Teaching Sound Frequency Imitation to a Child
with Autism

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Learning to discriminate the number of parts contained in auditory stimuli is an important skill for any child, but especially for children whose spoken language lags behind their typically developing peers. Developing strong auditory discrimination skills may help children to hear syllables in words, words contained in sentences, and phrases in sentences as distinct movements. Later, these skills may help with their reading development as they learn to blend isolated sounds into words and segment words into their component sounds. The chart we present here shows the performance of a toddler with autism as he learned to repeat the number of auditory stimuli spoken to him.

Kion was 3-years and 2-months old when this chart began. He had a diagnosis of moderate autism and attended an integrated preschool as well as received intensive in-home behavior analytic intervention for approximately 16 hours each week. Each day, Kion's therapists set a daily improvement goal for him on this skill. His therapists set his daily improvement goal by examining his Daily per Minute Chart for this skill and identifying a frequency of correct responding that represented significant growth in his performance over his previous highest frequency. Kion's therapists worked with him on this skill each day for ten minutes or until he reached the daily improvement goal they set for him, whichever came first. If he reached his goal, he chose a preferred item from a reinforcer menu.

Kion began timed practice on this skill on January 20, 2003. The first practice phase consisted of Kion's therapists repeating a sound one, two, or three times across the length of a thirty-second timing. Kion repeated the same number of sounds he heard back to his therapist. The sounds Kion practiced included single sounds, consonant-vowel blends, vowel-consonant blends, and consonant-vowel-consonant blends. The dots in the first phase of the chart represent Kion's frequency of sounds repeated correctly. Discriminating between one, two, or three sounds proved not very difficult for Kion; because of his steep acceleration in corrects and low error frequency, we moved on after three days from asking Kion to repeat one to three sounds to asking him to repeat sequences of three to five sounds—the second phase on the chart.

While the timing interval and the sounds remained the same as in the first phase, the movement cycle changed. Rather than counting each single sound as either correct or incorrect, we counted each sequence of sounds as correct or incorrect. Kion's therapists counted a correct sequence for each string of sounds Kion repeated correctly. As an example, if Kion heard two sounds ("ab-ab') and said the same two ("ab-ab), his therapists counted one correct. If Kion heard two sounds ("ab-ab") and instead said three sounds ("ab-ab-ab"), his therapists counted one error.

Repeating sequences of three to five sounds proved a bit more challenging than repeating sequences of one to three sounds for Kion. While on the first day of timed practice on this slice, Kion had higher errors than corrects, his performance crossed over the next day and his corrects continued to accelerate at X2.4 with a bounce of X1.8. His rate of sequences repeated correctly during this phase began at six correct sequences and ended the phase at 18 correct sequences per minute, with low and high values of 6 and 24 respectively, and a median frequency value of 12. His frequency of sequences repeated incorrectly (an "X") began at eight per minute, ended at six per minute, and had a median frequency value of eight per minute. His errors during the phase of sequences of three to five accelerated at X3.2 across the course of the phase with a bounce value of X3.0. Kion completed one to three practices per day during the phase, with a median of two practices.

Because hearing and saying three to five sounds took more time than saying only one to three sounds, and because past experience taught us that Kion's performance would likely show retention, endurance, stability, and application (RESA) at frequency of 40-60 correct syllables per minute on Hear/Say learning channels, we started

counting the number of syllables as well in the next phase of the chart. In the next phase, a closed circle still represents the rate of correct strings of frequencies and an "X" still represents the rate of incorrect strings. His rate of correctly repeating strings of sounds jumped down (/5) from the previous phase. While repeating sequences of three to five sounds, Kion's rate of sequences repeated correctly began at eight correct sequences per minute and ended at ten corrects per minute, with a low value of eight per minute, a high value of 28 per minute, and a median frequency of 16 per minute. His corrects bounced at X1.6 (a crease—a proportional change in bounce from one phase to another—of /1.1) and accelerated at X1.4 across the course of the phase, which represented a turn down of /1.7 from the previous phase.
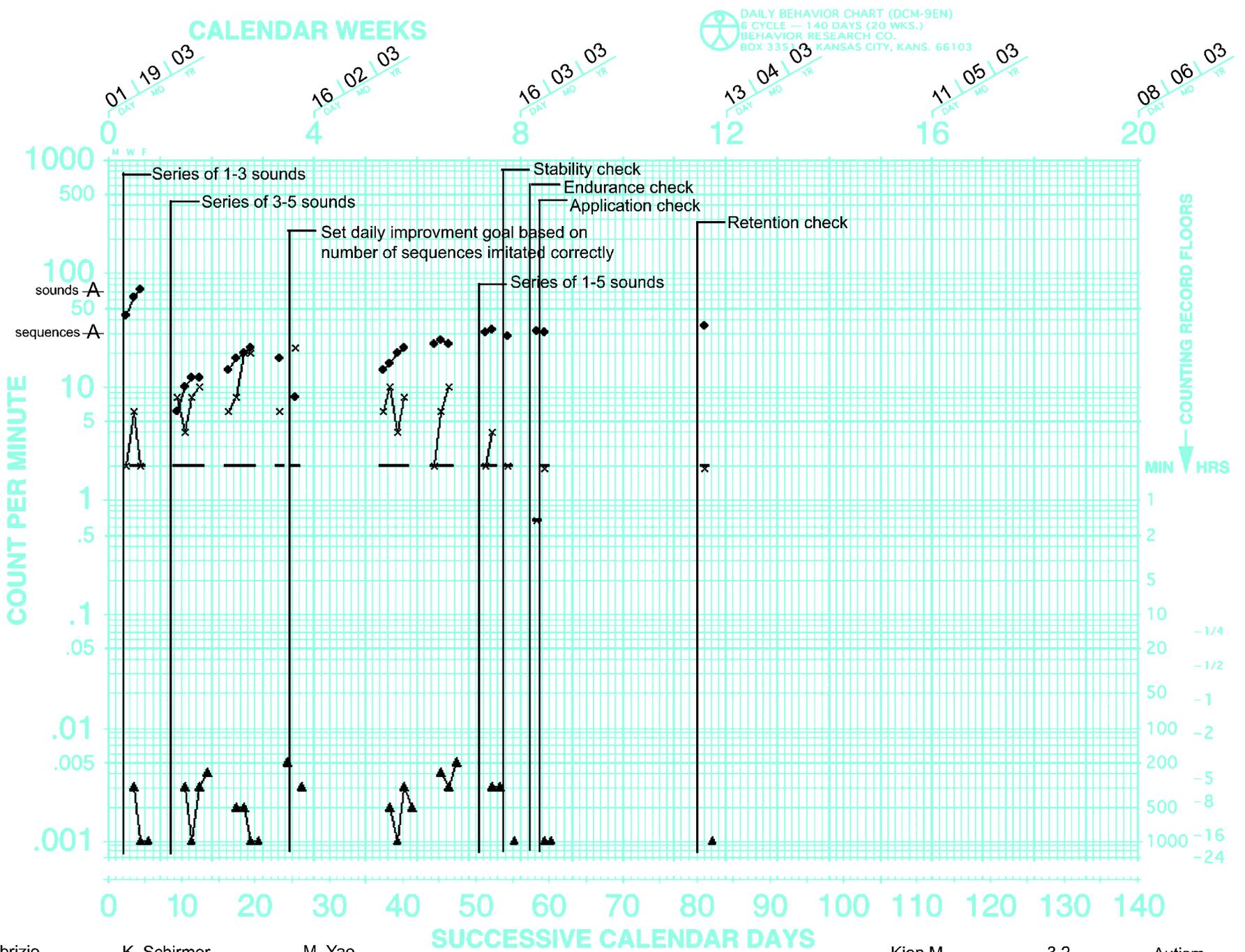
During the three to five sound phase of the chart, Kion's errors jumped down (/2.4) from the previous phase. His errors during this phase began at 22 per minute, ended at eight per minute, and had a low frequency of one, a high frequency of ten, and a median frequency of eight per minute. His errors decelerated during this phase at /1.8 with a bounce of X5—a crease in his error bounce of X1.6 from the previous phase.

While we began counting and charting the number of syllables he repeated, we continued to set Kion's daily improvement goal based on the number of correct strings, but we counted and charted the number of correct syllables. As Kion approached 60 correct syllables per minute, his number of practices per day began to accelerate. We interpreted this change in the number of practices he completed per day as suggesting that he may have reached the frequency aim that predicted RESA—despite our best efforts and his completing more and more daily practices, his frequency performance was not changing.

In the next phase, we combined one to three sounds with three to five sounds to ensure that Kion could perform across a full range of syllables. He did a beautiful job! Both his syllable and string frequencies remained very high, while his errors remained low. The number of practices he completed also remained low (three per day) for each of the two days in this slice.

Because Kion performed so strongly under these more complex conditions, and because repeating strings of between one and five syllables represented a functional and appropriate instructional set for a child of his age, we next began to test systematically each outcome of fluent performance (RESA). We started by assessing the stability of Kion's performance to evaluate whether he could maintain his high levels of performance in the presence of distraction. For Kion, the distractions we used consisted of completing the stability check timing while his favorite musical toy played. Kion's performance dropped only slightly on the first stability check timing, so we moved on to evaluate whether his performance would endure across long, untaught lengths of practice (Endurance Check). To test Kion's performance for endurance, we tripled the timing interval from thirty seconds to 90 seconds, and presented him with the same sounds and frequencies he practiced previously. Again Kion maintained his frequency of correct and incorrect performance, so we proceeded next with an application check. For the application check, we selected words that Kion had not previously practiced (for example, "banana") and divided the words into between one syllable (ba) and five syllables (banananana). Kion matched his previous best performance on his first timing, so we moved on to evaluate Kion's retention of the skill. To do so, we stopped all practice of this skill for four weeks. After four weeks, we presented Kion with the same sounds and frequencies from the final slice of timed practice. He passed his retention check at a slightly higher rate of sound strings. Having demonstrated that Kion's imitation of sound frequencies displayed retention, endurance, stability, and application—the primary outcomes of fluency—we stopped this chart and continued teaching Kion more advanced speaking skills.