# ACTIVITY 1: A Decision-Making Process for Selecting an Assessment Tool for Diagnosis Answer Guide

#### Instructions:

Select a vignette below and identify a test to use in assessment. Work through the diagnostic decision-making tree to determine the appropriateness of the test for diagnosis by answer the questions for each vignette.

#### NOTE: Below are possible answers as examples.

#### Vignette 1 (Audiology)

A 22-year-old university student is going to be coming to your audiology clinic for an evaluation. Her chief complaint is difficulty understanding speech in noisy environments. She has previously had her hearing tested and her pure-tone thresholds are within normal limits ( $\leq$  25 dB HL, 250 – 8000 Hz). When the speech was presented at 50 dB HL, her word recognition scores in quiet were 95% for both ears. A prior neurological examination ruled out the presence of any tumors or other disorders that may interfere with the auditory brainstem and central pathways. You decide that this patient should be assessed for an auditory processing disorder (APD).

1. Find a potential test that could be used to assess for an auditory processing disorder. Which test did you select?

Attempt 1: Dichotic Digits (Musiek 1983) Attempt 2: Gaps in Noise (Musiek, Shinn, Jirsa, Bamiou, Baran, & Zaidan 2005) Attempt 3: QuickSIN (Killion MC, Niquette PA, Gudmundsen GI, Revit LJ, Banerjee S. 2004)

Note: If you cannot get past Item 6 in the decision tree, select a new test to evaluate for up to three attempts.

- Can you use this test for diagnosis? Attempt 1-3: No. All selected tests lack a reference standard for diagnosis APD (Vermiglio 2016). Moreover, current professional society recommendations and clinical guidelines note APD diagnosis requires a battery of tests and not a single test.
- 2. Is there acceptable evidence of diagnostic accuracy? Attempt 1-3: No. In all cases where tests have been used individually or as part of a test battery to report accuracy of an APD diagnosis, the tests themselves were included in the reference test battery or the reference test was from an assessment detecting a Central Auditory Nervous System (CANS) lesion (while APD is defined as a processing disorder in the absence of a CANS lesion).
- 3. Does the normative sample reflect the person being tested? Attempt 1: No - Dichotic Digits "norms" are only derived from clinically recruited samples aged 7-12 (or similarly young childhood age ranges) and older adults (over 60 years) specifically from a single city in Wisconsin (Beaver Dam).

Attempt 2: No evidence for normative data outside of studies in children (ages 8-10)

Attempt 3: No – while a study does report QuickSIN "norms" for a sample of normal hearing listeners age 20-30 (Holder, Levin, Gifford, 2018). The study lacks sufficient detail to understand bias in the recruited analytic sample and did not describe methods used to reach participants with exposures who are commonly excluded from clinic-based research (e.g., education factors, cultural background, multilingualism) that would affect the central tendency and range of data.

ALL – studies reporting "normative data" for these tests mostly describe derived norms using a method of reporting standard deviations of sampled data to define a normative range in the absence of considerations for representativeness, generalizability, accuracy to a reference standard, construct validity, or reliability.

- 4. Does the test accurately measure the relevant skill(s) for diagnosis? Attempt 1-2: No, in isolation, these tests to not measure the relevant skills Attempt 3: One may argue that the face validity of the QuickSIN encompasses so many processes that it reflects a relevant skill for diagnosis. However, there is no criterion or reference standard for the for the tests relevant to the definition/construct of APD which limits ability to assess 'relevant skills.'
- 5. Does the test consistently measure a person's ability? Attempts 1-3: No, there is a lack of reliability of measurement data robust to time, conditions, behavioral considerations, and order effects.
- 6. Is this test sufficient for diagnostic decision-making? Attempts 1-3: No, based on described points above.
- 7. Reflection:
  - a. What went well when working through the decision tree? The process forces a reader at any level to work through the relevant literature in a guided format that encourages depth of review without losing focus
  - b. What were some challenges faced while working through the decision tree? In this case, none of the test meet the basic concept of diagnosis for APD which limits interpretation subsequent questions. While difficult for the reader, it creates further frustration when considering the best step to take for a patient in need when no appropriate assessment for the patient exist.
  - c. What are some potential ways to navigate those challenges in the future? While perhaps still frustrating, future ways to navigate the challenge could include thought exercises such as deeper consideration of the larger picture of defining APD and exploring alternative potential diagnoses with a clear reference standard to best serve the patient.

### References

Killion MC, Niquette PA, Gudmundsen GI, Revit LJ, Banerjee S. Development of a quick speech-innoise test for measuring signal-to-noise ratio loss in normal-hearing and hearing-impaired listeners. J Acoust Soc Am. 2004 Oct;116(4 Pt 1):2395-405.

- Musiek, F.E. (1983). Assessment of central auditory dysfunction: The Dichotic Digits Test revisited. Ear and Hearing, 4, 79-83.
- Musiek, F.E., Shinn, J.B., Jirsa, R., Bamiou, D., Baran, J.A. & Zaidan, E. (2005). GIN (Gaps-In-Noise) test performance in subjects with confirmed central auditory nervous system involvement. Ear & Hearing, 29, 608-618.
- Holder JT, Levin LM, Gifford RH. Speech Recognition in Noise for Adults With Normal Hearing: Age-Normative Performance for AzBio, BKB-SIN, and QuickSIN. Otol Neurotol. 2018 Dec;39(10):e972-e978.

## Vignette 2 (Adult SLP)

A 59-year-old male is sent by neurology for speech production evaluation. His native language is French, but he considers himself bilingual, learning English at a very young age. The patient reports a 9-month history of progressive changes in speech functioning; he has difficulty pronouncing words that are noticeable when speaking both languages. He has isolated speech changes, in the absence of any other physical symptoms. He came in with an outside diagnosis of Primary Progressive Aphasia (PPA). However, he and his partner both deny any difficulty with word finding, word choice error (except for sometimes reversing yes and no), or difficulty with comprehension. He has no trouble understanding or retaining what he reads. No changes in spelling or handwriting were noted. While the patient came in with a diagnosis of PPA, there is no report or evidence of language difficulties during your case history or language screen. You suspect the patient may have apraxia of speech (AOS) and would like to administer a test to document support of this diagnosis.

1. Find a potential test that could be used to assess for an apraxia of speech diagnosis. Which test did you select?

Attempt 1: Motor Speech exam from Duffy Textbook (Duffy (2020). Motor Speech Disorders: Substrates, Differential Diagnosis, and Management, Fourth Edition).

Attempt 2: Apraxia of Speech Rating Scale (ASRS-3.5; Duffy et al., 2022) (<u>https://pubs.asha.org/doi/10.1044/2022\_AJSLP-22-00148;</u> supplementary materials include video examples)

Attempt 3: Apraxia Battery for Adults – 2 (Dabul).

Note: If you cannot get past Item 6 in the decision tree, select a new test to evaluate for up to three attempts.

2. Can you use this test for diagnosis?

Attempt 1: Yes, the Duffy Motor Speech Examination is intended to serve as a guide of motor speech skills. It includes a variety of assessment activities in the areas of (a) Examination of the Speech Mechanism during Nonspeech Activities, (b) Assessment of Perceptual Speech Characteristics, and (c) Assessment of Intelligibility, Comprehensibility, and Efficiency.

Attempt 2: Yes, the ASRS-3.5 is a 13-item rating scale and an index of the presence and severity of apraxia of speech (AOS).

Attempt 3: No. This tool has not been norm-referenced in the progressive AOS population and is not an appropriate evaluation tool for this population.

3. Is there acceptable evidence of diagnostic accuracy? Attempt 1: No; Sensitivity and Specificity are not reported in the textbook.

Attempt 2: Yes; a cutoff score of 8 on the ASRS-3.5 maximized sensitivity to AOS presence and specificity relative to aphasia and dysarthria in patients with neurodegenerative disease (Duffy et al., 2022).

4. Does the normative sample reflect the person being tested? Attempt 1: No. No normative sample is reported in the Duffy textbook.

Attempt 2: Yes. The study evaluating the ASRS-3.5 included 308 participants, 218 of whom were those with suspected isolated or predominant neurodegenerative AOS and/or aphasia.

- Does the test accurately measure the relevant skill(s) for diagnosis? Attempts 1 & 2: Yes, both the Duffy Motor Speech Exam and ASRS-3.5 evaluate relevant motor speech skills for diagnosis of AOS.
- Does the test consistently measure a person's ability? Attempt 1: No. No interrater reliability information was reported for the Duffy Motor Speech Exam in the Duffy textbook.
- 7. Attempt 2: Yes, Interrater reliability was assessed for 27 participants. Interrater reliability on the ASRS-3.5 was good or excellent for most scale items and excellent for the Total score.
- Is this test sufficient for diagnostic decision-making? Attempts 1 & 2: Yes, in conjunction with relevant background information/history and physical exam.

Attempt 2: Yes, in conjunction with relevant background information/history and physical exam.)

- 9. Reflection:
  - a. What went well when working through the decision tree? The questions provided helpful prompts in thinking through the assessment tools that exist and populations for which they have been evaluated/norm-referenced.
  - b. What were some challenges faced while working through the decision tree? While the Duffy Motor Speech Exam (Attempt 1) is considered a primary means of assessment in evaluation of motor speech, the textbook itself does not provide psychometric data regarding the assessment. The ASRS-3.5 (Attempt 2) is a scale, not an assessment, but provides cut-offs for people with AOS and can also delineate between AOS, aphasia, and dysarthria (specificity).

c. What are some potential ways to navigate those challenges in the future? Continue to consult the literature regarding assessment of AOS and discuss with experienced clinicians.

## Vignette 3 (Pediatric SLP)

A five-year-old boy is coming into your clinic next week and you need to plan his assessment session. His mother reports that he has been living on the Navajo reservation with his grandmother who primarily speaks the native language (Navajo). The child is now back in his mother's full-time care and his mother primarily speaks English and she would like the child to use English. The mother reports that she is concerned because the child "doesn't talk much." The mother has a history of drug use but claims that she did not use while she was pregnant. The child was born full-term and there were no reported complications by the mother. The mother reports no history of learning disabilities on her side; although, she does not know about the father's history. The child was referred to the audiologist prior to your evaluation and the audiologist found no concerns of hearing loss. The mother reports that the child can say around 50 single words across Navajo and English (i.e., some words the child knows are in English and other words are in Navajo). The mother reports that there are no other developmental concerns and that she really wants him to be ready for kindergarten. You decide that as part of your evaluation, you are going to assess the child for a language disorder.

 Find a potential test that could be used to assess for an apraxia of speech diagnosis. Which test did you select? Attempt 1: Preschool Language Scale, Fifth Edition (PLS-5)

Attempt 2: Clinical Evaluation of Language Fundamental-Preschool, Second Edition

(CELF:P-2)

Attempt 3: Test of Oral Language Development-Preschool, Fourth Edition (TOLD:P-4)

Note: If you cannot get past Item 6 in the decision tree, select a new test to evaluate for up to three attempts.

2. Can you use this test for diagnosis? Attempt 1: Yes

Attempt 2: Yes

3. Is there acceptable evidence of diagnostic accuracy?

Attempt 1: No—the sensitivity for diagnosing a disorder is reported as .91 and specificity is reported as .80, which meets criteria of at or above .80. However, the comparison groups in the diagnostic accuracy study were not well-defined and the reference standard is unknown, this test does not have acceptable evidence of diagnostic accuracy. See <a href="https://www.leadersproject.org/2013/11/25/test-review-pls-5-english/">https://www.leadersproject.org/2013/11/25/test-review-pls-5-english/</a> or <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/</a> for more details.

Attempt 2: No—sensitivity and specificity are not reported in the manual. According to a separate diagnostic study, the CELF:P-2 has sensitivity at .64 and specificity at 92.9. The sensitivity does not meet criteria of at or above .80. See

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/ for more details.

Attempt 3: No—sensitivity and specificity were not reported. See <u>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/</u> for more details.

- 4. Does the normative sample reflect the person being tested? Attempt 1, 2, and 3: If students did not stop at Question 3, then here they should note that the normative sample does not reflect the person being tested.
- 5. Does the test accurately measure the relevant skill(s) for diagnosis? Attempt 1, 2, and 3: If the students did not stop at a question above, then students may reflect on that while the three selected assessments are intended for preschoolers, they would need to carefully consider the items to ensure that the items are not too advanced given that the child is reported to only have 50 words at age 5. This may also give some students pause about whether assessing spoken language should be a primary component of the assessment.
- 6. Does the test consistently measure a person's ability? If students did not stop at a question above, then...

Attempt 1: The PLS-5 manual reports good test-retest reliability and fair inter-rater reliability (see <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/</a>).

Attempt 2: The CELF:P-2 manual reports good test-retest reliability and fair inter-rater reliability (see <a href="https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/">https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/</a>).

Attempt 3: The TOLD:P-4 manual reports good test-retest reliability and fair inter-rater reliability (see <u>https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5594094/</u>).

- Is this test sufficient for diagnostic decision-making? Attempt 1, 2, and 3: Ideally, students should have stopped at one of the questions above for all three of these sample attempts. None of these tests are sufficient for diagnostic decision-making for this child.
- 8. Reflection:
  - a. What went well when working through the decision tree? The questions made you look more in depth in to the test in a systematic and thorough manner.
  - b. What were some challenges faced while working through the decision tree? None of the tests met the criteria, which is frustrating because now it is unclear what to give this child (NOTE: See the "Evaluation and Implementation of the Decision topic for more details on navigating this challenge).
  - c. What are some potential ways to navigate those challenges in the future?
    A) Find some alternative ways to assess
    B) Talk to more experienced clinicians about how to navigate this situation
    C) Use several assessments to answer specific questions about this child's diagnoses and needs (i.e., don't rely on a single assessment)