Remediation of /r/ *for* Speech-Language Pathologists

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Website: https://www.pluralpublishing.com

Typeset in 11/13 Garamond by Flanagan's Publishing Services, Inc.
Printed in the United States of America by McNaughton & Gunn, Inc.

Library of Congress Cataloging-in-Publication Data:

Names: Flipsen, Peter, Jr., author.
Title: Remediation of /r/ for speech-language pathologists / Peter Flipsen Jr.
Description: San Diego, CA : Plural Publishing, Inc., [2022] | Includes bibliographical references and index.
Identifiers: LCCN 2021011287 (print) | LCCN 2021011288 (ebook) | ISBN 9781635502879 (paperback) | ISBN 9781635503029 (ebook)
Subjects: MESH: Speech Intelligibility | Articulation Disorders—therapy | Speech Therapy—methods | Child | Adolescent
Classification: LCC RJ496.S7 (print) | LCC RJ496.S7 (ebook) | NLM WV 501 | DDC 618.92/855—dc23
LC record available at https://lccn.loc.gov/2021011287
LC ebook record available at https://lccn.loc.gov/2021011288

Contents

Preface

A Visit With the Rhotacist

In my more than 20 years of teaching in speech pathology programs and presenting at various professional meetings, I hear a lot about problems with remediating /r/ errors, especially with children over age 8 years. I am quite regularly approached by clinicians, including those with a wide range of clinical experience, who vent their frustration with this target sound. The most common query is "got any tricks?" I readily sympathize. I still recall my own challenges dealing with these errors in my clinical practice back in Canada in the early 1990s. It is also not uncommon for current students in their clinic placements to approach me after class for help correcting an aberrant /r/, often noting that they and their supervisors have "run out of ideas." Although I cannot promise any quick fixes here, I hope this book will at least offer some direction.

Specific concern about /r/ is not a new phenomenon. At least as early as 1882, Samuel Potter referred to this sound as "the most difficult consonant" (p. 34). He also referred to errors on /r/ as *rhotacism*. The word is derived from "rhotic" that is a label typically attached to /r/. Although the label rhotacism has long been out of favor, it was briefly revived a century later by Shriberg[1] (1982). In a book chapter discussing a very different kind of speech problem, Shriberg made reference to the *rhotacist*[2] or specialist in the correction of /r/ errors. Although I hesitate to consider myself such a specialist, for purposes of this book, I will attempt to serve as your friendly neighborhood rhotacist.

Rather than calling it rhoticism, most clinicians these days just describe the specific error being produced. For example, they may mention a "distortion of /r/" or a "substitution of [w] for /r/." The latter type of error (an overt substitution) is more common in preschool children; such substitutions rarely persist past age 6 years and either resolve into fully correct /r/

[1]In the interests of full disclosure, Shriberg was my doctoral mentor. His early research focused on the treatment of /r/; thus, this book is somewhat of a homage to him.

[2]Shriberg actually attributes the term to John Locke (a researcher in speech pathology, not the 17th-century philosopher).

CHAPTER 8

Treatment Option 3: Adding Supplemental Tactile Feedback

Having discussed traditional articulation therapy and a few modifications to its basic structure, we now turn our attention to a series of options for remediating /r/ that involve supplementing the feedback provided to the client. As mentioned earlier, these approaches are intended primarily to aid in the establishment of the correct target sound. The assumption is that these forms of alterative feedback will be the first step in some systematic therapy structure such as traditional articulation therapy and that the alternative feedback will eventually be faded out over time. The first of these feedback options (which represents our third treatment option overall) is the provision of alternative tactile feedback.

EXTERNAL VERSUS INTERNAL FEEDBACK

Feedback is received during speech either from outside sources (external) or from ourselves (internal). The discussion of feedback thus far has focused on external sources. In particular, in Chapter 5 external feedback was discussed in the context of the principles of motor learning. Specifically, it was discussed in terms of quantity (how much to provide), general type (knowledge of performance versus knowledge of results), and timing (how quickly to provide it). That discussion, however, presumed that the external feedback was verbal feedback provided by the clinician to the client. This is typical speech-language pathologist (SLP) therapy feedback.

It involves telling the client something. For example, in speech sound therapy we might say things such as "that was a good /r/" or "no, you forgot to keep your lips closed" or "did you mean one or run?" In later chapters, other forms of external feedback are discussed, but here the focus is on how to optimize internal feedback.

During speech, we receive internal feedback in several forms. We receive tactile feedback when one articulator contacts another. We receive kinesthetic feedback about the speed and direction of the movement of the articulators. We receive proprioceptive feedback about where the articulators are physically in space at any one moment in time. Finally, we receive auditory feedback (both air and bone conducted) about the acoustic output of the movements. Most of the time there is little or no conscious awareness of the internal feedback being received. In the process of providing external feedback to the client, one goal is to bring the internal feedback to the client's conscious attention. The principles discussed in Chapter 5 are partly intended to optimize that process. We begin with constant feedback on every attempt but wait a few seconds after each attempt before providing it. This allows the client to experience their own feedback. We initially provide specific information about what the client did or did not do correctly (knowledge of performance). This allows them to experiment with the movements or placements and experience both their own feedback and ours. We then slowly reduce the frequency of feedback and switch to only letting them know if their production was correct or not (knowledge of results). This allows them to begin making conscious decisions about what they need to be doing to consistently produce the correct target. This effectively is a form of self-monitoring instruction. We then extend this to encourage generalization by assigning homework that includes specific activities for monitoring their own speech outside of the therapy room.

When verbal feedback is provided, a few basic assumptions are implied. First, it is assumed the client is able to hear what is said; that is why there is always the concern about hearing status. Second, it is assumed that the client knows what is meant by the feedback, and that is why assessing language comprehension skills is so important. And third, it is assumed that they are able to use the feedback we provide together with their own internal feedback to make adjustments to what they are doing with their articulators.

However, despite the fact that the vast majority of children and adults with speech sound disorders have normal hearing acuity and normal language comprehension skills, not all of them seem to benefit equally from our verbal feedback. They are not able to use it to successfully correct their productions. One possible reason for this lack of success might be that even with the best and most appropriately structured verbal feedback, some clients may have limitations in the internal feedback that is available to them.

DIFFERENT KINDS OF INTERNAL FEEDBACK

As mentioned previously, internal feedback is continuously being received during speech. This includes auditory feedback (what you hear), proprioceptive and kinesthetic feedback (the sensation of where the articulators are and the speed and direction of their movements), and tactile feedback (the sensation of touch as one articulator contacts another). The focus in this chapter is on tactile feedback.

THE ROLE OF TACTILE FEEDBACK IN SPEECH

Despite considerable research and speculation, the precise role of tactile feedback in monitoring our own ongoing speech is still poorly understood. A number of studies, conducted mostly from the 1960s through the 1980s, offer some insight particularly relative to the production of /r/ that suggest some direction for therapy.

Tactile Sensitivity and /r/

As discussed in earlier chapters, when /r/ is being produced, contact between the tongue and the rest of the vocal tract appears to be limited. Contact may be made as the sides of the tongue dorsum brace against the upper molar teeth for a bunched /r/ or against the lower molar teeth for a retroflex /r/. That said, although the surface of the human tongue has lots of fast-acting mechanoreceptors that provide tactile feedback, they are not distributed evenly. There are more of these receptors in the front of the tongue compared to the back of the tongue and more in the middle of the tongue compared to the lateral edges (Ringel & Ewanowski, 1965; Trulsson & Essick, 1997). The net result is that given the location of tongue to teeth contact for /r/, even when accounting for tongue bracing, there may be limited available feedback.

Tactile Sensitivity in Individuals With Speech Sound Disorders

Is it possible that individuals with speech sound disorders have reduced sensitivity to whatever tactile feedback is available? Findings from studies using various tasks have yielded mixed results. One study by Fucci (1972) measured sensitivity to vibration in five adults who produced misarticulations (sounds not specified) and five adults with normal speech. Those

who produced misarticulations required a higher amplitude of vibration before they noticed the vibrations on their tongues than typically speaking individuals. This suggested reduced tactile sensitivity. Other studies of tactile sensitivity have used oral-form recognition tasks. These tasks involve placing small objects in the mouth and then asking the person to either describe or identify the shape or decide if two consecutive shapes were the same or different shape or size. Some studies using these tasks have shown poorer skill in children with speech sound errors (Ringel et al., 1970; Speirs & Maktabi, 1990), while other studies found no differences (Arndt, Elbert, & Shelton, 1970; Hetrick & Sommers, 1988). Thus, as a group, it is not at all clear whether individuals with speech sound disorders receive reduced tactile feedback from the oral cavity.

Tactile Sensitivity in Individuals With /r/ Errors

The more important question for our current focus is whether there is something unique about individuals with /r/ errors. Perhaps, only this subgroup, has reduced tactile sensitivity. Findings from at least three studies suggest this may be the case. First, Weinberg, Liss, and Hillis (1970) tested a group of 34 older children (12 to 18 years old) with persistent /r/ errors who had been in therapy for at least 2 years. Findings indicated significantly poorer oral form recognition compared to a group of 35 normal-speaking peers.

A second study by McNutt (1977) used two measures of tactile sensitivity and three groups (15 each) of 12- to 15-year-old children. One group had no speech errors, one group had errors only on /s/, and the third group had errors only on /r/. On two-point discrimination (how close together two points could be before they are no longer recognized as being separate points), McNutt found that compared to the other groups, the children with /r/ errors required larger distances before they could recognize two separate points. This difference was observed at three different sites on their tongues. Likewise, on oral form recognition, the children with /r/ errors made significantly more recognition errors than the other two groups. Children with /s/ errors did not differ on either measure from the children with no errors.

A third study by Jordan, Hardy, and Morris (1978) included nine first-grade boys who scored outside the normal range on a single-word articulation test. All produced errors on /r/, and most also produced other errors. A control group included nine boys with no speech errors. Each boy was fitted with a custom artificial palate embedded with five contact sensors (similar to electropalatography [EPG] as described in Chapters 1 and 9 except with fewer sensors). Each sensor was connected via a tiny wire to a different colored light. The boys were trained to light up each color independently (i.e., to contact each sensor by itself). Two to three weeks later, they were brought back and the procedure was repeated, but this

time a topical anesthetic was applied to the tongue before testing. Both groups were able to learn to do the task under both conditions. However, the children with speech errors required significantly more trials to learn the task under both conditions than their normal-speaking peers.

Together the findings from these three studies suggest the possibility that at least some children with /r/ errors have reduced oral tactile sensitivity. Assuming that is true, is it possible that providing supplemental oral tactile feedback might be the key to mastering /r/ for these children?

SUPPLEMENTING TACTILE INPUT

The notion of putting something in the mouth to assist with speech sound learning is not new. Clinicians have long been known to use tongue blades, ice chips, or flavored cotton swabs to raise intraoral awareness or to demonstrate the correct placement for a sound. For children who substitute /t/ for /k/, it is not uncommon for clinicians to use a tongue depressor to hold down the tongue tip to force the back of the tongue to come up to the velum for correct closure for /k/. Recall also from Appendix 6–1 the use of tongue depressors (as bite-blocks) in the Systematic Articulation Training Program Accessing Computers (SATPAC) method for eliciting /r/. Like so much of what is done in traditional articulation therapy, however, there has been limited systematic validation of such procedures. Clinicians incorporate them but do not usually evaluate them in any systematic way (but see Ruscello, 1995b, for a discussion of some early attempts). They typically try one thing and see if it works for a particular client. If it does, that is great, but if it does not, they simply try something else.

The approaches discussed in the following sections all assume that supplemental tactile feedback may be key to remediation of speech errors for some children. In each case, the goal is to be more systematic in the development of specific tools or approaches to do so.

SUPPLEMENTAL TACTILE INPUT AS FEEDBACK

Recall from Chapter 5 (under principles of motor learning) that when SLPs provide their verbal feedback, they are either telling the client (a) whether or not they were placing or moving the articulators correctly (knowledge of performance [KP]) or (b) whether or not the speech target was produced correctly (knowledge of results [KR]). It was also noted that the available evidence suggests that therapy should likely start with providing KP and then slowly switch to providing KR. Making this change allows the client to become their own therapist by combining the KR feedback with the feedback they receive from their own articulators and what they hear.

With supplemental tactile feedback, the client is effectively receiving KP. They learn more about what the articulators are doing. To be consistent with principles of motor learning, the tactile feedback must therefore be faded out over time to allow this switch to using their own feedback to take place. The idea that tactile feedback will not automatically generalize to speech without that supplemental feedback is also supported by a number of studies of other kinds of supplemental feedback (e.g., Fletcher et al., 1991; Gibbon & Paterson, 2006; McAlister Byun & Hitchcock, 2012; McAllister Byun, Hitchcock, & Swartz, 2014).

Box 8–1

Alternative feedback is intended largely for the establishment phase of therapy.

As therapy progresses to stabilization and generalization, the new feedback must be faded out.

SPEECH BUDDIES

An SLP and an engineer walk into a bar. Although it sounds like the opening line to a joke, it loosely describes how one approach to providing supplemental tactile feedback for speech sound intervention was born. Gordy Rogers (the SLP) and Alexey Salamini (the engineer) were good friends in high school who continued close contact through college and beyond. At some point after graduate school, they met up, and (as friends often do) they were sharing work stories. As they tell it, Rogers was lamenting his challenges with helping some of his clients achieve correct placement and movement for speech sounds. Salamini suggested that technology might be able to help. Perhaps they could come up with a device or a set of devices to place in the mouth to assist, and the idea for Speech Buddies was born (Rogers, personal communication, 2011).

Rogers and Salamini immediately saw the possibility of such devices both as a way to assist other SLPS and as a business opportunity. To create a viable business, they also knew they would have to be much more systematic in their approach. They fine-tuned their designs and worked with some manufacturers to develop a consistent process to build them. They then registered Speech Buddies as Class I medical devices with the U.S. Food and Drug Administration (FDA).[1] They ended up creating five

[1]Being registered is not the same as being approved. Registered simply means that the FDA has reviewed the manufacturing procedures and determined that these devices are