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Using Tactile Biofeedback, In the Form of Speech Buddies, For Treatment of Therapy Resistant Students Who Misarticulate /r/.

Abstract

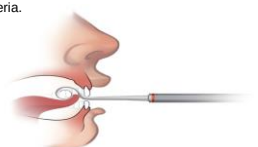
Up to 7.5% of school-age children in the United States are affected by speech sound disorders with approximately 28% of these making no measurable progress in traditional treatment. For these children, alternative approaches are often needed. The current study tests a relatively cost-effect approach in tactile biofeedback using the Speech Buddies ® tool set. This case study included two treatment-resistant children, aged 9:5 and 10:11 respectively. Through a school year-long therapy schedule, both students achieved remediation (90% accuracy). Implications for the treatment of residual articulation errors are discussed in depth.

Background

Articulation and speech sound disorders affect as many as 7.5% of the school-age population (Shriberg & Kwiatkowski, 1994) and can negatively impact teacher perceptions of students with reduced speech intelligibility (Overby, Carrell & Bernthal, 2007) as well as inter-peer relationships among school-age children (Crowe Hall, 1991). Even though there is evidence that traditional and phonological approaches to treating speech sound disorders can be effective, Jacoby, Lee, Kummer, Levin and Creaghead (2002) found that, broadly speaking, treatment employing these methods resulted in no measurable progress for approximately 28% of the 234 pre-school and school-age children they analyzed over a two year period.

In addition, evidence shows that children who have speech sound disorders that are not remediated by approximately age 9 are at increased risk of developing what are called "residual" speech errors (Shuster, Ruscello & Toth, 1995). These residual errors are particularly resistant to treatment and in many cases may result in a child being exited from therapy for lack of progress. Previous studies have examined the effect that alternatives to traditional approaches to articulation therapy have had on these residual speech sound errors. In general, these studies have examined various sensory biofeedback approaches, which use instrumentation to make covert physiological processes more overt (Huang, Wolf & He, 2006); Examples of sensory biofeedback are electropalatography, ultrasound, spectrography and Speech Buddies ®, a form of tactile biofeedback. These approaches have varying levels of evidence in remediating these residual errors.

Despite this promise of remediation from many of these approaches, they have had limited use in school-based services, the main setting for service delivery in the United States. This is primarily due to the high cost of these approaches, which rely heavily on electronic instrumentation and associated software applications. These approaches, therefore, often require extensive training for them to be effectively implemented. The current study aims to investigate the effect of one of these alternative approaches, tactile biofeedback delivered via the Speech Buddies ® set of speech correction tools, in the treatment of two school-age children at risk for producing residual speech sound errors. Speech Buddies are comparatively low cost and easy to implement. This case study-designed investigation was developed to reflect a natural school environment and enable parent involvement in each participant's treatment plan. The author hypothesizes that the addition of tactile biofeedback in treatment will enable previously residual speech sound errors to respond to therapy, thereby creasing the likelihood of meeting or exceeding qualifying discharge criteria.



Method

Participants

Two students at Brooks Elementary School in Windsor, California were enrolled in this study, which ran from October 3, 2012 to May 16, 2013. The first participant, R.J., a fourth grade girl, was nine years, five months of age at the time of enrollment. She had received two previous years of school-based speech services. During second grade (2010-2011), she received services on a response-to-intervention (RTI) basis. During her third grade year (2011-2012), R.J. received services according to an individualized education plan (IEP). IEP goals exclusively targeted speech sounds, particularly the /r/ sound.

The second participant, S.L. a fifth grade boy, was ten years, eleven months old at the time of enrollment in the study. S.L. had received extensive speech therapy services since pre-school, which included language as well as speech-related goals. For the time period covering this school year, S.L. only had speech-related goals on his IEP. S.L. had worked on treating misarticulated /r/ during the previous school year (his fourth grade year) with no measurable progress.

Therapy Plan

Participants received twice weekly services of thirty-minute, individual therapy sessions, from the author, a California-licensed and ASHA-certified speech-language pathologist with over twelve years clinical experience. The Speech Buddies® device specially designed for the North American English /r/ was used in this study as the primary means to elicit the /r/ sound. The device features a coil which is inserted into the oral cavity, immediately posterior to the upper dentition. Once in place, the participant unrolls the coil to model the retroflection required to correctly produce the /r/ sound.

The Speech Buddy was used as the primary mechanism for cuing in therapy sessions. However, these cues were supported by visual cues, particularly with regard to training the correct, rounded and slightly protruded lip configuration necessary for correct /r/, particularly consonantal and pre-vocalic /r/. Verbal instructions were also used to support the primary tactile cuing mechanism. For these reasons, the therapy approaches employed here best reflect a modified version of the traditional method of articulation therapy, as described by Van Riper and Emerick (1984).

Assessments

The R Speech Buddy was the primary cuing mechanism throughout the school year, as deemed necessary by the study SLP. Mean therapy hours administered for the two participants were approximately 25 hours at an average rate of one hour per week. All assessment data were gathered by the study SLP. The assessment battery consisted of primarily of the Secord Contextual Articulation Test (S-CAT) phoneme-specific probe for both the consonantal and vocalic versions of /r/. The probes assess the accuracy of, in this case, /r/ in all possible phonetic contexts. S-CAT probes were administered on two separate occasions at least two days apart both at baseline, and at the end of the school year. In addition, the Goldman-Fristoe Test of Articulation, 2- Edition (GFTA-2) was administered at baseline and at the end of the study as a means of comparing participants' progress with a standardized sample.

Results

Tables 1 and 2 summarize the participants' performance at baseline and at final assessment of the S-CAT Probes.

Table 1. Summary of Results for Participant R.J.

	Average of Baseline S-CAT Probes (%)	Average of Final S-CAT Probes (%)
Consonantal /r/	4/65 (6%)	63/65 (97%)
Vocalic /r/	21/85 (25%)	85/85 (100%)
Total /r/	25/150 (17%)	148/150 (99%)

Figure 1. Graph of R.J.'s accuracy of production: pre-treatment versus post-treatment

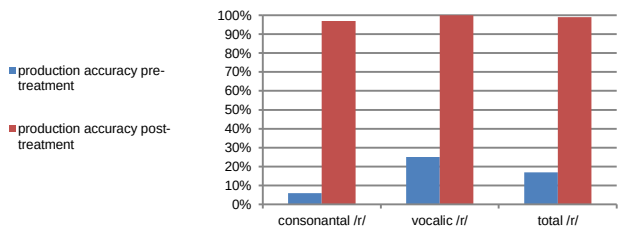
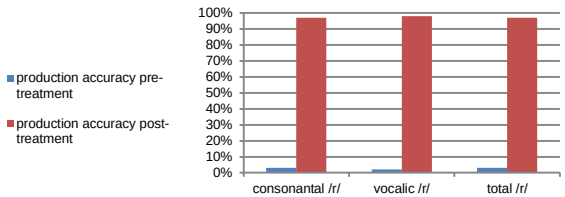


Table 2. Summary of Results for Participant S.L.

	Average of Baseline S-CAT Probes (%)	Average of Final S-CAT Probes (%)
Consonantal /r/	2/65 (3%)	63/65 (97%)
Vocalic /r/	2/85 (2%)	83/85 (98%)
Total /r/	4/150 (3%)	146/150 (97%)

Figure 2. Graph of S.L.'s accuracy of production: pre-treatment versus post-treatment



The results suggest that a remediation response was achieved by both participants across all phonetic contexts. S.L. showed some resistance to using the /r/ Speech Buddy device and required additional positional adjustments to be able to initially produce the /r/ sound correctly. R.J. showed no such resistance and was quickly stimulable for the /r/ sound in pre-vocalic and vocalic contexts with the /r/ Speech Buddy device. Additional training was necessary for R.J. to generalize correct /r/ up to the words-in-sentences level.

The pre-treatment administration of the GFTA-2 was completed on October 3, 2012. The post-treatment administration of the GFTA-2 was completed on May 16, 2013. Table 3 summarizes the pre-treatment and post-treatment results of the Sounds-in-Words subtest of the GFTA-2.

Table 3 Pre-treatment versus post-treatment performance on the GFTA-2

	Pre-Treatment		Post-Treatment	
Participant	Standard Score	Percentile Rank	Standard Score	Percentile Rank
RJ	87	4	97	15
SL	68	2	105	>30

Discussion

As Shuster, Ruscello and Toth (1995) noted in their study examining the effect of spectrographic feedback in an adolescent with long-standing, residual speech sound errors for North American English /r/, non-traditional approaches to remediation are often indicated for such children. Both participants in this study were older than age 9, generally the age at which persistent errors may become classed as "residual" errors. Preston and Edwards (2007) noted that such errors often co-exist with incomplete phonological representations of the target speech sounds in these pre-adolescents and adolescents.

Given that R.J. and S.L. were both older than age 9, their errors were at risk for becoming residual errors. Also, prior to enrolling in this study, both participants had received at least one full school year of speech therapy targeting the consonantal and vocalic /r/. During this time, little to no progress was made. For these reasons, an alternative treatment approach was indicated.

The study clinician was initially drawn to investigating the clinical effectiveness of Speech Buddies as a favored alternative approach given their lower cost as compared to other sensory biofeedback approaches, such as EPG and ultrasound. However, tactile cuing via Speech Buddies had considerably less objective evidence to support its widespread use. The data presented here suggest that Speech Buddies would be a viable treatment option for children in their later school-age years who have shown little to no progress in therapy and whose speech sound errors are at risk for becoming residual speech sound errors. Nevertheless, further evidence is required to determine whether these results may be applied to a larger participant sample size.

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