Riverside Insights

Assessment Plan

An Early Childhood Guide for Evaluating ADHD and Executive Functioning

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What is Executive Function?

> *"Executive function (EF) is a term used to describe a set of higher-level cognitive functions important for implementing and sustaining goal-directed behavior and complex problem solving."*[1]

Although there is not one universal definition of EF, recent literature notes that the cognitive processes commonly studied and assessed in younger populations include working memory, inhibition, and cognitive flexibility.[2]

The American Psychological Association (APA) expands this list of cognitive processes by defining EF as also including skills such as planning, decision making, problem-solving, action sequencing, task assignment and organization, effortful and persistent goal pursuit, and goal-conflict resolution. APA further notes that EF skills typically require the use of *"language, judgment, abstraction, and logic and reasoning."*[3]

[1] Decker, S. L., Davis, A. S., Eason, M., Bridges, R., Vasel, L. M. (2016). *Assessment of Executive Functions Using the Woodcock-Johnson IV Tests of Cognitive Abilities* (Woodcock-Johnson IV Assessment Service Bulletin No. 9). Itasca, IL: Riverside Assessments, LLC.

[2] Decker, S. L., Davis, A. S., Eason, M., Bridges, R., Vasel, L. M. (2016). *Assessment of Executive Functions Using the Woodcock-Johnson IV Tests of Cognitive Abilities* (Woodcock-Johnson IV Assessment Service Bulletin No. 9). Itasca, IL: Riverside Assessments, LLC.

[3] American Psychological Association. (n.d.). Executive Functions. In *APA dictionary of psychology*. Retrieved February 7, 2022, from https://dictionary.apa.org/executive-functions

Executive Function and ADHD

For young children, EF is crucial for the development of social-emotional, academic, and cognitive skills. Literature has found an overlap between the skills needed for early school readiness and the abilities related to EF (e.g., working memory, inhibition, flexibility, emotional regulation, attentional regulation)[4]. Executive dysfunction, or delays in EF skills, can co-occur with commonly known conditions, such as *Attention-Deficit/ Hyperactivity Disorder* (ADHD)[5]. Literature suggests that although the severity and presentation of EF complications can differ across individuals with ADHD, difficulties with EF appear to be a core aspect underlying the complex neuropsychology of the condition.[6] [7]

ADHD is "one of the most common mental disorders affecting children."[8] . The Diagnostic Statistical Manual, Fifth Edition (DSM-5) criteria outlines three ADHD presentations[9]: inattentive, hyperactive/impulsive, or combined (a mixture of inattentive and hyperactive/impulsive features). The DSM-5 further notes that ADHD is marked by several symptoms that must have an onset of 12 years or younger and must be present in two or more settings. Furthermore, based on the DSM-5, individuals with ADHD evidence characteristics that interfere with or reduce the quality core life functions, such as social functioning or school achievement. Lastly, an individual's ADHD characteristics must not be better attributed to another mental disorder. (Please note that ADHD was not one of the disorders that underwent a change in criteria when transitioning between the DSM-5 and DSM-5 TR. As such, the criteria referenced in this guide remains as outlined in the DSM-5).

Riverside Insights offers comprehensive early childhood assessment solutions to ensure a thorough review of all pertinent EF skills and ADHD-related features, allowing practitioners to gather crucial data for intervention services and educational planning. Note that the tools listed below do not diagnose ADHD alone but can be used to inform a comprehensive evaluation. Furthermore, results from formal tests should always be verified by other sources of data to ensure ecological validity.

[4] Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. American psychologist, 57(2), 111.

[5] Otterman, D.L., Koopman-Verhoeff, M.E., White, T.J. et al. Executive functioning and neurodevelopmental disorders in early childhood: a prospective population-based study. *Child Adolesc Psychiatry Ment Health* 13, 38 (2019). https://doi.org/10.1186/s13034-019-0299-7.

[6] Willcutt, E. G., Doyle, A. E., Nigg, J. T., Faraone, S. V., & Pennington, B. F. (2005). Validity of the executive function theory of attention-deficit/hyperactivity disorder: a meta-analytic review. *Biological psychiatry*, 57(11), 1336-1346.

[7] Antshel KM, Hier BO, Barkley RA. (2014). Executive functioning theory and ADHD. In: Goldstein S, Naglieri JA, editors. *Handbook of executive functioning*. New York, NY: Springer; 2017. pp. 107–120.

[8] What Is ADHD? (psychiatry.org)

[9] American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596.

When making diagnostic impressions, practitioners must consider the developmental appropriateness of an examinee's behaviors.

This is especially important when working with younger individuals (e.g., preschoolers) as it can be expected that they will present with high activity levels, variable attention spans, and/or disinhibition[10].

Presentation of these behaviors can be exacerbated by academic and social demands that may be developmentally unsuitable (e.g., remaining seated for prolonged periods of time). As such, it is important for practitioners to not only consider the developmental appropriateness of the behavior, but also the context in which the behavior is presented.

Diagnostic impressions should only be made by an individual who is qualified, has expertise in evidence-based ADHD assessment, and for whose role diagnosis is within the scope of practice.

Executive Functioning & ADHD Early Childhood Bundle (Ages 2.6-7.11)	
Comprehensive Measures	**Selective Measures**
WJ IV ECAD (for those aged 2.6-7.11)	Stroop Color and Word Test for Children (for those aged 5.0-7.11)
TOMAL-2 (for those aged 5.0-7.11)[11]	
CAS2 (for those aged 5.0-7.11)	
CEFI (for those aged 5.0-7.11)	
Conners 3 (for those aged 6.0-7.11)	

[10] Cherkasova, M., Sulla, E. M., Dalena, K. L., Pondé, M. P., & Hechtman, L. (2013). Developmental course of attention deficit hyperactivity disorder and its predictors. *Journal of the Canadian Academy of Child and Adolescent Psychiatry/Journal de l'Académie canadienne de psychiatrie de l'enfant et de l'adolescent.*

[11] The TOMAL-2 has specific tasks tapping core executive functions, in addition to those assessing areas of functioning that may be of interest to an examiner engaging in selective assessment.

Comprehensive Measures

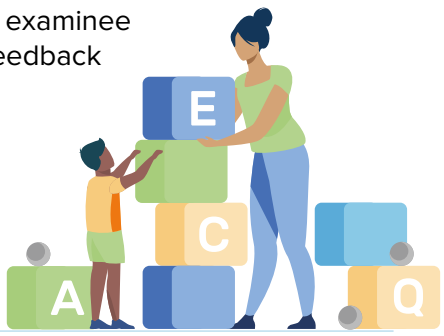
Core Executive Functions

WOODCOCK-JOHNSON IV TESTS OF EARLY COGNITIVE AND ACADEMIC DEVELOPMENT (ECAD®)

The ECAD® is a battery of cognitive, language, and academic tests specifically designed for early childhood populations aged 2.6 through 7.11. There is theoretical correspondence between specific tests within the ECAD's® General Intellectual Ability- Early Development cluster and pertinent EF skills. Specifically, the ECAD® allows for a review of working memory and cognitive flexibility.

Working memory involves the ability to hold information in immediate awareness while manipulating or transforming the information in some fashion. Short-term working memory lends itself to achievement across life domains. For example, in the service of understanding and following directions, working memory can support the retention of key steps and details needed to execute required actions. Furthermore, working memory supports a child's ability to learn how to read, write, and engage in mathematics.

- Short-term working memory is assessed by **Sentence Repetition**, a measure that requires the examinee to remember and then restate individual words, phrases, and sentences.
- **Memory for Names** is a controlled-learning task that taps the examinee's ability to make auditory-visual associations. During the task, the examinee is shown visual stimuli paired with names. The examinee is then shown a page containing the target stimuli amongst a set of distractors. The examinee must correctly identify the stimuli that was introduced, in addition to any other stimuli previously noted. The examinee is only required to point to the stimuli, and the examiner provides immediate correction of the examinee's errors. The associative component of this test demands working memory, as the examinee must remember the meaning of the stimuli in addition to corrective feedback that is provided by the examiner.



- **Visual Closure** measures closure ability, an aspect of visual processing. The examinee must verbally identify a drawing that has been altered (e.g., missing lines or an overlaid pattern). This test demands visual working memory as it requires mental manipulation of visual stimuli.

Cognitive flexibility is broadly defined as the ability to adapt or change behaviors in response to changes in situational demands (Deak, 2004)[12]. Facilitating the development of cognitive flexibility in early childhood may lead to improvements in school readiness and approaches to learning (Vitiello et al., 2011)[13]. Examiners can assess cognitive flexibility via the ECAD® by administering the following tests:

- **Verbal Analogies** tests comprehension-knowledge and fluid reasoning. Items on this test assess whether an examinee understands and can complete logical word relationships. The examinee first must identify the association between the target words, and then must recall an appropriate word for their response. This test demands cognitive flexibility as the examinee must shift their thinking and adapt to determine the increasingly complex relationships between the target words. Elements of working memory are also tapped, as the examinee must hold information in immediate awareness (the two target words) while determining an answer (the relationship between them).
- **Rapid Picture Naming** is a speeded task that taps processing speed, speed of lexical access, and naming facility. The examinee is asked to quickly name a series of simple pictures under timed conditions. This test demands intact cognitive flexibility and shifting skills for the examinee to be accurate in the naming of the visual stimuli as the pictures change. This test also demands fluency, which is often defined as how quickly and accurately an individual can complete a task.

[12] Deak, G. O. (2004). The development of cognitive flexibility and language abilities. *Advances in Child Development and Behavior,* 31, 271–327.

[13] Virginia E. Vitiello, Daryl B. Greenfield, Pelin Munis & J'Lene George (2011) Cognitive Flexibility, Approaches to Learning, and Academic School Readiness in Head Start Preschool Children. *Early Education and Development*, 22:3, 388-410, DOI: 10.1080/10409289.2011.538366

Once an examiner has administered all tests of interest from the ECAD®, they can derive a series of scores unique to the battery including Developmental Zone, Months Delay, Percentage Delay, and Standard Deviation Delay.

The Developmental Zone score is a unique application of the Relative Proficiency Index (RPI) that identifies where along a developmental scale an examinee's present level of functioning falls. In turn, the delay scores may be of interest to agencies and jurisdictions who require such scores for reporting and eligibility purposes as they can help determine the presence and severity of a developmental delay.

Furthermore, examiners can conduct procedures to determine the presence and significance of strengths and weaknesses in the cognitive abilities noted above. Specifically, Intra-Cognitive variations can be conducted to identify specific cognitive strengths and weaknesses in the examinee's profile.

WIIIP

The *Woodcock-Johnson Interpretation and Instructional Interventions Program* (WIIIP™) is an add-on subscription offering a research-based supplement that can serve as a starting point for analysis, discussion, and implementation of teaching strategy, generating personalized interventions and accommodations based on an individual's ECAD ® results.

It includes checklists that can be synthesized into a *Comprehensive Report.* Pre-school and school-aged checklists include Reason for Referral, Parent's Checklist: Preschool Age, Teacher's Checklist: Preschool Age, and Classroom Behavior Observation Form. Evidenced-based interventions also can be integrated into comprehensive reports from an interventions bank that is included with a WIIIP™ subscription. Suggested interventions are based on an examinee's performance across assessed domains.

Additional information regarding the **WIIIP** can be viewed in the *Overview of the WJ IV Interpretation and Instructional Interventions Program- Assessment Service Bulletin No. 5* and in our **WIIIP** Overview PowerPoint.

COGNITIVE ASSESSMENT SYSTEM SECOND EDITION (CAS2)

The CAS2 is a comprehensive norm-referenced measure of cognitive ability designed for those as young as five years of age. The CAS2 is aligned with PASS theory (Planning, Attention, Simultaneous Processing, and Successive Processing), an alternative view of intelligence[14], which is used to define the abilities evaluated by the instrument.

Specifically, administration of the CAS2 allows for a review of neurocognitive functions related to planning, attention, and processing information. Upon administration of the PASS scales, examiners can also derive a CAS2 *Full Scale score*, which serves as an overall estimate of an examinee's cognitive functioning.

Data derived from the CAS2 can be used to identify specific learning strengths and weaknesses, neurocognitive deficiencies, in addition to interventions and supports that best align with a student's functional profile. The domains of PASS theory, each of which tap aspects of EF, and their constituent subtests, are described below.

Planning is a neurocognitive ability used to determine, apply, self-monitor, self-correct, and control one's thoughts and actions, in the service of problem-solving and goal attainment. This CAS2 scale assesses the examinee's ability to generate a course of action, execute it, review that it has been implemented appropriately, and revise the plan as needed. It is comprised of the following timed subtests:

- **Planned Codes** presents the examinee with a legend that displays letters corresponding to specific codes (e.g., A corresponds to OX). The examinee is shown rows of letters with empty boxes underneath. They are asked to write as many corresponding codes under each letter as they can.
- **Planned Codes** demands that the examinee connect a series of letters and numbers.
- **Planned Number Matching** presents the examinee with several rows of numbers. The examinee is tasked with identifying the matching numbers in each row as quickly as possible.

[14] Practitioners seeking to learn more regarding the CAS2 and PASS theory are encouraged to review the following resource: Naglieri, Jack A., and Tulio M. Otero. *Essentials of CAS2 Assessment.* Hoboken, New Jersey: Wiley, 2017. Print.

Attention is another EF skill that involves the ability to selectively focus on target stimuli in one's environment while inhibiting responses to extraneous input. Assessment of attention via the CAS2 involves the following subtests:

- For those aged 5.0-7.11, **Expressive Attention** presents examinees with rows of common animals, depicted as either large or small. The examinee is required to identify whether the depicted animal is large or small in real life, regardless of how the animal is depicted on the stimulus pages.
- **Number Detection** taps the examinees' ability to identify target numbers amongst a field of extraneous digits.
- For those aged 5.0-7.11, **Receptive Attention** requires the examinee to underline pairs of objects that are identical in appearance or similar in name (lexically alike).

Simultaneous Processing involves the integration of separate information into a whole unit or group. Tasks within this area of functioning review the examinee's ability to synthesize various sources of input into one meaningful whole. This scale can be derived by administering the following subtests:

- **Matrices** incorporates interrelated shapes and geometric placements. The examinee is asked to analyze the relationships between the stimuli and is provided with a series of response options. They must select the best option that completes the item based on the established relationship.
- **Verbal Spatial Relations** requires the examinee to select a visual stimulus out of an array that best matches a verbal description.
- **Figure Memory** tasks the examinee with viewing two-to-three dimensional figures for a brief period and then identifying the same figures when they embedded in a more complex geometric pattern.

Successive Processing taps the ability to integrate information in a specific order. Tasks in this ability area require the examinee to recall or understand information that is arranged in a specific serial order. For early childhood populations, this scale includes:

- **Word Series** that requires examinees to repeat a string of high-frequency words verbatim.
- **Sentence Repetition** demands the examinee to repeat syntactically correct sentences that have little meaning.
- **Visual Digit Span** tests the examinee's ability to recall a series of visually presented numbers in the order that they were presented.

Examiners also can derive additional scales that are pertinent to the assessment of EF and ADHD: *Executive Function and Working Memory*. Descriptions of the scales and their constituent subtests are listed below.

- The **Executive Function** (with Working Memory) scale taps similar functions as the Executive Function scale, in addition to an examinee's ability to keep information in memory during problem solving.
  - **Planned Connections**
  - **Expressive Attention**
  - **Verbal Spatial Relations**
  - **Sentence Repetition**
- The **Executive Function** scale provides an estimate of an examinee's ability to use planning and task organization skills to achieve goals. This scale also provides a measure of the examinee's ability to hone their attention to pertinent information while ignoring extraneous input.
  - **Planned Connections**
  - **Expressive Attention**
- The **Working Memory** scale offers an estimate of an examinee's ability to hold information in immediate awareness, recall the information, and manipulate it over brief durations of time.
  - **Verbal Spatial Relations**
  - **Sentence Repetition**

TEST OF MEMORY AND LEARNING SECOND EDITION (TOMAL-2)

The TOMAL-2 is a comprehensive 14-subtest memory battery appropriate for examinees as young as five years of age. It is designed to provide a robust and targeted assessment of verbal and nonverbal memory. In the context of ADHD and EF assessment, examiners can derive an **Attention/Concentration Index** using the following tasks:

- Digits Forward demands the examinee to recall strings of digits as presented.
  - Digits Backward requires the examinee to recall strings of digits reverse order.

- Letters Forward is described as the language complement to digits forward, requiring the examinee to recall strings of letters as presented.
  - Letters Backward is described as the language complement to digits backward, requiring the examinee to recall strings of letters in reverse order.

- Manual Imitation requires the examinee to repeat a sequence of motor movements modeled by the examinee.

Examiners seeking to further investigate a larger sampling of an examinee's memory and learning capabilities are encouraged to administer additional tasks based on clinical judgment and selective testing methods (*see Selective Testing* below).

Behavioral Rating Scales

COMPREHENSIVE EXECUTIVE FUNCTION INVENTORY (CEFI)

The CEFI is a robust norm-referenced behavior rating scale assessing an array of executive functions for those as young as five years of age. Rating scale data are crucial when conducting a comprehensive evaluation of EF and ADHD as they provide information regarding an examinee's presentation outside of the one-to-one testing setting. Furthermore, data garnered from the CEFI can be reviewed in conjunction with standardized formal measures to determine the presence of variations and/or consistencies in strengths and weaknesses across settings. Administration of the CEFI yields a Full Scale score, in addition to nine scale scores. The nine scales include:

- **Attention** measures how well an individual can ignore distractions, concentrate, and sustain attention while completing tasks.
- **Inhibitory Control** provides an estimate of how well an individual can control their impulses and behaviors.
- **Emotion Regulation** concerns how well one can control and manage their emotions.
- **Flexibility** relates to how well an examinee can adapt their behavior to changes in their environment, including the ability to problem-solve.
- **Initiation** pertains to how well an individual can begin tasks without being prompted.
- **Organization** provides a description of how well an examinee can manage their academic and personal tasks, in addition to their management of personal belongings.
- **Planning** refers to how well an examinee can develop and implement a strategy to achieve a goal.
- **Self-Monitoring** concerns how an individual rates their performance and behaviors.
- **Working Memory** reflects how well an examinee can hold important information in immediate awareness (e.g., remembering instructions).

Examiners utilizing the CEFI's scoring software have the option to generate several different reports to facilitate data analysis. The interpretive report provides information about a single administration. It includes an evaluation of the ratings provided by an endorser, regarding the consistency of their responses, impression styles (positive and negative), and the number of omitted items. An examiner should review this information to gain insight regarding the validity and reliability of the data provided by a respondent.

The interpretative report also offers scores indicating how the examinee compares to peers in the norming sample, in addition to an analysis of intra-individual variability across the CEFI scales. EF strengths and weaknesses are labeled in the examinee's profile, expediting the identification of areas that can be capitalized on and those that may warrant support.

Examiners who administered the CEFI to multiple respondents can choose to run a comparative report, which offers a multi-rater perspective regarding an examinee's EF skills. The visual format of this report helps examiners identify the variability in EF skills across settings.

Once specific areas of weakness have been identified, examiners are encouraged to consider evidence-based strategies for remediation purposes. Intervention strategies are offered to the examiner when generating an interpretative report.

The effectiveness of EF interventions can be monitored via the CEFI's progress monitoring and treatment effectiveness report, which visually displays the same

The Conners EC can also evaluate developmental milestone progression across the following domains:

- **Adaptive Skills**
- **Communication**
- **Motor functioning**
- **Play**
- **Pre-academic/cognitive abilities.**

In addition to providing information regarding functioning in the areas noted above, respondents are asked to rate the examinee's level of impairment in the domains of learning/pre-academic skills, peer interactions, and for parents, home settings. Respondents further are asked to respond to critical items related to other clinical concerns that may warrant additional investigation.

Examiners have the choice of hand- or computer-scoring the Conners EC. Those who elect to computer-score will have access to three different report types that facilitate data analysis and educational/treatment planning. Assessment reports provide information regarding a single administration, documenting intra-individual variations and the examinee's scores compared to those in the norming sample. Progress reports can also be generated that facilitate measurement of intervention effectiveness.

These reports compare the same respondent's results for up to four administrations, allowing examiners to measure change over time. Lastly, comparative reports display the results across multiple raters facilitating the review of inter-rater differences in scores.

Overall, the administration of the Conners EC can support the identification of behavioral complications and developmental delays that may inform an examinee's presenting problems.

[15] Identified as an overall scale with constituent subscales.

[16] Identified as an overall scale with constituent subscales.

[17] The parent/caregiver assessment form includes a sleep problems subscale.

CONNERS 3

The Conners 3 is a behavior assessment tool designed for those as young as six years of age. The Conners 3 can be used to identify children who demonstrate elevations in ADHD symptoms across home and school settings.

Due to the Conners 3's symptom-level alignment, it does not include all of the DSM-5's ADHD criteria (e.g., course, age of onset, differential diagnosis). As such, it should be used in conjunction with other assessment tools if examiners seek to diagnose ADHD. Please note again that ADHD was not one of the disorders that underwent a change in criteria when transitioning between the DSM-5 and DSM-5 TR. As such, the criteria referenced in this guide remains as outlined in the DSM-5).

Respondents can include parent/caregivers and educators.

Respondents can identify the presence of ADHD symptoms in accordance with:

- DSM-5 symptom-level criteria
- Level of impairment in academic, social, and home living domains[18]
- An overall ADHD Index

In addition to symptom-level ADHD criteria and impairment levels, the Conners 3 provides information regarding ADHD's most common co-morbid behavioral (Oppositional Defiant Disorder and Conduct Disorder) and social-emotional conditions (Anxiety and Depression). The behavioral conditions are also assessed in accordance with DSM-5 symptom criteria.

Additional content scales are available concerning:

- Inattention
- Hyperactivity/Impulsivity
- Learning Problems[19]
- Executive Functioning[20]
- Learning Problems/Executive Functioning[21]
- Defiance/Aggression
- Peer relations

[18] Impairment in the home living domain is only assessed by the parent/caregiver form.

[19] Learning Problems is identified as a scale for parent forms, and a subscale for teacher forms. Teacher forms include this subscale under the Learning Problems/Executive Functioning Scale.

[20] Executive Functioning is identified as a scale for parent forms, and a subscale for teacher forms. Teacher forms include this subscale under the Learning Problems/Executive Functioning Scale. **This scale is not assessed as part of the self-report forms.**

[21] The Learning Problems/Executive Functioning scale is unique to the teacher forms.

Information related to restlessness/impulsivity and emotional lability can also be derived via the parent and teacher forms' Conners 3's Global Indices.

- Conners 3 Global Index
- Restlessness/Impulsivity Index
- Emotional Lability Index

Lastly, critical items (e.g., fire starting) are provided, facilitating the identification of children who need immediate support.

Examiners can elect to hand-score, or computer score their administrations. Those opting to use the Conners 3 scoring software will have access to an interpretative assessment report that can guide clinical diagnosis and intervention. The report includes detailed information regarding how an examinee compares to the normative sample across the content scales, ADHD index, and Global Index.

Examiners are also provided with examples of functional manifestations of challenges in each content scale area. A DSM-5 overview is provided with examiner guidelines for interpretation depending on the symptom count and scores an examinee obtains across the inattentive and hyperactive/impulsive areas of functioning. For all DSM-5 aligned conditions, probability markers are provided, indicating the likelihood of an individual meeting diagnostic criteria.

Furthermore, DSM-5 symptom tables are displayed, which indicate the specific criteria identified by a given respondent. As with other rating scales, examiners are encouraged to review its validity scales: Positive Impressions, Negative Impressions, and Inconsistency. Data from these scales provide insight regarding the reliability of a respondent's endorsements.

Selective Tests

Selective Testing refers to the careful selection of instruments to further assess skill areas pertinent to the referral concerns, when deemed necessary based on clinical judgment. Selective Testing allows an examiner to obtain the most diagnostic information in the least amount of testing time, for any given individual's unique needs.

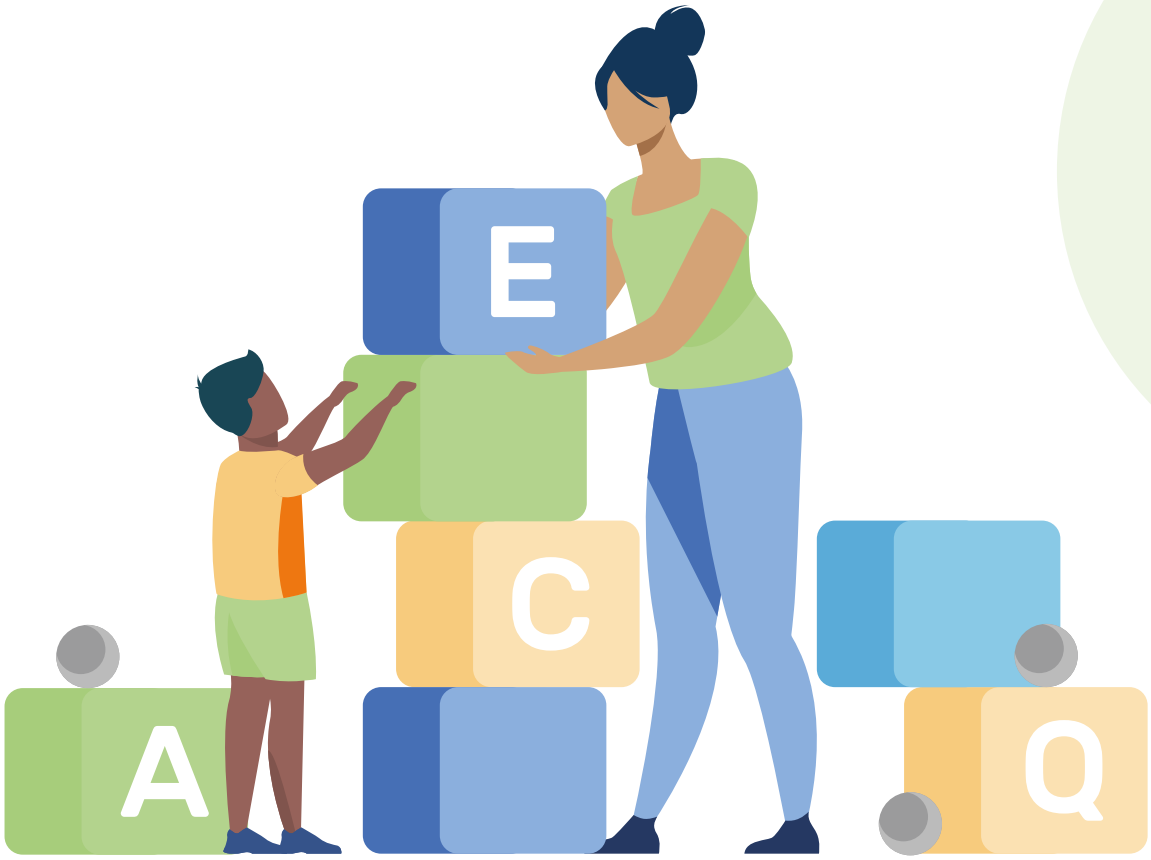
Selective Testing may also be conducted based on an individual's functional profile (e.g., pattern of strengths and weaknesses that emerges during testing) to provide further information that can be used for diagnostic purposes and educational program planning.

Assessment of Inhibitory Control

STROOP COLOR AND WORD TEST FOR CHILDREN

The Stroop Color and Word Test is a quick-to-administer neuropsychological measure that can be utilized to further assess an examinee's inhibition skills. During this timed test, the examinee must inhibit a reading response to properly name stimuli.

The examinee is required to respond to three stimulus cards. The first card demands the examinee to read a list of color words (e.g., blue) printed in black ink. The second card requires the examinee to name the text color of nonword stimuli. The final card presents the child with color words that are printed in a different color than the word itself (e.g., red printed in blue ink). The child is asked to name the color of the text for each word, rather than reading the word itself.



Selective Memory and Learning Assessment

TOMAL-2

Although individuals with ADHD and EF deficits typically struggle with short-term working memory, a complete evaluation of one's memory and learning profile can inform interventions and supports to ensure educational goals are met. Examiners can choose to derive Verbal and Nonverbal Memory Indices for further exploration.

To derive the Verbal Memory index, examiners must administer:

- **Memory for Stories** is a highly contextual task that demands the examinee to engage in verbal free recall of orally presented stories. The examinee is granted credit for correctly recalling specific story elements.
- **Word Selective Reminding** is a lower context task that tests the examinee's ability to recall a list of orally presented words across six trials. The examiner informs the examinee of any omitted words after a trial, prior to the examinee repeating the list again.
- **Object Recall** involves the examiner presenting a series of 15 visual stimuli associated with specific names. The examinee is then required to present the name of a target illustration. The stimulus presentation is randomized as the examinee progresses through the task.
- **Paired Recall** is an associative learning task involving word pairs. During the learning trials, the examinee is presented with word pairs. They then are shown halves of these word pairs and must verbally recall the word that completes the target pair. The presentation of the word pairs is randomized across trials. Examiners can generate scores for easy versus challenging word pairs for further analysis, in addition to an overall score based on the total number of pairs recalled.

The Nonverbal Memory index can be derived from the administration of the following subtests:

- **Facial Memory** taps recognition of meaningful information (facial recognition skills) in the presence of extraneous stimuli.
- **Abstract Memory** assesses recognition of less semantic, yet abstract, stimuli (geometric figures) among a series of distractors.
- **Visual Sequential Memory** demands that the examinee recall the specific order that abstract designs were presented. Examinees first are shown a series of abstract designs, and then are asked to correctly identify the sequence of the stimuli, when shown the same designs in a randomized order.
- **Memory for Location** assesses visual-spatial memory as examinees must recall the location of dots in a picture book. After the initial dot presentation, the examinee must place chips on a grid indicating where the dots were previously placed.

After administering the Verbal and Nonverbal Memory indices, examiners can generate a Composite Memory Index that serves as an overall estimate of memory functioning. Furthermore, examiners can review performance within and across the verbal and nonverbal memory indices to determine an individual's strengths and weaknesses. Specific supplemental subtests can also be administered to gather more information regarding the examinee's functional profile. It is important to note that supplemental subtests can be administered to substitute for spoiled subtests.

The TOMAL-2 has a total of six supplemental subtests: Digits Forward; Digits Backward, Letters Forward; Letters Backward, Manual Imitation, Visual Selective Reminding, Memory for Stories Delayed, and Word Selective Reminding Delayed. Note that the first five subtests listed are used to derive the **Attention/ Concentration Index** noted above.

- **Visual Selective Reminding** is the visual complement to the Word Selective Reminding task. The examiner first models a pattern by touching dots in a specific order. The examinee then must recall the pattern modeled by the examiner. The examiner informs the examinee of any steps they omitted after a trial, prior to the examinee attempting the trial again.
- **Memory for Stories Delayed** tests the examinee's long-term memory and retrieval skills for highly contextual information, as they are asked to identify elements from the stories presented to them during the Memory for Stories task.
- **Word Selective Reminding Delayed** tests the examinee's long-term memory and retrieval skills for less contextual information, as they are tasked with recalling the list of orally presented words first presented during the **Word Selective Reminding** subtest.

Administration of these supplemental subtests allows an examiner to derive additional domains for review, including Verbal Delayed Recall, Attention and Concentration (described in detail above), Sequential Recall, Free Recall, Associative Recall, and Learning Skills. The tasks that comprise these domains are as follows:

Verbal Delayed Recall

- Memory for Stories Delayed
- Word Selective Reminding Delayed

Sequential Recall

- Visual Sequential Memory
- Digits Forward
- Letters Forward
- Manual Imitation

Free Recall

- Facial Memory
- Abstract Visual Memory
- Memory for Location
- Object Recall

Associative Recall

- Memory for Stories
- Paired Recall

Learning Skills

- Word Selective Reminding
- Visual Selective Reminding
- Object Recall
- Paired Recall

Significance and cumulative frequency tables are available when scoring, allowing the examiner to make comparisons between all composites and supplementary indices. Examiners can also review scatter within each supplementary index.

Furthermore, a learning curve analysis can be conducted for specific subtests, and a mean number of elements recalled by trial and age are provided for norm-based comparisons.

Overall, administration of the TOMAL-2 can yield important information regarding an examinee's memory strengths and weaknesses, which can inform educational planning and intervention implementation.