

Exercise Description: Sky Rider

In Sky Rider, the participant must identify and remember the number and order of a series of frequency-modulated sound sweeps and indicate the pattern just heard. In this way, the participant improves advanced listening accuracy and auditory sequencing.

Skills Strengthened by Sky Rider

Sky Rider helps participants build language skills in the following ways:

- The base frequencies for the sound sweeps cover the most common frequencies found in speech: 500, 1000, and 2000 Hz.
- Across the exercise, the sounds change based on frequency, duration, intervals between sounds, and the number of sounds in a sequence. These stimulus changes push the auditory processing system to develop greater sensitivity to rapid auditory stimuli.
- To provide feedback and enhance motivation, an adaptive algorithm is also used to control various visual interface elements. Changing backgrounds, different character movements and speeds, and the animated speedometer all help participants track their level of success and progress.

In addition, Sky Rider builds cognitive skills as follows:

- **Memory**—hold a sound sequence in working memory while recalling visual symbol-sound associations from long-term memory
- **Attention**—focused and sustained attention
- **Processing**—auditory processing of tonal sweeps
- **sequencing**—identify and reproduce the sequence of rapidly presented sets of tonal sweeps

How Participants Work on Sky Rider

In Sky Rider, the participant clicks the yellow planet and a sequence of 2 sounds is presented. The participant clicks the up arrow to indicate an "up" sound sweep (lower to higher frequency) and the down arrow to indicate a "down" sweep sound (higher to lower frequency). The participant clicks the up and down arrows in the same order as up sweeps and down sweeps were presented in the sound sequence. As the participant progresses in the exercise, sequences of 3, 4, and 5 sounds are presented. As the participant reproduces sequences correctly, the sky rider moves through different environments with increasing speed and skill.

How Participants Progress through Sky Rider

In Sky Rider, the participant progresses through sound stimulus sets. Each stimulus set presents a unique combination of:

- Frequency: 500Hz, 1000Hz, or 2000Hz
- Duration: 80ms to 30ms
- Number of sweeps: 2, 3, 4, or 5

As the participant progresses through a set, the inter-stimulus intervals (ISIs) are reduced in 23 stages, starting at 500ms and ending at 20ms.*

*When the exercise begins, the participant progresses through each frequency with only 2 sounds at longer durations and with longer inter-stimulus intervals to become familiar with the task and learn to listen closely to the differences in the sounds. During this initial phase, the sky rider will not move beyond the lower, orange skill level (as shown by the needle on the skill/speed gauge).

How Participants Advance in Sky Rider

In order to complete Sky Rider, the participant must pass all stimulus sets at the highest stage (ISI 20ms).

In order to advance to the next (ISI) stage within a stimulus set, the participant must answer 3 consecutive trials correctly. If the participant answers a trial incorrectly, the participant moves back one ISI stage.

The skill/speed of the sky rider will increase and decrease based on the number of consecutive correct or incorrect trials.

Sky Rider adapts to the participant's performance within a set, and will transition the participant to a new set if s/he is continuously moving between the same few stages or answering numerous consecutive trials incorrectly in a given set. The set will be repeated at a later time.

Points Awarded in Sky Rider

Sky Rider awards points to the participant based on the following conditions:

- **Correct answers:** The participant earns 1 point for each correct trial in sound sets with 2 sounds. The participant earns 2 points for each correct trial in sound sets with more than 2 sounds.
- **Bonus points:** As the skill of the sky rider increases bonus animations occasionally play and bonus points are awarded. If the participant is working on a set with 2 sounds, 5 points are awarded per bonus animation. If the participant is working on a set with more than 2 sounds, 10 points are awarded per bonus animation.

Exercise Description: Laser Match

In Laser Match, participants identify pairs of matching English or "Alien" words within grids of tiles displaying phonologically similar words. Within each pair, the first tile presents the word aurally and shows it written on the tile. The second tile presents the word aurally, but shows a blank tile. The participant must rely on memory and reading skills to complete the match. In this way, Laser Match helps participants to improve their skills in word analysis and phonological memory.

Skills Strengthened by Laser Match

Laser Match helps participants build language and reading skills in the following ways:

- Aural and written presentations of stimuli are paired to help participants learn the associations between sounds and spelling patterns.
- The words in the exercise have been digitally enhanced to emphasize the rapidly changing phonetic elements within natural speech, helping the participant to develop listening accuracy.
- Laser Match presents over 100 English words and over 100 nonsense ("Alien") words, with spelling patterns ranging from simple CVC (e.g., cup), to consonant cluster (e.g., clock, plunt), consonant digraph (e.g., pack, cheat, blish) and vowel digraph (e.g., stair, hear, groot).
- After students have demonstrated mastery of the task with familiar English words, they are presented with unfamiliar nonsense ("Alien") words, increasing the demands on their decoding and memory skills.
- Often, grids will contain minimal pairs (words that only differ by a single phoneme, such as big/dig or splag/spleg) to help participants build phonemic awareness and letter-sound associations for the targeted phonemes.
- Fluency rounds with an alternative interface are designed to enhance motivation while reinforcing learned content.

In addition, Laser Match builds cognitive skills as follows:

- **Memory**—using auditory and visual-spatial working memory to locate matching word pairs in a grid
- **Attention**—focused and sustained attention
- **Processing**—auditory processing of phonemes for identification and recognition, visual processing of letters and written words, and cross-modal processing of phoneme-grapheme associations

How Participants Work on Laser Match

In Laser Match, an alien with a laser control sits beside a grid of monitors. The participant clicks a monitor, and a word is pronounced and displayed on that monitor. The participant then clicks the other monitors until the same word is found. If a monitor is clicked that has a word that matches a previously displayed word, the word is heard but not displayed. The participant must go back and click the monitor with the displayed word to match the pair. When a pair is matched, the monitors with the paired words turn off. The laser control held by the alien contains the number of clicks remaining to clear all the matches and successfully complete the grid. Each time the participant clicks a monitor, the

number on the laser control is decreased by 1. The participant continues matching words until all the monitors are paired up and turned off.

After the participant has completed several grids of varying size, the participant works on the same words in a Fluency Round. The object of the Fluency Round is to identify as many matches to the target word as possible within the time allowed. An empty grid appears; an alien with a laser control is positioned beneath the grid. A single target word is pronounced. A word appears and disappears in each cell of the grid, moving from left to right top to bottom, beginning at the top left corner. The participant moves the alien beneath the column where the target word appears and clicks to fire the laser at the target word. Fluency Round trials are not counted towards advancement or tracked for data reporting, but they allow the participant to review the material at a faster pace and provide a fun opportunity for the participant to earn more points.

How Participants Progress through Laser Match

In Laser Match, the participant progresses through 4 levels as follows:

- Level 1: words processed with highly emphasized phonemes (Speech Processing Level 3).
- Level 2: words processed with less phoneme emphasis (Speech Processing Level 4)
- Level 3: no processing, words presented in natural speech
- Level 4: no processing, nonsense words, natural speech

In the first 3 levels, the participant progresses through 11 word sets:

- Sets 1 – 3: words differ by initial/final consonant (big, dig, bit)
- Sets 4 – 8: words differ by onset only (sock, tock)
- Sets 9 – 11: words differ by vowel (bug, bag).

In the final level, the participant progresses through 9 additional sets comprised of nonsense words:

- Sets 12 – 14: words differ by initial/final consonant (prunt, prunk, plunt)
- Sets 15 – 17: words differ by onset only (sloot, stoot)
- Sets 18 – 20: words differ by vowel (splig, splog)

Within each level, the sets are presented in order. For each set, the participant progresses through a series of stages. Each stage is made up a specific grid size:

- Stages 1 – 3: 4-cell grids (2 matches) (presented only at the start of the exercise)
- Stages 4 – 6: 8-cell grids (4 matches)
- Stages 7 – 10: 16-cell grids (8 matches)

After the participant has completed Stages 1 – 3, the participant will always begin working on a set at Stage 5 (Stage 4 will only be presented when Stage 5 is not successfully completed). When the participant completes all the grids for a set, the participant is presented with the Fluency Round.

How Participants Advance in Laser Match

In order to advance to the next level in Laser Match, the participant must pass all sets within the level at the highest stage.

The participant advances to the next stage within a set by clearing all the matched pairs within a grid within the maximum number of allowed clicks. When the participant completes Stage 10 within the maximum allowed clicks, the participant is presented with the Fluency Round. After the Fluency Round, the participant advances to Stage 5 of a new set.

Plateau Based Transition:

If the participant uses more than the maximum clicks to clear the grid, the participant will be demoted one stage (for example, if Stage 5 is not completed within the maximum number of clicks, the participant is presented with Stage 4). If the participant is at Stage 4 and does not clear the grid within the maximum number of clicks, the participant will transition to a new set and the incomplete set will be presented again at the end of the level.

Points Awarded in Laser Match

Laser Match awards points to the participant based on the following conditions:

- **Correct answers:** When a match is correctly completed, the participant is awarded 1 point.
- **Progress points:** When a grid is completed, the participant is awarded the number of clicks remaining on the laser control.
- **Fluency Round points:** When each target word is correctly identified, the participant is awarded 1 point. In addition, if all the target words in a grid are correctly identified, the participant is awarded a token for each correct target. If the participant fails to correctly identify a target word or falsely identifies a word as a target, the participant loses all accumulated tokens. At the end of the Fluency Round, any tokens that remain are converted to points and added to the participant's score. The number of points awarded for each token is based upon the number of sets passed in the current level.

Exercise Description: Meteor Ball

In Meteor Ball, the participant listens to a spoken word, then recognizes and selects the target word when it recurs within a series of phonologically similar words that are spoken and written. In this way, the participant improves word analysis and sustained attention.

Skills Strengthened by Meteor Ball

Meteor Ball helps participants build language and reading skills in the following ways:

- Aural and written presentations are paired to help participants learn word-to-print mappings.
- The sound structure of the aural words in the exercise has been digitally enhanced to emphasize the rapidly changing phonetic elements within natural speech, helping the participant to develop listening accuracy.
- Most contrasts involve minimal pairs in which the words differ by a single phoneme (e.g., dig/pig or cap/cash) to help participants build phonemic awareness and letter-sound associations for the targeted phonemes.
- This exercise presents over 130 words, both CVC words like “pet” and CVCC words like “dust.”
- Fluency rounds with an alternative interface are designed to enhance motivation while reinforcing learned content.
- The word-bearing meteors always move across the screen from left to right, reinforcing left-to-right visual scanning patterns for reading.

In addition, Meteor Ball builds cognitive skills as follows:

- **Memory**—hold a target word in working memory while comparing it to a series of spoken and written words to find the one that matches
- **Attention**—sustain attentional focus while monitoring a stream of words for a target word
- **Processing**—auditory processing of words at the level of individual phonemes, visual processing of letters and written words, and cross-modal processing of phoneme-grapheme associations

How Participants Work on Meteor Ball

In Meteor Ball, the participant clicks the yellow planet and a target word is pronounced. A series of meteors move towards a batter. As a meteor moves in front of the batter, a word is pronounced and displayed on the meteor. The participant clicks the meteor with the word that matches the target word. When a word is correctly selected in the allotted time, the batter hits the meteor into an asteroid.

After the participant has worked successfully through 3 sets of words, these same sets are presented in the Fluency Round. In the Fluency Round, the participant will be presented with 3 trials. In each trial a target word is pronounced. Words are pronounced and displayed on meteors. The participant must click the target word within the allotted time to earn a ball. After all trials are completed, if the final trial is answered correctly, a

batter hits the earned balls into asteroids to earn bonus points. Fluency Round trials reinforce skills by using the same word sets, but in a different environment. Fluency Round trials are not counted towards advancement or tracked for data reporting, but they allow the participant to review the material at a faster pace and provide a fun opportunity for the participant to earn more points.

How Participants Progress through Meteor Ball

In Meteor Ball, the participant progresses through 3 speech processing levels as follows:

- Level 1: words processed with highly emphasized phonemes (Speech Processing Level 3).
- Level 2: words processed with less phoneme emphasis (Speech Processing Level 4)
- Level 3: no processing, words presented in natural speech

In each level, the participant progresses through the same 54 word sets. These sets are grouped by:

- Target sound position: Initial (**pet** vs. **get**) and Final (**pet** vs. **pen**)
- Discriminability of target and alternate response: Each set is made up of a target word and one or more alternate responses. The alternate responses presented depend upon the presentation stage. The participant progresses through each set in these 3 stages:
 - Stage 1: Easy alternate response (**gab** vs. **lab**)
 - Stage 2: Hard alternate response (**gab** vs. **cab**)
 - Stage 3: Mixed alternate response (**gab** vs. **lab**, **cab**, and **jab**,)

After the participant has completed 3 sets at the highest stage, the participant is presented with a Fluency Round.

How Participants Advance in Meteor Ball

In order to advance to the next level in Meteor Ball, the participant must pass all sets within the level at the highest stage.

In order to advance to the next stage within a set, the participant must answer 3 out of the last 4 trials taken in the stage correctly. (Note: If the participant answers the first 3 trials in the unit correctly the 4th trial is not presented and the stage is passed.) When a stage is passed, the participant advances to the next stage for the current set. A set is closed for the current level when the participant passes the set at the highest stage (Stage 3).

Plateau Based Transition:

If the participant completes 20 trials in a stage without reaching at least 30% correct, or if the participant completes 30 trials in a stage without passing, the participant transitions to Stage 1 of the next open set. The participant must pass all sets in a processing level before advancing to the next processing level. The participant will continue to cycle through all the sets not yet passed, until they are all passed.

Points Awarded in Meteor Ball

Meteor Ball awards points to the participant based on the following conditions:

- **Correct answers:** The participant earns 3 points for each correct trial.
- **Progress points:** The participant earns 4 points upon passing a stage, 6 points upon passing a set, and 9 points upon passing a level.
- **Fluency Round points:** The participant earns 1 point for each correct trial in the Fluency Round. At the end of the Fluency Round, the participant may be awarded up to 20 additional points, depending upon the level and the number of correct answers in the Fluency Round.

Exercise Description: Lunar Leap

In Lunar Leap, the participant listens to a target word and then finds the matching word in a pair of spoken and written words that are phonologically similar. In this way, participants improve word analysis.

Skills Strengthened by Lunar Leap

Lunar Leap helps participants build language and reading skills in the following ways:

- The words in the exercise have been digitally enhanced to emphasize the rapidly changing phonetic elements within natural speech helping the participant to develop listening accuracy.
- Stimulus words are presented repeatedly, with aural and written presentations paired to help participants learn the associations between words and print and between sounds and spelling patterns.
- Lunar Leap presents over 150 words, including both CVCs (e.g., log) and CVCCs (e.g., cast).
- Most of the words that are contrasted are minimal pairs (words differing by a single phoneme, such as dish/fish) to help participants build phonemic awareness and letter-sound associations for the targeted phonemes.
- Fluency rounds with an alternative interface are designed to enhance motivation while reinforcing learned content.
- Written word choices are always presented in a left-to-right sequence, reinforcing left-to-right visual scanning patterns for reading.

In addition, Lunar Leap builds cognitive skills as follows:

- **Memory**—hold a target word in working memory while comparing it to two, phonologically similar alternate words to find the matching one
- **Attention**—focused attention
- **Processing**—auditory processing of phonemes for identification, visual processing of letters and written words, and cross-modal processing of phoneme-grapheme associations

How Participants Work on Lunar Leap

In Lunar Leap, the participant clicks the yellow planet and a target word is pronounced. A word appears on the helmet of each alien head. As each word appears, it is pronounced, then it disappears. The participant clicks the helmet in which the word that matches the target word appeared. As the participant answers trials correctly, the alien attempts to bungee to the next moon. When the participant has answered 30 trials correctly, the alien will successfully bungee to the next moon.

In the Fluency Round, the participant is presented with 5 rows of 5 blocks. A target word is spoken, and the top row of blocks become active, displaying 5 words. The participant must click all instances of the target word in the active row. If the participant correctly selects all of the target words in a row, the subsequent row will activate. If all 5 rows are

completed before time is up, the 2nd-5th rows will reactivate, displaying new arrangements of words. The participant has 20 seconds to find as many tiles with the target word as he can. For each correct answer, a token is earned. If the participant answers a trial incorrectly, all tokens are lost. At the end of the round, any remaining tokens are awarded as bonus points. Fluency Round trials are not counted towards advancement or tracked for data reporting, but they allow the participant to review the material at a faster pace and provide a fun opportunity for the participant to earn more points.

How Participants Progress through Lunar Leap

In Lunar Leap, the participant progresses through 3 speech processing levels as follows:

- Level 1: words processed with highly emphasized phonemes (Speech Processing Level 3).
- Level 2: words processed with less phoneme emphasis (Speech Processing Level 4)
- Level 3: no processing, words presented in natural speech

In each level, the participant progresses through the same 61 word sets. The participant progresses through 2 sound change types (Initial or Final Sound Change). Within each sound change type, there are 6 target sounds, with multiple sets for each sound. The participant progresses through multiple word sets simultaneously. Within each set, the participant progresses through 3 stages; in each stage the phoneme is changed to make the target word harder to discriminate from the alternate response (e.g., target sound=/t/, change type = final: Stage 1 = bit vs. bin, Stage 2 = bit vs. bib, Stage 3 = bit vs. bid).

After the participant has answered 21 out of the last 27 trials correctly, the exercise presents a Fluency Round. Fluency Round trials are not counted towards advancement.

How Participants Advance in Lunar Leap

Initially, the first set for each target sound is opened and trials (comprised of the target word and alternate response) are selected randomly from all the open sets. A stage is passed if the participant answers 7 out of the last 8 trials taken in a set correctly. When a stage is passed, the next stage for the current set is opened. When a set is passed at the highest stage it is closed and the next set for that sound is opened. If sets are not passed at the highest stage, they remain open; participants must close all sets of one type (initial) before advancing to the next type (final). When the participant has closed all sets in both sound types for the current level, the participant advances to the next level.

Plateau Based Transition:

If the participant completes 20 trials in a stage without passing or reaching at least 70% correct, or if the participant completes 30 trials in a stage without passing, the set remains open and is added to the end of the list of sets for the current sound. Stage 1 of the next set for the current sound becomes available. The participant must pass all sets in a processing level before advancing to the next processing level. The participant will continue to cycle through all the sets not yet passed, until they are all passed.

Points Awarded in Lunar Leap

Lunar Leap awards points to the participant based on the following conditions:

- **Correct answers:** The participant earns 2 points for each correct trial.
- **Progress points:** The participant earns 4 points upon passing a stage, 8 points upon passing a set, and 12 points upon passing a level.
- **Fluency Round points:** The participant earns 1 point for each correct trial in the Fluency Round. At the end of the Fluency Round, the participant will be awarded 2 additional points for each remaining bonus token.

Exercise Description: Galaxy Theater

In Galaxy Theater, the participant listens to a story and answers comprehension questions about it. The participant then listens to sentences and selects the pictures that best represent the sentences. Finally, the participant listens to instructions and manipulates one or more objects as instructed. Through these activities, the participant improves listening comprehension, following directions, English language conventions, and vocabulary.

Skills Strengthened by Galaxy Theater

Galaxy Theater helps participants build language and reading skills in the following ways:

- The audio in the exercise has been digitally enhanced to emphasize the rapidly changing phonetic elements within natural speech, helping the participant to develop listening accuracy.
- 3 fiction passages are aurally presented, along with a total of 48 listening comprehension questions about the passages; these questions are designed to build comprehension and memory for details, main ideas, and relationships within the story.
- 432 sentences are aurally presented; these sentences include a wide range of language structures and are designed to improve the participant's understanding of the relationship between words, grammar, and meaning.
- Across the exercise, a total of 240 aural commands are presented; these commands are designed to improve the participant's skill in attending to, understanding, and following increasingly complex directions.

In addition, Galaxy Theater builds cognitive skills as follows:

- **Memory**—hold a statement or question in working memory while retrieving picture-concept associations from long-term memory and identifying the best match or answer
- **Attention**—focused and sustained attention
- **Processing**—auditory and linguistic processing of orally presented sentences and stories for meaning and comprehension
- **sequencing**—using word order to comprehend simple and complex statements and instructions and organizing a response that follows the specified sequence of actions

How Participants Work on Galaxy Theater

In Galaxy Theater, the participant listens to a short chapter from a story. The participant is then presented with 3 activities:

- In the listening comprehension activity, the participant must answer questions pertaining to the story just heard.
- In the language comprehension activity, the participant hears a sentence and sees 4 pictures that are possible representations of the sentence. The participant must identify and click the picture that best represents the sentence.

- In the following directions activity, the participant is presented with a board containing rows of colored objects. The participant clicks the yellow button to hear instructions, such as "Touch the green car and the white car." The participant must follow those instructions.

How Participants Progress through Galaxy Theater

In Galaxy Theater, participants progress through the 3 levels of the exercise. Each level is a different story. Each of the stories, and all items associated with it, is presented at a different speech processing level:

- Level 1: Devon and the Sarcastic Remarks--speech processing level 3
- Level 2: The New Dreamer--speech processing level 4
- Level 3: Justin and his Friend, Buddy--natural speech

Each story is divided into 4 chapters. After listening to a chapter, the participant progresses through 3 activities:

- Listening Comprehension: The participant is presented with 4 listening comprehension questions after each chapter. These become more difficult across levels, moving from literal questions to questions that require sequencing or making inferences.
- Language Comprehension: After each chapter, the participant is presented with 36 Language Comprehension items. Within each level, 31 grammatical structures are covered, ranging in difficulty from early developing structures (e.g., comparative with -er: Which one is emptier?) to later developing structures (e.g., complex sentences: The rest of the band got tired of waiting for Devon to set up her drums, so they started warming up without her).
- Following Directions: After each chapter, the participant is presented with 20 commands. Within each set of commands, the difficulty level increases from less complex (e.g., Touch the purple pillow and the green alarm clock) to more complex (e.g., Put the small blue lunch box between the green microphone and the purple television camera).

How Participants Advance in Galaxy Theater

In order to advance to the next level in Galaxy Theater, the participant must meet the criteria for each of the 3 activities. After all trials for a level (story) have been presented, the exercise makes this determination based upon the following advancement criteria:

- Listening Comprehension: 100% The participant must answer 4 out of 4 Listening Comprehension trials correctly in each chapter.*
- Language Comprehension: 90% The participant must answer 130 out of 144 Language Comprehension trials correctly.
- Following Directions: 90% The participant must answer 72 out of 80 Following Directions trials correctly.

If the participant fails to meet the advancement criteria for any activities in the level, those activities that were not passed are repeated. The participant will not advance to the next level, until criteria has been met for all activities in the current level.

*Each chapter is evaluated independently for Listening Comprehension. Once the Listening Comprehension criterion is met for a given chapter, the participant will not repeat the narrative or the Listening Comprehension trials for that chapter.

Points Awarded in Galaxy Theater

Galaxy Theater awards points to the participant based on the following conditions:

- **Correct answers:** The participant earns 5 points for each correct trial.
- **Bonus points:** For every 10 trials the participant answers correctly, the participant is awarded 10 bonus points.