tests are initially standardized using a sample of test-takers, by convention the average of the test results is set to 100 and their standard deviation is set to 15 or 16 IQ points (see Flynn, 2009, for detail). When IQ tests are revised, they are again standardized using a new sample of test-takers, usually born more recently than the first. Again, the average result is set to 100.

However, when the new test subjects take the older tests, in almost every case their average scores are significantly above 100.

In addition to the Single Human Figure Drawing (SHFD) based on the standard protocol of DAP-IQ administration (with comparison to the Goodenough Draw-a-Man Test for Toddlers aged 3-6 years; see Tan, 2004, p. 81), AA also produced other drawings for three other projective drawings (more to find out about the child's emotional status and thoughts): (i) Draw-a-Family prompted by the author (see Figure 5); (ii) Draw-Your-Family Test (DYFT) (see Figure 6); and (iii) Draw-Your-House Test (DYHT) with the author's prompting (see Figure 7). These three projective drawings (see Figures 5, 6 and 7) were meant for follow-up activity therapy sessions and/or counselling with the child.

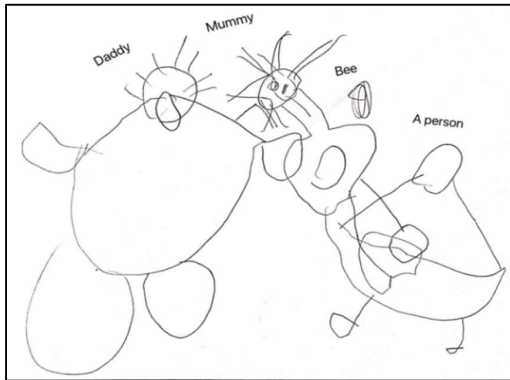


Figure 5. Draw-a-Family (prompted by the author)

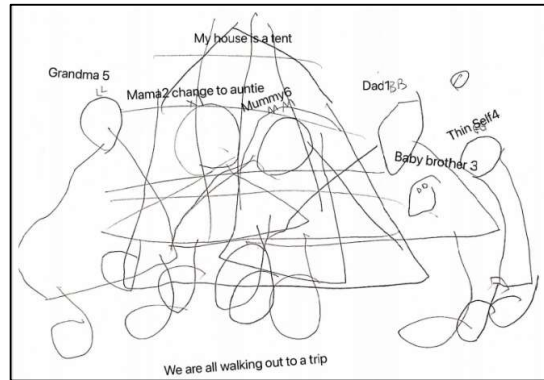
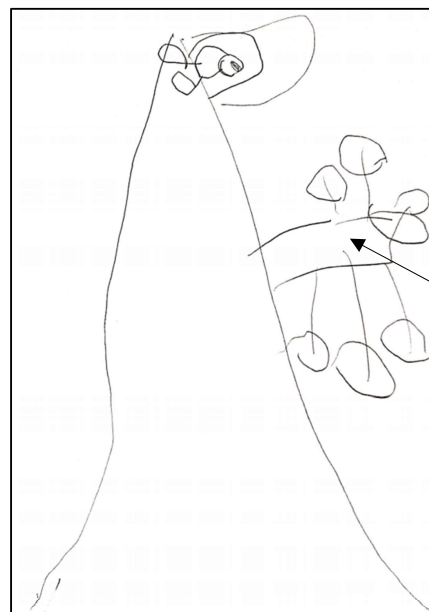


Figure 6. Draw-Your-Family (AA drew the house first and added the family next, saying that they were outside the house)



AA added a tree at the prompting of the author.

Figure 7. Draw-Your-House

A brief summary for the above three additional drawings indicated that AA was currently in the transition phase between Kinesthetic Drawing and Representational Drawing (DiLeo, 1977). Scribbling could be seen in the Kinesthetic Drawing phase (between 15 months and 36 months old) during which a “crayon *or pencil* held in fist makes zig-zags; later a variety of configurations: whorls, eventually distinct circles; enjoys watching a record of motion on the paper; crayon/*pencil* will be guided by index finger” (DiLeo, 1977, p. 155; words in italic are the author’s). Moreover, during the transitional phase, the child would discover “that the circle may serve to represent something, probably a head; has made a first graphic symbol” (DiLeo, 1977, p. 154).

There are three subphases in the Representational Drawing phase: (i) Expressionistic; (ii) Intellectual realism; and (iii) Visual realism. At the time of this assessment, AA’s drawing development was between the expressionistic subphase: “Subjective rendition of favorite theme: human body”; and intellectual realism subphase: “what is known to exist shall be shown; importance is expressed by size” (DiLeo, 1977, p. 154). What was drawn is showing the child’s mental impression rather than a visual observation (Read, 1966). In addition, Read (1966) argued that “the representation is not purely intellectual but imbued with emotional elements” (cited in DiLeo, 1973, p. 9). DiLeo (1973) added “that drawings by young children are representations and not reproduction, that they express an inner and not a visual realism” (p. 9). More importantly, DiLeo (1973) emphasized that “[T]he drawings make a statement about the child himself and less about the object drawn. The image is imbued with affective as well as cognitive elements” (p. 9).

Hence, in analyzing the three projective drawings (Figures 5, 6 and 7) done by AA, the author prompted the child with the following question: “What did you draw?” The answers to this question (for the purpose of obtaining a detailed projective drawing analysis) can be summarized as follows:

- (1) What was important to AA: predominantly people, then animals, houses, trees (Eng, 1954): e.g., AA drew his parents, his baby brother, a bee (see Figure 5), and a house (see Figure 6).
- (2) Some, but not all of what was known about the key object, i.e., AA drew what he knew and not what was seen (Eng, 1954): the key object that AA drew was himself (see Figures 5, 6 and 7).
- (3) What was remembered at the time of drawing (DiLeo, 1973): e.g., AA recalled a family outing (as in Figure 7).
- (4) The idea – representing the object the child drew (Prudhommeau, 1947) – colored by feelings: e.g., in AA’s drawings, no colors were

used, but the child’s idea was that the family was outside the house going for a family trip (see Figure 6).

- (5) What was seen (in the sense used by Arnheim, 1965): e.g., AA mentioned verbally that his house was a tent (see Figure 6) and he was thin (see Figure 6); and
- (6) An inner, i.e., an inner realism (Wolff, 1946) and how the figures drawn by the child were exaggerated by affective and expressive influences (Piotrowska & Sobeski, 1941/1942), not an optical reality (Ricci, 1885): e.g., AA drew himself cycling happily (as told by the child) outside the main door of his house on a mountain (see Figure 7).

That is to say, at this juncture, AA was an expressionist for whom the key object (i.e., the human figure of himself in all three drawings) in his projective drawings served merely as a cue or catalyst. “Whether drawing from a model or from memory, the result is the same” (DiLeo, 1973, p. 10).

It is interesting to note that in Figure 6, which AA drew a somewhat dilapidated house first and added his family next, saying that they were outside the house. The child did his detailed, careful drawings and that may reveal him as someone “who feels the need to try very hard” (Mandrappa, 2015, para. 20). According to Mandrappa (2015), this should not come as a surprise as children’s feelings can be expressed through their drawings. For instance, the lines drawn by AA could reveal much of his emotions. “The quality of line can also be significant – a figure drawn with light, wavering, broken lines, reveals a hesitant, insecure child who appears to think as he goes along” (Mandrappa, 2015, para. 22). “By contrast, the bold, continual, freely drawn line is expressive of self-confidence, and a feeling of security” (Mandrappa, 2015, para. 22). However, “[B]old strokes, especially if close together, can be a sign of stress, strong feelings, determination or anger, while softer marks suggest a gentler nature” (Mandrappa, 2015, para. 21). AA displayed his sense of frustration and anger in his drawings though he managed very well to mask his feelings through the way he could sweet talk anyone or sugarcoat his words in his attempt to appease his parents and/or significant others.

Moreover, lines drawn by AA for the house and the human figures were disjointed or disintegrated. It suggested a physical or emotional breakdown, or it might also mean the deterioration of a given emotional situation (Chia, 2010). “When a human figure is drawn in such a way that all the parts are not properly joined, it suggests the drawer is having

either some visual perceptual difficulties or emotional disturbance” (Chia & Ng, 2011, p. 35). In AA’s case, he was more of emotionally insecure, probably due to having co-exist or share the

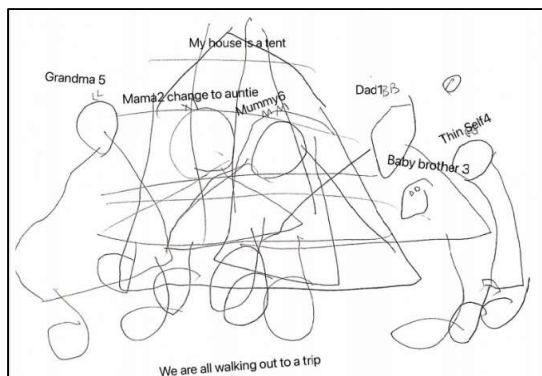


Figure 6. AA’s Drawing of His ‘Dilapidated’ House

When looking at the child’s drawing of his dilapidated house, one could not help comparing it with Charlie Bucket’s house, which was a small wooden house on the edge of a great town. It somewhat resembled that image of a ramshackle cottage. According to Suwan (2015), common doodling indicates a drawer’s need for security or at least a sense of security. “A neat drawing of a house suggests a secure home life, a more messy-looking sketch (especially one without windows) indicates unhappiness with your home life. A house pictured on its own on top of a hill suggests you’re feeling isolated and lonely” (para. 12). Interestingly, AA draw a third picture (see Figure 7) depicting the location of his house on the hilltop. He added a tree at the author’s prompting. This could suggest the child’s sense of isolation, loneliness and unhappiness.

Next, by examining the sizes of the human figures (i.e., his grandmother, his mother, his aunt, his father, his baby brother and his skinny self being squeezed on the right end of the A4 paper) that AA had included in his drawings (see Figures 5 and 6), “the relative size of the figures drawn is considered to be significant, with more important or dominant figures being drawn larger” (Mandrapa, 2015, para. 23). However, AA’s human figures other than his baby brother and himself almost shared the same size. What was noticeable was the absence of arms. This is sometimes interpreted as indicating timidity, a sign of non-aggressiveness (Mandrapa, 2015) or suggesting inadequacy and ineffectiveness (Klepsch & Logie, 1982). It is also perceived as lack of power and strength (Chia & Ng, 2011). Big feet were seen in the human figures drawn by AA suggesting the need for security or a firm grounding (Klepsch & Logie, 1982). “Likewise, tiny feet are seen as a sign

of abundance of parental love with his baby brother (as indicated by the symbolic interpretation of a bee drawn in Figure 5).



Figure 8. Charlie Bucket’s House (2005 movie) [in black-and-white]

of insecurity – literally an unstable foundation” (Mandrapa, 2015, para. 24). In AA’s case, his drawings suggested that he lacked power in decision-making, inadequate and ineffective in his attempt to build a better or stronger bonding with his parents.

Another interesting observation in AA’s drawing (see Figure 6) was the positioning of the human figures in relation to AA’s own figure. His self’s figure was closer to the baby brother and his father than to his mother, aunt and grandmother. The position of the aunt’s figure was first drawn to represent the child’s mother, but AA later decided to rename it as his aunt and the mother’s figure was re-drawn (though with a gap) next to the father’s figure. Subconsciously, AA had positioned all the male human figures closer to each other to the right while the female human figures were placed closer to each other toward the left.

When it comes to positioning in the drawing, apparently the left side of the page, according to Mandrapa (2015), “is traditionally associated with the past and with nurturing ... also associated with mothers” (para. 15). As for the right side of the drawing, it relates to “an interest in the future, and a need to communicate ... associated with fathers” (Mandrapa, 2015, para. 16). This was exactly what AA had drawn as shown in Figure 6 in his desire to have more interactive time with his father.

From the drawings done by AA, the child could be described as an expressionist with an average cognitive capacity and/or maturity. However, the child was identified to show hesitant insecurity, hidden frustration and anger only to be masked by his sweet talk and attempts to appease his parents. This behavior resembles the traits of what has been

termed as Uriah Heep Complex²⁰. In addition, internally, the child was emotionally fragile and unstable, feeling a sense of inadequacy and ineffectiveness in his deeds. His drawing (see Figure 6) spoke a lot of how he perceived the female and male members in his family. The female figures representing his grandmother, aunt and mother were drawn on the left (interpreted to mean “nurturing” force) while AA drew himself with the male members representing his father and baby brother on the right (interpreted to mean “need to communicate more” for his future interaction or relationship). To sum it up all, AA’s drawings suggested that the child was experiencing loneliness, isolation and unhappiness for whatever reasons best known to himself. This requires an experienced therapist to analyze his drawings (including previous and current scribbles, if any) and work with the child closely to understand his psyche.

From Projective Drawings to Biblio-Analysis

It is interesting to take note that from the biblio-analysis²¹ of the above three drawings, there are some similarities with the descriptions in the children’s classic *Charlie and the Chocolate Factory* (Dahl, 1964) that has been adapted into two movies: *Willy Wonka & the Chocolate Factory* (1971 movie) and *Charlie and the Chocolate Factory* (2005 movie) (see Figures 9, 10 and 11). According to Overland (2020), “[T]he most obvious moral is that good children get rewarded, ultimately, and bad children get punished. What goes around comes around. Karma is a real thing; just ask the Oompa Loompas” (para. 1). Overland (2020) added that “... poor children are more often virtuous than rich... and if a child comes from a rich, privileged family that child will end up rotten — unless the parents are careful not to overindulge the kid” (para. 2). Hence, “a big part of the moral is, ‘It’s always in part the parents’ fault” (Overland, 2020, para. 3).



Figure 9.
The Movie (1971): Willy Wonka
& the Chocolate Factory

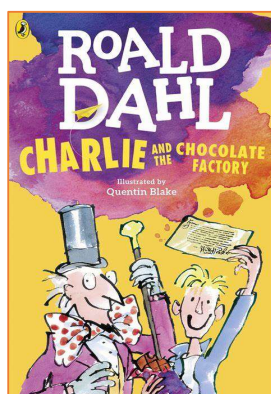


Figure 10.
The Book: Charlie & the
Chocolate Factory (Dahl, 1964)



Figure 11.
The Movie (2005): Charlie & the
Chocolate Factory

That has brought the important role of parents and their parenting into attention again. The behavior of a child reflects very much how s/he has been parented or brought up, especially when both parents are working to support the family, leaving little time to spend with their children during their formative years. As what Stacy (2014) described that “[I]n this crazy busy world, we (*parents*) get so caught up in it is way too easy to forget there are those in our lives who want and need our undivided attention. Just as our children need a parent’s attention, parents also need attention from their children. Although I am an adult with grown children of my own, I am reminded that I need to spend more time with my mom, just

one-on-one” (para. 5). Samantha (2019) also raised an important point that “[K]ids learn from their parents” (para. 7).

Returning to *Charlie and the Chocolate Factory*, readers familiar with the story should be quite aware of the kinds of misbehaving or spoiled kids that Roald Dahl described. Samantha (2019) explained, “Throughout the movie (*Willy Wonka and the Chocolate Factory*), we see children continually being pampered by their parents and even rewarded for bad behavior” (para. 8). Each of the five children (except for Charlie Bucket, the protagonist in the story), who had won the Golden Tickets to visit

²⁰ Uriah Heep is a fictional character in the 1850 novel *David Copperfield* written by Charles Dickens. The character – the primary antagonist during the second part of the novel – is known for being cloyingly humble, unctuous, obsequious, and insincere, and often making frequent references to own

‘umbleness’. The name of this character is now synonymous with sycophancy (Parker & Parker, 2017).

²¹ The prefix *biblio* refers to relating to a book (or books). Biblio-analysis is the use of a storybook with a theme relevant or related to the projective drawings for the purpose of evaluation and interpretation.

Willy Wonka's Chocolate Factory, displayed their unique negative attitudes that would have caused dismay to their parents and disgusted many others. "When Veruca (the second child winner of the Golden Ticket to visit the Chocolate Factory) falls down the garbage chute, the Oompa Loompas sing about her rotten behavior. They reference her spoiled lifestyle and desire to be pampered and talk about it being the fault of her parents" (Samantha, 2019, para. 7). "Augustus (the first child to win the Golden Ticket) has a habit of eating, as do his parents. Violet (the third child to win the Golden Ticket) has a desire to be number one in all she does, something she learned from her parents. Mike (the fourth child to win the Golden Ticket) is a disrespectful child who can't get away from the television because his parents allow him to" (Samantha, 2019, para. 9).

Conclusion

Children are mirrors, reflecting images of what happens around them, and they also reflect parental behavior (Urban Child Institute, 2011). "In addition to sharing genetic similarities with parents, they reflect the gestures, language, and interests of the adults in their lives" (Urban Child Institute, 2011, para. 1).

AA constitutes a child image of juxtaposition between good and bad – used with the vernacular phrase "Jekyll and Hyde" that refers to someone with an unpredictably dual nature, i.e., outwardly good, but sometimes shockingly bad (Sapostnik, 1971). This behavior could be the subliminal traits of dark personality yet to be in full bloom. However, this should not stop the parents from taking the first step to work on their parenting approach to manage their child and steering him away from such behavioral challenges awaiting to happen.

AA is still an impressionistic child in the psychosocial developmental phase of early childhood (3 to 6 years old). He exhibits the typical traits of a child of his age. As mentioned earlier in this paper, his attributes of egocentrism, manipulateness and selective empathy define his current psyche. It is the manipulateness that should call for his parents' immediate attention. Parenting consistency is essential to nip the child's manipulateness so that the subliminal Jekyll-and-Hyde behavior will not be allowed to develop later on. Both his parents must come to an agreement on how they should go about managing AA. Family rules are essential and AA must be made aware of these rules, which should include obedience and responsibility. However, many parents often confuse obedience with responsibility. They would love their children to do what they ask, to follow directions and to not question their authority. This is

understandable and important goals when raising children. The Center for Parenting Education (2021) has pointed out that such behaviors are not related to responsibility. These behaviors collectively are classified as obedience. "Over time, most parents want children to accept ownership for a task or chore – the children do it because it needs to be done and accept that it is their obligation to do it. Over time, they may even initiate doing a task 'because it needs to be done' – not because they are being told to do it. This attitude would be called responsibility" (Center for Parenting Education, 2021, para. 4-5).

It is important for AA's parents currently being advised and guided by a parenting educator to know exactly what and how to manage but never to under-parent the child should his behavioral traits deviate from what are considered socio-emotionally and morally acceptable in the specific socio-cultural context of his family. The Center for Parenting Education (2021) argued that "finding the balance between over-managing and under-parenting is an art. Deciding when it is appropriate to step in and when it is more effective to let go and give the child space to do it his way will depend on the child's cognitive maturity, past behavior with responsibility in general and with this task in particular, the developmental task he is working on, his temperament, and many other considerations. It is important to instill the attitudes and traits that make the child responsible occurs over years and involves many different pieces that make up the parenting puzzle" (para. 11-12).

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Beyond Rhoda Kellogg's Analysis of Scribbles: What else do They tell us?

Hong LIANG
Early Childhood Teacher
Little Seeds Preschool@Noah's Ark, Singapore

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Abstract

Scribbles, squiggles, whorls and doodles, including dots, lines and circles, are markings that young children make in their early development of drawing and later handwriting. These are more than meaningless markings on the surface. They have been identified as different types of markings: scribbles, doodles and drawings, based on their respective marking processes, i.e., graphomotor, grapho-psychomotor and psychomotor. Firstly, there are 20 basic scribble types that are further classified into six categories based on their overall directions: vertical, horizontal, diagonal, circular, alternating and no line movement. With or without colors, scribbles can reveal one's emotions. Secondly, doodles are aimless markings made absent-mindedly but they offer an insight into the understanding of a drawer's state of mind, conscious or subconscious, as well as emotion. Lastly, drawings are advanced psychomotor markings that take many different forms of meaningful schemata. They have led to the development or many projective drawing techniques such as single human figure drawing, kinetic family drawing, and house-tree-person drawing. In this paper, the author chose to focus on exploring beyond Rhoda Kellogg's 1969/1970 classical study that has provided the essentials to identifying cognitive development and educational needs evidenced in children's art. The question that begs to be answered: What else do scribbles tell us?

Key Words: Doodle, Drawing, Scribble, Squiggle

Introduction

Why do young children scribble and squiggle the way they do? Ask any child, s/he would not be able to explain why. Many a time in the past, early scribbles and squiggles done by young children were dismissed as meaningless activity (Chia & Lui, 2020) or as what Kellogg (1969/1970) described as "an imperfect record work of children" (p. 1). What are these markings made by toddlers and/or young children about? Is there any difference between scribbles and squiggles? Or they mean the same thing? What do past and present research studies say about them from the time when Rhoda Kellogg (b.1898-d.1987), a psychologist and nursery school educator, self-published *What Children Scribble and Why* in 1955 (and re-published in 1959 by National Press) until now?

Coates and Coates (2015) asked the question "whether the physical satisfaction of making marks is sufficient reward for this often repeated activity, or whether with each repetition children intend deeper meanings not apparent to the eyes of the adult beholder" (p. 60). They argued that "[T]he narrative, which frequently accompanies such drawings, indicates that far from being merely a mark-making

activity, the scribbled work represents for children a means of communicating a story or an experience" (Coates & Coates, 2016, p. 60). This argument has been supported by Mrunal (2018), who explained that "younger children might not be articulate enough to verbalise them" (para. 3). Hence, one way to understand a young child's mindset is to study his/her early scribbles and squiggles. "Give him/her coloring tools like a drawing and coloring book with a set of crayons or watercolors," Mrunal (2018) urged, "and look out for the colors s/he uses, the strokes s/he makes and the overall 'feel' of the picture" (para. 3; letters and words in italic are added by this author). Scribbling or squiggle provides us a "valuable insight into the state of mind of your child. It can also tell you about any kind of physical and sometimes even emotional experiences he is going through" (Mrunal, 2018, para. 4).

Scribbles, Doodles and Drawings

According to Chia and Lui (2020), they identified scribbles, doodles and drawings as three different types or forms of printing markings on a given surface regardless of its texture, area and/or size (see Table 1).

Table 1. Markings (Chia & Lui, 2020)

Marking	Type/Form	Intent
• Scribble	Graphomotor	No meaningful intent
• Doodle	Grapho-Psychomotor	Partially indicative of mood (e.g., boredom)
• Drawing	Psychomotor	Meaningful intent

There are differences among the terms: scribble, squiggle, whorl and doodle. They are briefly described as follows:

- (1) Scribble (see Figure 1): The Wiktionary (n.d.) describes a scribble as some kind of a marking (i.e., it can be writing, doodle or drawing) that is carelessly and/or hastily done. A scribble may be confused with a squiggle.
- (2) Squiggle (see Figure 2): It “is a short twisting or wiggling line or mark” (Wiktionary, n.d., para. 1).
- (3) Whorl (see Figure 3): It is a pattern of spirals or concentric circles that can often be seen in children’s scribbles.



Figure 1. Scribble



Figure 2. Squiggle



Figure 3. Whorl



Figure 4. Doodle

• **Scribbles: Graphomotor Markings**

There are more than just the four markings as shown in Figures 1, 2, 3 and 4 above. They also include circles, diagonals, dots, loops, waves, and zigzags. According to Kellogg (1969/1970), scribbles constitute basic-line formations or markings made by hand “movements showing variations of muscular tension that do not require visual guidance” (p. 14).

Table 2. The 20 Basic Scribble Types (Kellogg, 1969/1970)

Scribble 1		Dot
Scribble 2		Single vertical line
Scribble 3		Single horizontal line
Scribble 4		Single diagonal line
Scribble 5		Single curved line
Scribble 6		Multiple vertical line
Scribble 7		Multiple horizontal line
Scribble 8		Multiple diagonal line
Scribble 9		Multiple curved line
Scribble 10		Roving open line
Scribble 11		Roving enclosing line
Scribble 12		Zigzag or waving line
Scribble 13		Single loop line
Scribble 14		Multiple loop line
Scribble 15		Spiral line
Scribble 16		Multiple-line overlaid circle
Scribble 17		Multiple-line circumference circle
Scribble 18		Circular line spread out
Scribble 19		Single crossed circle
Scribble 20		Imperfect circle

- (4) Doodle (see Figure 4): It is a simple drawing with “a concrete representational meaning or may just be composed of random and abstract lines, generally without ever lifting the drawing device from the paper, in which case it is usually called a ‘scribble’” (Wikipedia Contributors, 2021, para. 1). According to Rabach (1972), doodles are aimless designs, i.e., they are drawings and scribbles that are absent-mindedly rendered while an individual’s thoughts wander away elsewhere. Watts (2000) defined doodles as pictures of self-expression that are generally produced when someone’s mind is in a preoccupied or trance-like state of consciousness.

There are 20 basic scribbles (see Table 2), as identified by Kellogg (1969/1970), consisting of dots, lines and circles made by two-years-olds and by even younger children. These 20 basic scribble types are “the building blocks of art, and they are important because they permit a detailed and comprehensive description of the work of young children” (Chia & Ng, 2020, p. 4).

In addition, Kellogg (1969/1970) also categorized the 20 basic scribble types into six types of basic scribbles on the basis of their overall direction as listed below:

- (i) Vertical: Scribble types 2 (single vertical line) and 6 (multiple vertical line);
- (ii) Horizontal: Scribble types 3 (single horizontal line) and 7 (multiple horizontal line);
- (iii) Diagonal: Scribble types 4 (single diagonal line) and 8 (multiple diagonal line);
- (iv) Circular: Scribble types 5 (single curved line), 9 (multiple curved line), 15 (spiral line), 16 (multiple-line overlaid circle), 17 (multiple-line circumference circle), 18 (circular line spread out), 19 (single crossed circle) and 20 (imperfect circle);
- (v) Alternating: Scribble types 10 (roving open line), 11 (roving enclosing line), 12 (zigzag or waving line), 13 (single loop line) and 14 (multiple loop line); and
- (vi) No line movement: Scribble type 1 (dot).

Kellogg’s (1955, 1959, 1969/1970) classical studies have provided the essentials to identifying cognitive development and educational needs evidenced in

children's art, especially the scribbles and their placements. Kellogg saw scribbles as the first stage of drawing development and explored further “in various placements on a surface and later developed into simple shapes or basic diagrams such as circles and rectangles” (Goodnow, 1977, p. 25). According to Kellogg (1969/1970), she “thinks that at every stage, children respond continually to the presence of order in a shape ... try out numerous scribbles, diagrams, and combinations ... remember and repeat ... those that have good visual form, or good balance. The mandala – a closed form, usually ovoid, with crossed lines – is one of her favorite examples” (cited in Goodnow, 1977, p. 25). Figure 5 is an example of a mandala created with a stencil and a pen.

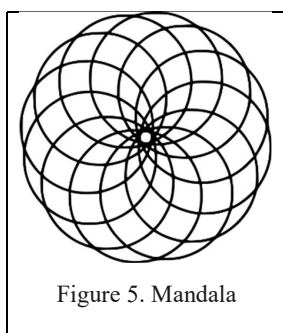


Figure 5. Mandala

Chia and Ng (2020) have regarded scribbles as graphomotor markings rather than psychomotor markings because graphomotor means the action taken is ‘pertaining to the muscular movements in writing’ (p. 4; also see Dictionary.com, 2019, para. 1). A good example provided by Chia and Liu (2020) is the marking O that resembles the capital letter O or the number 0, or lines // \ that resemble a pair of parallel lines with a figure 1 sloping downward to the right.

Kellogg (1969/1970) explained that scribbles “help us to see that drawing capacity of a fundamental sort is natural in very young humans” (Kellogg, 1969/1970, p. 14). Kellogg (1969/1970) further added that “[A] child who cannot make them must therefore be severely disabled, mentally or physically” (p. 14). With colors added to these scribbles, squiggles and whorls, they help the young children “to better express their emotions than a simple pencil would” (Mranual, 2018, para. 6).

Scribbling is a random drawing and it is also known as *gesture drawing* (Red Bike Studio, n.d.) – where “the focus is on trying to capture the energy within the subject of your drawing” (Read Bike Studio, n.d., para. 3). When a child scribbles, s/he draws with energy and feeling; there is more life to the drawings rather than just treating them as a representation or rendering of what one sees. More

importantly, such drawings are often accompanied by verbal narratives as told by the young drawers themselves. Coastes and Coastes (2016) explained that such a narrative, which frequently accompanies such drawings, “indicates that far from being merely a mark-making activity, the scribbled work represents for children a means of communicating a story or an experience” (p. 60).

However, Chia and Lui (2020) further elaborated that the scribbling marks (or scribbles) made randomly by young children may mean nothing to them, i.e., without any meaning in mind. As for psychomotor, they mean the action taken is “of or relating to a response involving both motor and psychological components” (Dictionary.com, 2019, para. 1). In this case, some form of meaningful scribble is created to represent something in the child drawer’s mind. For example, the very familiar golden arch [M] is now a powerful symbol that represents McDonald’s fast-food chain of restaurants worldwide that every child or adult can recognize it without a problem.

• Doodle: Grapho-Psychomotor Markings

Next, there are also the doodles (see Figure 4), which have been described and explained earlier above, and they are markings made while a drawer’s “attention is otherwise occupied” (Wikipedia Contributors, 2021, para. 1). Doodling is thought to give an individual a powerful mirror into his/her sub-conscious mind, allowing him/her to tap into other concepts and ideas s/he might not have otherwise considered. Doodling is also thought to give certain processes in the brain a break, while firing up other, more helpful ones. In this way doodling helps to improve one’s memory (Andrade, 2010). Moreover, other research studies have also found that doodling could help to boost a person’s mood (Dalebroux, Goldstein, & Winner, 2008), reduce stress (Selby, 2015), make one a better listener and also learn more effectively (Andrade, 2009), understand oneself better (Qutub, 2012), and process one’s emotions positively (Baweja, 2020).

Both scribbling and doodling are considered to be early markings that lack hand-and-eye coordination as well as taken to be at the lower mental or cognitive development associated with toddlers and young children between 2 and 4 years of age. Therefore, it is not surprising to notice “young children struggling to keep their coloring attempts within the line art (i.e., boundary or contour) of the subject” (Wikipedia Contributors, 2021, para. 2). It is also not uncommon to observe such behavior with adults, too, who are doing it jovially, out of boredom, frustration, anxiety, depression or to release stress, and also those with developmental coordination disorder (DCD) or developmental dyspraxia.

- **Drawings: Psychomotor Markings**

Finally, according to Chia and Lui (2020), “[D]rawings are more advanced forms of psychomotor markings that take many different forms from a wide range of meaningful schemata (e.g., person, house, tree, animal, insect, and many other objects)” (p. 5). From these drawings, several projective drawing techniques have been developed and also used as standardized assessment tools in determining drawers’ mental or cognitive maturity (Reynolds & Hickman, 2004), general intelligence (Flanagan & Motta, 2007) and the state of emotional disturbance (Naglieri, McNeish, & Bardos, 1991), which includes both internalizing and externalizing behavioral problems (Crusco, 2013)

The Five Phases in Drawing Development

Drawings done by young children have been studied by many individuals, especially Viktor Lowenfeld (b.1903-d.1960), an Austrian-born professor of art education, and others like Joseph DiLeo, Judith M. Burton and Marianne Kerlavage – being the pioneers in the field of children’s drawing development. There are five phases of drawing development in the following sequence:

(1) **Scribbling Phase** (2 to 4 years old): also known as Non-Representational Phase, is always taken to be the first stage of the artistic or drawing development (see Table 2). This consists of three substages as a child drawer grows and develops (Renae, 2019). During the first

substage (18 months to 3 years old) of this phase, young children explore media through their various senses, make random markings and become aware of the marks they make. This is when scribbling begins to take place. In the next substage (3 years old), young children begin to explore and manipulate materials more than before. They also begin to scribble with more control and may cover more of the paper that they use in their scribbling (Kellogg, 1969/1970; Goodnow, 1977; Renae, 2019). This is a placement of scribbles. In the third and last substage (3 to 4 years old), young children continue to scribble but they also begin to perceive the shapes in their drawing. This is also the time when try to create shapes in their scribbling and are able to name and identify the scribbles they make.

(2) **Pre-Schematic Phase** (3 to 7 years old): Visual idea comes in mind during scribbling. The scribbles they have made show what these young children perceive as most important about the subject of their choice by representing it with symbols as well as objects that they are most familiar with. It is during this phase that they begin to link and/or combine two or more scribble types into one known as an aggregate, e.g., a happy sun (see Figure 6) or a smiling face (see Figure 7). Also, human-like like a tadpole-circle (known as a cephalopod) with stick arms and legs (see Figure 8) which a child of this age will say is a person.



Figure 6. A Happy Sun



Figure 7. A Smiling Face



Figure 8. A Cephalopod

(3) **Schematic Phase** (6 to 11 years old): The phase is all about the ‘schema’, “which means adhering to the same symbol to represent a specific object” (Raja, 2020, para. 7). For example, a child draws a house the same way every time s/he is asked to draw it. According to Renae (2019), children at this phase are aware of the concept of space, colors, up and down, top and bottom, and each object in their drawing has a relationship with others figures or items in the same drawing and drawn with a purpose. This time, scribbles are transformed more to resemble whatever they are supposed to represent (e.g., an apple will be drawn to resemble closely to a real apple). Moreover, they now plan and include details in their

drawings and also begin to evaluate what they have drawn.

(4) **Transitional Phase** (9 years old and above): During this transitional development, the drawing skills of a child should have developed and matured tremendously. His/Her reproduction of a drawing will be “per the standards of an adult’s understanding of the world” (Raja, 2020, para. 8). However, one significant development during this phase is that the child commences “to define gender roles for people *or the human figures* s/he draws through items of clothing and other finer details in his/*her* artwork” (Raja, 2020, para. 9; words in italic are this author’s addition); and

- (5) **Realism Phase** (12 years old and above): This is the last phase in the drawing development. Whatever, the child draws now resembles more of the real things s/he sees. “S/He has become an astute artist as far as his/her understanding the medium is concerned. The child now knows more about art, drawing tools, his/her subjects, and his/her environment” (Raja, 2020, para. 11). Moreover, the child is also more aware of “what mature artwork looks like and begins to draw as per his/her new understanding of life” (Raja, 2020, para. 12; the word in italic is the author’s addition). The key feature in this phase is the child drawer’s self-critical aspect of his/her drawings.

Mcilroy (2021) has also included the Pre-Scribbling Phase (12 to 18 months) in the drawing development, adding up to six developmental stages in all. It is a phase that comes before Scribbling Phase (2 years to 4 years old) and concerns about “exploring and developing motor coordination” and “[A]t around 15 to 18 months babies begin to develop uncontrolled scribbles that don’t represent anything” (Mcilroy, 2021, para. 14). However, in this paper, the author’s focus is on the Scribbling Phase.

The Scribbling Phase

The random scribbling of lines as seen in the Scribbling Phase has no real meaning, or for that matter, literal meaning. Mrunal (2018) has reiterated that “[S]cribbling makes no sense when you look at it, but the process can give insights” (para. 11). The process of scribbling involves four key behavioral tasks: (i) manipulation, (ii) uncontrolled marking, (iii) controlled marking, and (iv) planned/named marking. These behavioral tasks are not arranged in terms of sequence or priority. Any of these tasks can happen during scribbling. Scribbles are often accidentally made rather than deliberately. Kellogg (1969/1970) saw scribbles the first stage of drawing development and they “are explored in various placements on a surface and later developed into simple shapes or basic diagrams such as circles or rectangles” (cited in Goodnow, 1977, p. 25). These scribbles can be linked or combined with three or more others to form aggregates (e.g., a circle with spokes made from three or more intersecting lines to form crosses).

- (1) Manipulation constitutes one of the behavioral tasks in scribbling. Its action involves influencing or controlling something to the drawer’s advantage, often without others knowing the drawer’s intent or thought. For example, a child randomly scribbles something that resembles or shapes like a circle or a square. His/Her parent praises him/her for being

‘clever’ and points out to the shapes that the child has made. This is followed with a warm hug and kiss. The child enjoys it and uses the same behavioral task to manipulate the situation to his/her advantage.

- (2) Uncontrolled marking refers to the behavioral task that is performed or occurs as a result of a sudden impulse or inclination and without premeditation or external stimulus. This action can be seen in very young children’s random scribbling. There is no specific goal to executing the task nor is there any meaningful intent. A child who continues to display this behavior even as s/he grows up is certainly an indication of some intellectual or physical challenges that the parents could have missed out. Hence, it is an important sign for observation in monitoring a child’s typical developmental milestones.
- (3) Controlled marking involves some deliberate action in doing a task. For example, a child is asked to draw his parent (mother or father), and s/he makes an effort to create it through some form of sensory modulation, e.g., visual processing input that involves eye-and-hand coordination to scribble a human figure on a piece of paper. Figure 9 shows a scribble by a child aged 4 years when asked to draw his parent. The child chose to draw his father and notice that the arms are missing from the single human figure drawing. This is the beginning of the transition from Scribbling Phase to Pre-Schematic Phase. The human figure is closer to that of what is known as a cephalopod – a tadpole-like human figure.

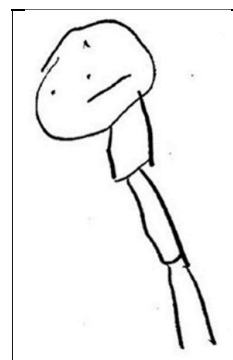


Figure 9. My Father

- (4) Planned/name marking comes about when a child has better grasp of his drawing or writing tools. Also, s/he has a better conceptual knowledge of the different shapes and their perceptive representations. The child can also use words to name people, animals, things and others that s/he sees. For example, a triangle is drawn to represent a dress for a female human figure, while an oblong that is shaped like a

rectangle or ellipse but having one longer end is often used in drawing to represent a male human figure.

Young children or toddlers do not try to represent reality with the scribbles they are making. It is just “a joyful exploration of their own new found power - the ability to make a permanent mark on the world” (The Conversation, 2016, para. 2). This ability of a young child to draw an enclosed shape denotes the new chapter in his/her developmental milestone: being able to represent the objects in the world around him/her. “It also marks the beginning of being able to form the letters of the alphabet” (The Conversation, 2016, para. 4).

Gradually, these scribbles begin shifting from simply being an internal visceral pleasure for young children to pre-schemata representing something they see, as the adults (e.g., parents and teachers) search for messages they believe are hidden in their markings (The Conversation, 2016). Interestingly, circles, for instance, are drawn now resemble a head, the sun, or even a flower – each is a schema. Adults like parents and early childhood teachers also begin to assign meaning to the scribbles done by these young children or toddlers, asking questions like “Is that your mummy that you have drawn?” “What a beautiful fleecy cloud in the sky that you have added!” “What a beautiful sunflower!” Often through the encouraging social interactions and modelling from adults, these scribbles done by young drawers now become more recognizable as “things” to significant others, especially, parents, teachers and peers. According to The Conversation (2016), “[T]his is also an introduction to the complex and abstract notion that written words are also symbols of meaning” (para. 7). These young children begin to become aware of the communicative power of their mark making though they may not fully understand how it works.

Next, what is noticed during the transition from the end of Scribbling Phase to the beginning of Pre-Schematic Phase is the child’s ability to recognise an “inside” and an “outside” of those scribbled shapes. “Dots on the inside become eyes and noses, lines shoot from the outside to become arms, legs, sun rays, petals and stems” (The Conversation, 2016, para. 13). These same scribbling skills are required by young children to refine their pre-writing of alphabet letters. Both parents and teachers will be excited to see the emerging of recognizable symbols being scribbled or doodled, and often positive responses coming from these adults will encourage these young children to create more through their scribbling. From scribbling through doodling to drawing, children’s art is continually lauded, their art pieces are displayed on the class noticeboards, stuck on to the refrigerator doors with magnetic

strips ... and so, they carry on scribbling ... doodling ... drawing. From a four-year old’s perspective, one question that will keep them pondering: “What is not to like about drawing?” Scribbling-doodling-drawing has given them an immense intrinsic pleasure, making their loved ones happy, allowing them to test and play with feelings and ideas. Moreover, drawing allows these young drawers to observe closely the world around them, to record what they see and use that experience as the basis for their further enquiry. It can become an essential player in their internal dialogue as these young drawers work through conceptual challenges they encounter daily.

Conclusion

In summary, Mcilroy (2021) has highlighted that drawing (or scribbling, to be more precise) “is a crucial activity during the toddler and preschool years as it contributes in the following ways:

- (i) building fine motor skills;
- (ii) developing hand-eye coordination;
- (iii) developing creative expression through free drawing/scribbling;
- (iv) setting as the foundation of pre-writing/handwriting skills;
- (v) building a child’s attention-concentration span; and
- (vi) developing cognitive understanding of concepts” (para. 8).

Not only does scribbling, squiggling and/or doodling provide both educators and parents a better glimpse into the developmental milestones of their children, it can help them to supplement the children’s learning in many creative ways, and also to engage their emotions and feelings with a better understanding.

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Parental Perspective on Teaching Number Sense to Young Children (One to Five Years Old)

¹Ignatius Guoliang YEO BEng, PGDE, MEd

²Cathleen Rui Lin LAU DISE, Dip.IT, Cred.SNET

¹Founder & Principal Mathematics Tutor

²Early Intervention Teacher & Educational Therapist

¹AlphaOmegaMath Program

^{1,2}Praxis Academia, Singapore

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Abstract

The first author is a former mainstream school mathematics teacher and the second author is his wife, used to be an allied educator before she resigned to be a homemaker. Together they have three daughters, Oli²² (five years old), Ven²³ (three years old) and Ely²⁴ (one year old). Their first two daughters, Oli and Ven, currently attend pre-school enrichment classes for about three hours per weekday. At home, the parents teach them numeracy and literacy skills for around 30 to 45 minutes a day. The two authors have explored various ways to engage, enrich and enlighten their children in learning mathematics. They acknowledge that every child is unique and learns differently at every stage of his/her development. As such, the authors have employed a repertoire of mathematics teaching strategies to cater to their children's learning needs, especially in making sense of numbers. One of the key challenges the authors have encountered is finding a meaningful way to make mathematics learning fun and relevant. In this paper, they have chosen to share, from their parental perspective, how to teach number sense to young children.

Keywords: Mathematics Learning, Numeracy, Number Sense, Teaching Methods

Introduction

In today's competitive and fast paced economy, the ability to solve problems through mathematics is considered critical. This is especially true in Singapore's fast paced workforce where one who possesses such skills is often seen as valuable to any organization. Major corporations believe that such a quality may translate to higher productivity and efficiency to the company or society. Hence, one with good mathematical ability is often deemed as an asset in any organization to solve problems. As the employment rat race continues to remain competitive in Singapore's context, one should start from young and enrich their children with mathematical experiences so as to enhance their mathematical abilities (Ritchie & Bates, 2013; Watts, Duncan, Siegler, & Davis-Kean, 2014).

Anecdotal evidence suggests that it is becoming increasingly difficult for children to bridge their mathematical abilities later in their school life if little or no intervention is provided to help them at a young age (Aunola et. al., 2004; Bodovski & Farkas, 2007). The lack of mathematical ability may persist because many children have underdeveloped

mathematical skills and knowledge, and as a result, manifest low confidence in achieving mathematical success (Gervasoni & Perry, 2017). In addition, further research suggests that there is a direct correlation between a child's inability to make sense of numbers in their early years and poor mathematics learning in their elementary years (Gersten, Jordan, & Flojo, 2005). These conclusive research results indicate that a strong mathematical foundation and attention to early mathematics education as well as instruction is vital to enhancing a child's mathematical achievements at a later stage, especially preparing the child for school readiness (Duncan et al., 2007).

All children are natural mathematicians and that parents are children's first teacher (Vukovic, Roberts, & Green Wright, 2013; also see Marshal & Swan, 2010, for detail). Parents' (and later working collaboratively with teachers when their children go to school) involvement in teaching their child can help the child to realize his/her potential earlier by assisting them to uncover and unpack these strengths through play. Play is a very powerful enabler to opening a child's mathematical world (Ramani &

²² Not the first child's real name; a pseudonym has been used.

²³ Not the second child's real name; a pseudonym has been used.

²⁴ Not the third child's real name; a pseudonym has been used.

Eason, 2015; also see Tirosh et al., 2020, for further detail). When play is meaningful and fun, the children can gain a deeper understanding of number, quantity, size, patterning, and data management (Grossman, 1996).

There are three operating principles the authors have built on when teaching number sense. Firstly, it is to seek every possible opportunity to learn and communicate mathematics in a fun and simple way (Moyer, 2000). In this way, a child's curiosity would be aroused and learning can take place constantly. Integrating mathematical language in everyday communication (Perry & Dockett, 2008) could further contribute to the opportunity of learning mathematics. This could come in the form of using terms such as 'addition' or 'subtraction' when referring to an event where items are added or removed. Communicating in mathematical language such as adding the number of cookies or taking away or hiding the number of toys could also contribute to learning mathematics. Secondly, it is to create a safe and positive learning environment. The home as a numeracy environment or simply home numeracy environment (Rathé et al., 2020) is a good place for the authors' children to start learning mathematics and making mistakes in their pursuit of acquiring mathematical concepts and skills. Studies have shown that a child's home numeracy environment plays an important role in a child's number sense acquisition (LeFevre et al., 2009; Skwarchuk et al., 2014) within the context of home as it presents a safe place for trial and error. Lastly, it is to celebrate every possible success no matter how big or small in mathematics learning. Everyone, including adults, want some form of affirmation and encouragement

when executing their tasks. It is no different for any other children as it would empower their mathematics learning and build a stronger parent-child bond (Rahmawati & Amri, 2020).

Teaching Ely (one-year-old) number sense

A key developmental milestone is that at one-year old, children develop an explorative attitude towards everyday objects and how they function. Ely, being the youngest of the authors' three daughters, likes to meddle with objects and may explore objects largely through her senses of taste, touch, smell and sight. The child displays a keen sense of touch and movement (tactile-kinesthetic) such as pushing the door, opening the cupboard drawers and taking out toys (see Baccaglioni-Frank, 2018, for detail). In this trial-and-error exploration stage, it is an opportune time to facilitate her number sense by introducing the following steps/activities:

(1) *Counting whenever possible.*

Parents should seize every opportunity to count objects or everyday items with the toddler. For instance, counting the number of cookies on a plate, counting big and small goldfish in a bowl/fish-tank or counting different shapes and sizes of toys in a box. Parents should explicitly point to the object or guide the child's finger to point as the parent(s) count(s). This will enable and enhance the child's numeracy awareness. Progressively, the child would associate counting numbers to the number of objects, a useful method known as one-to-one correspondence.



Picture 1. Ely taking out soft balls as parents count 1, 2, 3



Picture 2: Ely clapping her hands to the song with counting rhythm

(2) *Singing counting songs out loud.*

Numerous counting songs can be found on Youtube as these videoclips provide very catchy jingles and nursery rhythms. Some examples include '1 little 2 little 3 little monkeys' or "Six little ducks went out one day ...". Parents can sing the songs during playtime or naptime and, if possible, use a toy for each number sung in the song so that the child can relate to it. It is good to encourage the child to sing along and eventually, s/he will learn how to sing it him/herself. This allows a rhythmic counting impression to be formed in the young mind.

(3) *Reading with the child.*

Reading counting picture books as well as other printed materials relevant to numeracy and mathematics can form new numeracy domains in children. One benefit is that it enables a child to think and communicate mathematically (Moyer, 2000) and gradually the child will create his/her own mathematical ideas over time (Perry & Dockett, 2008). Consistent reading of counting books to children allows them to learn how to connect numbers to the correct quantity of objects illustrated in the book. Some recommended books include the following: 'Baby's First 123', Dr. Seuss's '123' and '10 little You's'. For more interesting counting books that parents and teachers can use with children, please refer to McDonald (2007) for detail.

(4) *Playing with toys.*

Using cause-and-effect toys (e.g., a squeaky rubber duck to play with the child) can promote the fun of learning mathematics. Any parent may start counting as s/he presses the rubber duck, and thus helping the child to associate the number of squeaks with the number spoken by the parent. Also, parents need to allow their child to press the rubber duck and count the number of squeaks. When keeping the toys, parents could also count the toys as the child places them back into a box or container. This may inherently cultivate a good habit and discipline of ensuring the correct number of toys taken out is put back.

(5) *Using pictorial number flashcards.*

Using flashcards in drill-and-practice has its advantages as these cards are easy to create and they can be used individually or in groups (Reynolds, 2010). The use of flashcards aids in reinforcing numbers at an early stage. For instance, a flashcard with one dot represents the number one, two dots represent two and so on. Parents can use flashcards with one to three dots at the start of an activity, once a day for three

weeks. One of the teaching strategies found to be useful is repetitive teaching. It allows the child to concretize his/her impressions of numbers both visually and verbally. As the existing schema is strengthened, the child may inherently recognize that one dot is the number one. For older children who are advanced learners, parents may show and question which is one dot and which is two dots, allowing the older child to point to the correct card. Furthermore, one could make learning more fun and interesting by using flash cards with the respective number of animals in place of dots.

Teaching Ven (three-year old) number sense

As a three-year old, Ven displays an absorbent and curious mind. This is evident in her speech and action. For instance, the child may ask many 'why' questions. Ven may also try out many other things and appear to be mischievous as it is the child's natural way of discovering things around her. As long as safety is not compromised, parents can and should encourage the child to learn and play freely. The following are activities and/or strategies enacted to integrate play with teaching number sense:

(1) *Playing mathematics prediction games.*

Children love any sort of games their parents can play with them. Hence, to arouse children's interest in number sense, parents may play a game of prediction with their children. For example, encouraging the child to predict the number of steps s/he can see the staircase, guess the number of oranges in a basket at a supermarket, or speculate how many people are wearing black in a restaurant. After the prediction activity, parents may reveal the actual number by counting the aforementioned items to the child. They may even ask their child to count along with them.

(2) *Playing memory games.*

This maybe in the form of a flash card showing number and dots or objects on the card. Patterns may also be introduced to enhance the difficulty of the game. A recommendation is to begin first with three cards to trigger the child's interest and gain his/her confidence. Then, increase the number to five, moving gradually to ten depending on how fast the child can pick up in learning. The numbers can be repeated from 1 to 10 and objects can be changed/substituted with other items. There is no need to rush the activity and one may repeat with three cards until the child is familiar before proceeding with an increased number of cards.

(3) *Using Montessori mathematics manipulatives.*

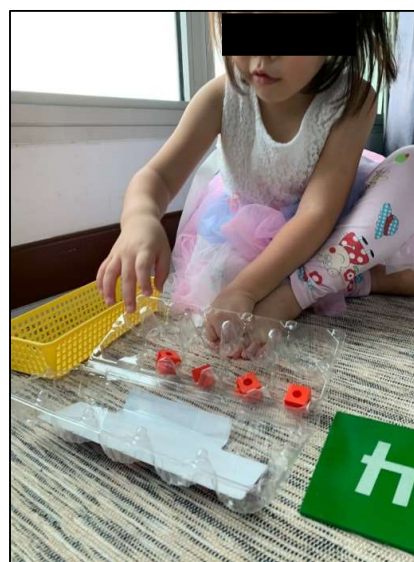
Montessori mathematics manipulatives have been found to be effective in mathematics

teaching and learning (see Laski et al., 2015, for detail). They are fundamental representations of mathematical tools that do not resemble real objects or possess irrelevant perceptual features. One example of a good set of Montessori apparatus is the Cylinder blocks (see Picture 3). It can be used to enhance a child's sensory awareness, and also to introduce the mathematical idea of size and proportion to the child as s/he will eventually be led to the concept of comparison of size. This activity can be conducted to allow the child to feel the depth and shape of the cylinder to make sense of which one to use.

The use of Number Rod, another Montessori apparatus, is another useful tool to introduce



Picture 3. Ven exploring the use of Cylinder blocks



Picture 4. Using small blocks to make sense of number 1 to 5

(4) *Learning to write numbers 1 to 10.*

Identifying numbers 1 to 10 is a crucial milestone for early mathematics learners. Whether a putative innate number sense is required for successful arithmetic achievement as opposed to a pure reliance on domain-general cognitive factors remains an interesting unresolved question still being debated among the experts (Siemann & Petermann, 2018). With the acquisition of number sense, young children can better understand the basics of counting as this form of meaningful exercise allows them to draw connection between written numbers and objects. When writing, the parent should guide the child's hand in writing the proper form and encourage him/her to count out loud when writing. Writing or tracing numbers could be a

useful guide for the early learners as it guides the penmanship of the child.

(5) *Learning mathematics through nature.*

When time permits, bringing children to nature and introducing real life mathematical concepts to them can help to contextualize their learning, e.g., counting the number of trees along a stretch of road or counting the number of petals in a flower. Parents should encourage their children to also count back the objects found in nature to their parents and, better still, to self-discover the connection between numbers and nature (see Watson, 1987, for detail).

Teaching Oli (five-year-old) number sense

Oli is not mathematically inclined and often chooses to avoid tasks related to mathematics (homework

and home-based worksheets). Rote learning through the use of worksheets often bores her to tears very quickly. As a result, her attitude towards learning mathematics is not very positive. However, the authors believe that all children can learn and also cultivate the positive habit of learning and liking mathematics. Hence, they believe it is necessary to engage the child through interesting lessons with fun and thrill, otherwise she would lose interest and impede his/her mathematics learning. When children are not engaged during mathematics instruction, it can affect their learning (Hanich, 2011). Therefore, the following are some of the authors' suggestions on how to make lessons relevant, meaningful and entertaining for Oli:

(1) *Counting and writing up to twenty.*

After having learnt the counting and writing of 1 to 10, the child can and should proceed to learn counting and writing numbers up to 20. There are many teaching aids including manipulatives commercially available that can be used in teaching numbers in the teens (also known as teens numbers, i.e., the numbers 13 through 19); one useful teaching aid is the teens board, where small blocks are used to formalize

the numbers from 10 to 20. The child will be guided in counting the small blocks and putting them beside the respective numbers s/he sees on the teens board. Another good strategy or activity is tracing numbers that can be used to guide the child in writing the teens numbers. It can also come in form of a puzzle maze game, where one correct trace leads to another along a pathway within the maze. Seeking opportunities to count in our everyday life (e.g., counting the number of lift buttons from 1 to 20) could also reinforce the idea of counting. One may play a game of counting numbers backwards (i.e., 20, 19, 18 ...) to further reinforce the number sequence order. An example of this could be using a rocket toy to count down (e.g., "10, 9, 8, 7 ... 5, 4, 3, 2, 1. Launch!") successfully before showing the rocket lift-off. For advanced learners, parents can ask their children to identify the numbers on a car license plate and ask if they can make 2-digit numbers, between 10 and 20, from the numbers they see on the number plate. This activity may excite the child and enhance his/her understanding of basic number combinations.



Picture 5. Oli preparing for her math task



Picture 6. Oli using teen board to learn numbers 11 to 15

(2) *Addition and subtraction.*

Preschoolers can attempt to solve easy problem sums through arithmetic operations of addition and subtraction of objects/items. For instance, at a supermarket, parents may ask their children to help them to pick up 4 oranges, 3 apples and 2 pears. Then introduce the term 'addition' as the child counts the fruits altogether. The final number is validated by asking her/him to count and say out the last number counted. Another

example is that if parents have a fish-tank at home, they may encourage their children to actively count the number of fish food pellets before feeding the fish. Take 10 pellets and feed 4 pellets to the goldfish in the fish-tank. After feeding the goldfish with 4 pellets, the child can then count the number of remaining pellets. In this way, parents can reinforce the idea of subtraction by saying "Subtracting 4 from 10

leaves us with 6 pellets, or 10 minus 4 gives you 6”.

(3) *Comparing numbers.*

The idea of bigger or smaller, more or less, more or fewer constitutes an integral part of understanding the number system. There are many activities parents can introduce to engage with their children in teaching the concept of comparison. For example, one can put 5 marbles of the same color in front of a child and ask him/her to sort them out into groups of 2 and 3. After which, parents can also ask the child which group has more and which has less. If the child is unable to compare, parents help by explaining the concept and showing him/her how to count and telling the child which group has more and which has less marbles of certain colors. Parents must remember to emphasize comparisons by using the terms ‘more’ or ‘less’. For advanced learners, parents may introduce more colored marbles (up to the number the child is familiar with) and ask the child to group them by colors and compare in terms of quantity. When given more opportunities to explore and compare quantities of objects/items, children will learn to utilize two or more mathematical concepts to mastery (Gick & Holyoak, 1983; Son, Smith, & Goldstone, 2011).

(4) *Using clock or time to learn number sense.*

Understanding the concept of time is one of the important skills a preschooler should learn and a clock can also be used to teach number sense (Griffin, 2004). The parent may bring in a simple idea of time by telling them, “It is the morning and the sun rises at 7am. The sun sets at 7pm and there are 12 hours of day time” or “how long did you sleep during your afternoon nap?” The use of a teaching clock is useful to illustrate the concept of time: e.g., recognizing a clock face has the numerals from 1 to 12, and the shifting of the hour and minute hands moves in the clockwise direction. Also, in explaining that when the clock strikes 12, the hour hand moves to the next number and the next number in an hour’s time is 1 and so on. Allowing the child to ‘feel’ the numbers inscribed on the clock face or spin the hands in the clockwise direction provides him/her an excellent opportunity to explore the movement of the clock hands and also to understand how time is read off the clock. For advanced learners, parents may show their children a specific time and ask them to show the same time or another time after resetting it. To incorporate the fun element in learning time, parents may have the activity timed to play as a game with their children.

Conclusion

Teaching number sense to young children or any preschoolers is by no mean an easy feat. However, it does bring along joy and with a calibrated approach, it can help to foster a strong parent-child bonding or relationship. The above list of suggested activities on how to teach are purely based on the authors’ parenting and teaching experiences. Readers are reminded that the list of activities mentioned in this paper is non-exhaustive. There is no one-size-fits-all method or strategy and parents are strongly encouraged to explore many different ways to widen their child’s perspective of numbers (or number sense). One may refer to commercially published teaching books, watch mathematics pedagogical videos for early learners and/or read relevant articles to gain more theoretical as well as practical knowledge on teaching methods. Real life experiences and hands-on approach via trial-and-error appears to be the most efficient and effective way to hone the teaching skills.

In this journey of educating young children, both parents (i.e., father and mother) must learn to complement and support each other. This is an essential factor because parenting burnout is a real concern. A suggestion is for the father to perform the play role while the mother to perform the teaching role or vice versa. This approach is most helpful and useful. It is recommended that parents should distinguish their respective parental roles so that the child is not confused by the “fuzzy” parenting so that s/he can easily associate the role of each parent when it comes to learning. As the saying goes “it takes the whole village, to raise a child”. Hence, every family member should make a concerted effort in upbringing and teaching the young child in order to maximize his/her potential.

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