

SCREENING FOR DEVELOPMENTAL BEHAVIOURAL PAEDIATRIC DISORDERS

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ABSTRACT

Developmental and Behavioural Paediatrics encompasses all neurodevelopmental and behavioural issues that children and adolescents may encounter across time. The developmental journey of each child starts at birth and screening should be done routinely during all well-child visits at the community medical practitioner level. It involves screening through routine developmental milestones and looking out for deviations as well as identifying red flags in any domain of development, including motor, speech and language, and social development. We screen in order to allow prompt identification and early intervention.

The American Academy of Paediatrics recommends developmental screening to be done at 9, 18, and 30 months. Screening tools include the Denver Developmental Screening Test, Singapore as the baseline screening tool and other specific tools such as the Goodenough Draw a Man, the Ages & Stages Questionnaire, the Vanderbilt Rating Scales, and the Modified Checklist for Autism in Toddlers, Revised with Follow-up.

Differentiation between Autism Spectrum Disorder and Attention Deficit Hyperactivity Disorder can be challenging at a young age. Differences need to be teased out through a carefully taken history of the early years. The Diagnostic and Statistical Manual – V now allows dual diagnoses, most commonly established in tandem around the age of six. Screening at around the age of five will thus be useful to look for ADHD as an occurring condition amongst those diagnosed with ASD. School readiness should also be looked at around this time.

Better awareness and identification will then lead to prompt diagnosis and intervention in order to optimise eventual outcomes.

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INTRODUCTION

Developmental Paediatrics has expanded over the years to become Developmental and Behavioural Paediatrics, and oftentimes include a neurological aspect – Neurodevelopmental and Behavioural Paediatrics. The developmental paediatricians understand that the development of any child fully encompasses not only developmental milestones, but also the entire wide spectrum of behaviours and neurological issues that a child may experience challenges in. On top of that, parenting itself becomes a facet of this ever-growing field.

WHY DO WE SCREEN

As children become increasingly recognised as a precious resource in Singapore, community doctors can play a bigger role in helping to care for them on a wider scale. Screening becomes the bread and butter of every community doctor, in this case not for chronic illnesses but for better health and development of every child, in order to be able to identify risk-factors and effect early diagnosis and intervention.

Some developmental lags herald the diagnosis for impairments or disorders that warrant early treatment for better outcomes. Congenital hearing impairment, as the most common major birth defect, presents with best outcomes if it is picked up before three months and treatment implemented by six months.¹ Inborn errors of metabolism known to be a cause of progressive intellectual and neurological deterioration in children also benefit from earlier identification and appropriate treatment.² Congenital or acquired hypothyroidism leads to mental retardation if treatment is not provided as early as possible. A 4-to-5-month delay in treatment of congenital hypothyroidism could lead to an IQ of 70 in a child with otherwise normal intelligence at birth.³ Early detection of low tone and delayed motor milestones in any young infant would warrant a thyroid function test. It would also be wise to screen for muscle disorders at the same time in hypotonic babies.

WHEN TO SCREEN

Developmental milestones should be routinely tracked from the baby's birth. Every well-child visit is an opportunity to screen, within minutes, for any developmental deviation and concerns.

The American Academy of Paediatrics (AAP) recommends that developmental and behavioural screening for all children during regular well-child visits should be done at nine months, 18 months, and 30 months.⁴ AAP also recommends specific screening for an autism spectrum disorder at 18 months and 24 months, during well-child visits. Special surveillance is also to be paid to those aged

4-5, so as to survey their readiness for impending enrolment for primary school.⁵ In the presence of any red flags, full standardised developmental screening testing or onward referral must be effected for early intervention and necessary action for optimal outcomes.

With the combined efforts of the community doctor, general practitioner or paediatrician, and the developmental specialists, no child will then be left behind.

HOW TO SCREEN

The Denver Developmental Screening Test, first published in 1967, was widely used as a screening tool to identify children at risk for developmental delay and disability.⁶ It was widely utilised and re-standardised in many countries. It was further validated and improved upon in 1992, with the increase in language items and other markers to identify milder delays.⁷ Since then, it has also been studied and adapted for use in Singapore.⁸⁻⁹

In 2020, the Ministry of Health, Singapore issued a circular on Guidance on Childhood Developmental Screening, citing the need for clinicians to use the developmental checklists in the Child Health Booklet, which are based on the Denver Developmental Screening Test, the only tool standardised for the local Singapore population to date. In this circular, recommendations were given for onward referral to a private paediatrician, public sector General Paediatric clinic, private developmental specialist, or to the Child Developmental Programme (refer to **Annex 1**).

Every sick-child or well-child visit to the general practitioner or the community paediatrician should be an opportunity for developmental screening. A quick run-through of the basic developmental milestones should be done at every visit.

In infancy, the early motor milestones, together with hearing and vision, should be checked. The minimal screening questions would include when the child sat, walked, and spoke his/her first words and phrases. In addition, for pre-schoolers, questions on social interaction amongst same-aged peers and the types of toys he or she engaged with would bring up any reduced inclination for socialisation and also any delayed development in the domain of pretend play or role play, by ages 3-4 years. For ready-for-school kids at six years, the ability to sit and attend to an age-appropriate (non-electronic) task, without the need for intense supervision, should exceed a minute per year of life. At that age, pre-literacy and numeracy skills should also be in place, inclusive of the ability to recognise common sight words as well as write out the alphabet and numbers.

When there is developmental delay, it is often easier to pick the kids out. When there is no frank developmental delay, it can be challenging and takes an experienced eye to sift out the differences and decide if the symptoms are variations of the norm or are considered atypical features that would warrant further exploration and assessment.

BEYOND DELAYED DEVELOPMENTAL MILESTONES – THE PRESENCE OF ATYPICAL FEATURES AS RED FLAGS

The usual lags in milestones going by the various domains are well studied and noted. Delays in motor skills or speech onset would usually be picked up at routine screening. One word of caution would be to ensure that there is serial tracking and review if any delay has been noted and advice not be simply given to parents to observe without further review.

The other common comment when a child does not speak by 18 months would be that it is alright to observe and that boys usually speak later than girls. It is NOT alright for a child, male or female, to start speaking later than 18 months. “Speaking” in this case, is defined as the use of spoken words by 18 months, involving at least three other single words, outside of “papa”, and “mama”, or the equivalent. When this is not met, a *red flag for speech and language delay* should be raised.

Red flags for a communication disorder include those that indicate delays in social communication, such as poor or unsustained eye contact, joint attention at tasks, and a paucity of the use of social gestures inclusive of protoimperative pointing and prodeclarative pointing, social smiles and waving goodbye amongst others.

Protodeclarative pointing is pointing to direct a comment or remark on an item or a state so as to share interest or attention, to another person, as an end in itself.¹⁰ Protoimperative pointing is pointing used to secure help from another person to acquire an object or meet a need in the physical world. Both forms of pointing appear in normal development between 9-14 months, first described by Bates in 1975.¹¹ These gestures should precede the development of speech in typical development and involve the use of directed and shared gaze, implicative of the ability to provide joint attention in the process of communication. A paucity of such gestures way past infancy tend to point towards a lag in the developmental of symbolic communication, commonly associated with Autism Spectrum Disorder.

Red flags for atypical speech and language skills include the aforementioned symptoms, and subsequently, discrepant development of rote speech skills such as numerating and rote recitation of the alphabet as opposed to addressing parents or declaring a need. Other red flags include odd prosody of voice – often high-pitched, sing-song or musical in manner and quite unrelated to prior exposure to American or other Western programmes – regression of previously acquired words and scripted pre-learnt phrases from programmes or from other people used meaningfully for communication. These indicate a higher possibility of an Autism Spectrum Disorder as well.

Red flags for motor challenges include the skipping of crawling in infancy, walking at/after 15 months of age, motor clumsiness, tendency to stumble even though not falling, and clumsiness with the use of cutlery (spoon and fork, fork

in combination with knife for the Westerners and chopsticks for the Asians), buttons, and scissors beyond preschool years. These would point towards motor incoordination, the hallmark of a Developmental Coordination Disorder.

Towards the end of the preschool years, one is usually, in the Singaporean culture of having been exposed to preschool learning, able to recognise letters and numbers by the age of four and then reading-ready by the age of six. In the presence of reasonable speech and language skills, the lack of development of this ability would indicate possible *red flags for Dyslexia or a Specific Learning Disorder*. Letter reversal, either in individual letter format or entire word reversal, would be a red flag for this possibility, particularly at the end of preschool years. Writing is not however expected to be in place before the age of five.

The presence of any aversion or overly-seeking behaviours towards sensory stimuli would be a *red flag for Sensory Integration and Processing Disorders*. This could include sounds, touch, textures, taste, and proprioceptive or vestibular activities.

Red flags for Attention difficulties at school-going age will include poor ability to sustain focus for an age-appropriate task, given that the task is not something in the domain of a known developmental delay. For instance, one cannot be flagged for an attention disorder if the task concerned was a writing task in a child with dyspraxia and weak finger strength and grip. Accompanying inattention may also be hyperactivity or, more clandestinely, impulsivity. A child should not be flagged for inattention whilst performing an academic task in the presence of significant speech and language impairment, cognitive delays, or specific learning disorders. The underlying conditions need to be addressed first. It might be difficult to know which was the chicken and egg as poor attention would in turn lead to learning delays. A careful history is thus critical. Medical conditions such as hearing or visual impairment, obstructive sleep apnoea, or severe eczema need to be excluded in all children with poor attention and focus.

Red flags for perseveration should be raised in the presence of reported repetitive behaviours and fixations on specific items or topics. It is obvious when these are physical repetitions such as opening and closing doors, lining up of objects, or spinning of self or objects. It is subtle when it might be sequences that are routine and common become repetitive and fixed. Favourite topics for perseverative interests, often resulting in verbal diarrhoea in those verbally-able, would often include Thomas the Tank Engine, Paw Patrol, Cocomelon, dinosaurs, solar systems, flags of the world, volcanoes, World Wars, sea creatures, history, and even US presidents. In those not so verbally able, they would be looking for these items and constantly playing with the same item or insisting on their favourite shoes, bags, clothing, or other personal items, often with their related pictures. It could also be a fixation with specific electronic games such as Minecraft or Youtube videos related to specific topics. Extensive knowledge into and perseverating

in specific topics such as chess strategies or world languages beyond the expected level for their age has often been noted. Importantly, these must not be standalone atypicalities for them to be flagged as a red flag. They are usually accompanied by other areas of rigidities such as resistance to change of routes, patterns of doing things, placement of their items, and inability to accept and/or adapt to sudden changes in plans.

Perseveration indicates an inability to shift from one concept to another or to change or cease a behaviour pattern once stated.¹² It is a repetitive and continuous behaviour, speech or thought that points towards reduced mental flexibility. It involves doing something to an exceptional level or beyond an appropriate point. Perseveration is seen in a variety of conditions including speech aphasia or traumatic brain injury.¹³ In developmental paediatrics, it is often related to cognitive inflexibility seen in those with autism spectrum disorder.¹⁴

SPECIFIC SCREENING WITHIN THE OFFICE SET-UP

There are some simple though specific tests that can be done in the waiting area or in the office.

- **Goodenough Draw a Man test**¹⁵ (refer to **Figure 1**)

Developed by Florence Goodenough, this has been widely used as a measure of intellectual maturation in children. It can be accomplished in under 10 minutes, noting that it may not be as indicative if the child is above 10 years of age or has had prior art lessons. The instruction given is simple enough: Draw a man (woman/friend/mother/father...) and make it the best drawing with as many details as you can.

- **Ages & Stages Questionnaire (ASQ)**¹⁶

This is a screening tool covering development in those aged one month through 5.5 years. This is however not a free tool. The forms are available in Arabic, Chinese, English, French, Spanish, and Vietnamese. It takes about 10 minutes, whilst in the waiting room, for parents to answer the form matched to the age of the child, and another 2-3 minutes for the professional to score. It comes with references for activities.

- Screening for **Fine Motor** skills (refer to **Figure 2**)

The ability to wield a pencil or crayon for the purpose of scribbling can occur as early as 18 months of age, often starting as some meaningless simple squiggles or wavy lines, often light in pressure. As the child crosses two years of age, more can be expected.¹⁷ Some can draw the shapes spontaneously as requested. However, some with poor prior exposure to terminology may not produce as requested, not because they do not have the fine motor skills but because they do not know what is requested. Separate these by giving a demonstration and then removing it from sight with a request to draw/

duplicate, failing which then the sample is left for them to copy. Keep instructions simple.

• **Vanderbilt Rating Scales¹⁸**

Adapted from the **Vanderbilt Rating Scales** developed by Mark L Wolraich, these scales were validated for both referred and community populations.¹⁹⁻²⁰ The first edition of the NICHQ (National Initiative for Children’s Healthcare Quality) scales is available free of charge, though there have been two newer editions since then. In children above the age of five, should both copies (parents and teachers) reflect the same concerns, with a significant score of 2 or 3 in at least six out of nine stems in the Inattention (Questions 1 to 9) and/or the Hyperactivity-Impulsivity domains (Questions 10 to 18), onward referral for further evaluation and management should be made. Notably, teachers here refer to a classroom group setting and not a private tutor in a 1:1 setting.

• **The Modified Checklist for Autism in Toddlers, Revised with Follow-up (MCHAT R/F)²¹**

The MCHAT R/F screening tool by Dr Diana L Robins (<https://mchatscreen.com/>) is a screener intended for toddlers between 16 and 30 months of age to assess risk for Autism Spectrum Disorder. Its overall specificity is reported to be as high as 95 percent though the accuracy is better in those aged 20 months and older.

A score above 2 warrants a Follow-Up and a persistent score above 2 on Follow-Up or a first-time high score of 8 and above would warrant a direct referral for diagnostic evaluation and early intervention.

Figure 1: Goodenough Draw a Man

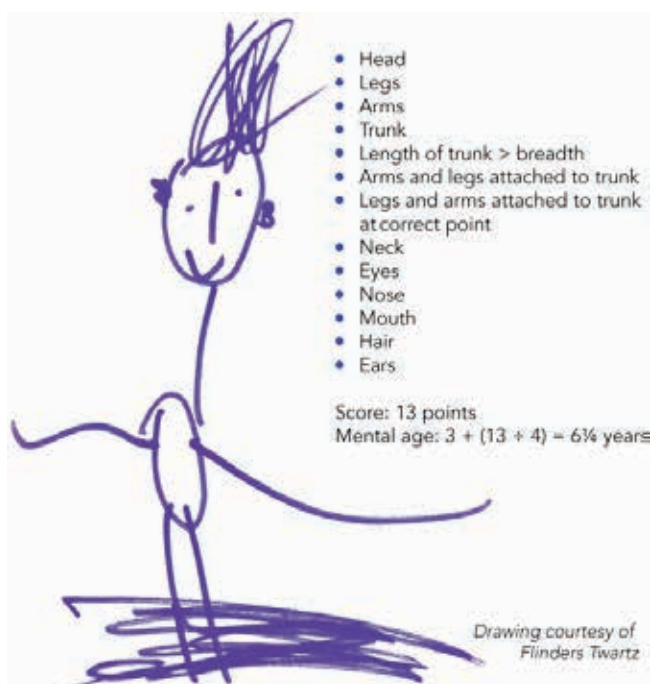
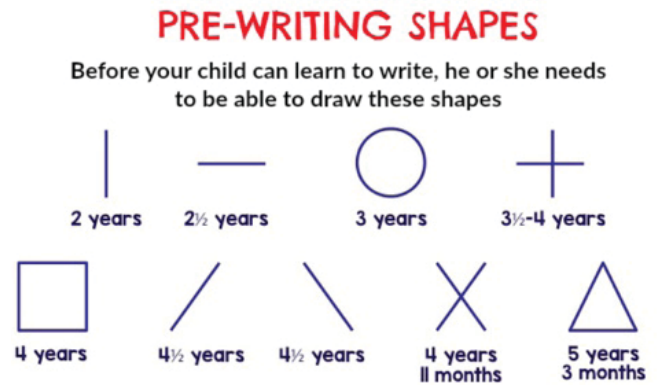


Figure 2.



Dena Bishop, OTR/L.

<https://www.continued.com/early-childhood-education/ask-the-experts/what-shapes-do-children-need-22714#:~:text=At>¹⁷

DIFFERENTIATING BETWEEN ASD AND ADHD

Autism Spectrum Disorder (ASD) is characterised by the presence of **all** three core features listed under Criterion A and at least two of four features listed under Criterion B, with presentation from a young age and impacting daily life.²²

Criterion A

- Deficits in social in social-emotional reciprocity
- Deficits in non-verbal communicative behaviours used for social interaction
- Deficits in developing, maintaining and understanding relationships

Criterion B

- Stereotyped or repetitive motor movements, use of objects or speech
- Insistence on sameness, inflexible adherence to routines, or ritualised patterns of verbal or non-verbal behaviours
- Highly-restricted, fixated interests that are abnormal in intensity or focus
- Hyper- or hyporeactivity to sensory input or unusual aspects of the environment.

Social interaction disturbance is considered the most distinctive sign for Autism Spectrum Disorder over other developmental disorders.²³ The combination of impairments in social communication and interaction, with impairment in eye contact and protodeclarative and protoimperative pointing as well as weak joint attention and shared enjoyment, together with stereotyping/perseverative behaviours and sensory processing challenges, point strikingly towards this diagnosis.

Attention Deficit Hyperactivity Disorder (ADHD) is diagnosed in the presence of six or more symptoms of inattention and/or hyperactivity-impulsivity in those below aged 17 (five for 17 years and older), existing for at least six months, from before age 12, across environments to an extent that is disruptive and inappropriate for the person’s developmental level.²²

Sometimes it can be difficult to tease these two diagnoses apart, especially as we know that these are co-occurring in a wide number of cases, ranging in reported studies from 40-70 percent.²⁴ About one in every eight children diagnosed with ADHD would also be found to be on the autism spectrum.²⁵ As per the recently released Clinical Practice Guidelines on Autism Spectrum Disorder in Children and Adolescents, the recommendation is given that²⁶

“Practitioners should be aware of the higher incidence of attention deficit hyperactivity disorder (ADHD) among children and adolescents on the autism spectrum. In the presence of symptoms of ADHD, especially after the age of 5, further screening and referrals should be done, for timely diagnosis, supported by validated measures, and early intervention and management.”

Often, children on the autism spectrum get misdiagnosed as having ADHD alone.²⁷ Most of those with a dual diagnosis, allowable since the DSM-V, receive the dual diagnoses at the age of six.²⁸ Thus screening for ADHD amongst those on the autism spectrum can be considered from age five if symptoms become obvious, especially after intervention. The use of the Vanderbilt Rating Scale is easy and quick, scorable in under five minutes, with the ability to effect a plan for further evaluation and treatment immediately.

CONCLUSION

The identification of a child with special needs usually involves a careful eye and a listening ear more than a series of tests and assessments. Taking an extra five minutes to screen through some simple developmental questions and looking out for atypicalities would go a long way into making definitive changes in the trajectory of a young child's development. Early identification and referral for intervention and further diagnostic evaluation would be key to optimising the outcome of a child with developmental challenges.

ANNEX I – GUIDANCE ON CHILDHOOD DEVELOPMENTAL SCREENING

MONITORING OF AND REFERRAL FOR DEVELOPMENTAL DELAYS

10. If a developmental delay is suspected or detected, monitoring and referral for investigations should be performed at the discretion of the clinician. The following guidance provides the broad principles for which referral should be considered.

(I) Single isolated domain delay

- (i) Refer to a private paediatrician or public sector General Paediatric clinic for:
 - a) any regression of motor milestones (even if still within normal range of development for age); or
 - b) gross motor delay associated with significant hypertonia or hypotonia

- (ii) Refer to a private developmental specialist or to the Child Developmental Programme (CDP) for any of the following:
 - a) language regression
 - b) language delay with hearing concerns
 - c) autism red flags
 - d) other developmental concerns
- (iii) If there are concerns about language delay, it is important to get a hearing screen done even if the initial Universal Newborn Hearing Screening (UNHS) screen was normal.
- (iv) If the above concerns are not present and there is no prior history of developmental delay in any domain, the clinician may schedule a review within the age range shown in **Table 1** for isolated delays, and subsequently refer to the appropriate specialist department if the milestone is not met. At the review, referrals should be made even if the child appears to have progressed in the specified developmental domain, but still has not met the age-appropriate milestone, as the progress could be due to increasing age.
- (v) If the above concerns are not present, but there is prior history of delayed milestone attainment in any developmental domain, refer to a private developmental specialist or to the CDP.

(II) Delays in Multiple Domains

- (i) Refer to a private paediatrician or public sector General Paediatric clinic if there is regression of milestones.
- (ii) Refer to a private developmental specialists or to the CDP if there is a delay in multiple domains, regardless of whether there was a prior history of developmental delay.

(III) Others

- (i) Children with isolated abnormal occipital-frontal circumference (e.g., ≤ 3 rd centile or ≥ 97 th centile), especially when it appears disproportionate to the weight or height, should be referred to a private paediatrician or public sector General Paediatric clinic).
- (ii) Children with abnormal growth (e.g., height or weight at ≤ 3 rd centile or ≥ 97 th centile) should be referred to a private paediatrician or public sector General Paediatric Department if there are clinical concerns of a medical, genetic, or syndromic condition. In all other cases, the clinician should review and advise on appropriate nutrition and physical activity and monitor for progress for at least six months before making a referral.

11. Clinicians should take note of parental concerns about developmental delays or age-appropriate red flags, e.g., on autism (listed under “Parental concerns” in coloured boxes at the top of each of developmental checklist section in the Child Health Booklet).

GUIDANCE ON CHILDHOOD DEVELOPMENTAL SCREENING, MINISTRY OF HEALTH, 2020

Table 1: Recommended touchpoints for CDS

	Recommended touchpoints for CDS	(Age Range)
[1]	4 weeks	4 – 8 weeks
[2]	3 months or 4 months ²	3 – 5 months
[3]	6 months (physical examination if deemed necessary) ³	6 – 12 months
[4]	12 months	
[5]	18 months	15 – 22 months
[6]	30 months	24 – 36 months
[7]	48 months	48 – 60 months

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LEARNING POINTS

- **Screening for developmental and behavioural conditions should be a routine protocol in every well-child visit, particularly at nine months, 18 months, and 30 months; particular attention should be paid to 4-to-5-year-olds in relation to their readiness for primary school enrolment.**
 - **The use of the Denver Developmental Screening Test, Singapore as a baseline, as per delineated in the Child Health Booklet, serves as an easy guide in tracking the developmental journey of each child.**
 - **Coupled with quick but careful history-taking and strong observational skills, the use of simple screening tools in the community doctor's room takes only a few minutes and yields good information on the developmental status and intellectual maturity of the child. It can also help to differentiate between disorders that are often similar at surface presentation.**
 - **Autism Spectrum Disorder often co-occurs with Attention Deficit Hyperactivity Disorder, with social interaction disturbance associated with symbolic communication challenges and perseveration or rigidity being more indicative of the former.**
 - **Prompt identification allows prompt diagnosis and early intervention to allow optimisation of development potential of each child.**
-