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PRONUNCIATION LEARNING STRATEGIES THAT IMPROVE ESL LEARNERS' LINKING

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This study explores the long-term effects of empowering 38 international graduate students with pronunciation learning strategies that they can use to improve their ability to link sounds within and across words. The effects of instruction are investigated through a mixed-method analysis that triangulates data from (a) a read-aloud test administered and recorded twice during the course, and again five months to two years after the course ended; (b) the same read-aloud test administered nine months after the testing in (a) to 23 of the 38 participants; (c) learners' responses to two questionnaires and a survey; and (d) the researcher's notes. The results reveal that students maintain a significant improvement over time regardless of their native language, gender, and length of stay in the US prior to instruction. There are, however, other learner characteristics and factors that seem to contribute to greater or lesser improvement over time. This paper identifies the pronunciation learning strategies taught for improving students' ability to link sounds, analyzes the factors contributing to lesser or greater improvement over time, and discusses the results and pedagogical implications of the study.

INTRODUCTION

This study explores empirical evidence in support of the Covert Rehearsal Model (CRM) (Dickerson, 1989, 1994, 2000; Hahn & Dickerson, 1999a, 1999b) for improving non-native students' (NNS) ability to link (or combine) sounds within words and at word boundaries without changing their phonetic qualities, as in (1), (2), (3), and (4), or by inserting a brief /j/ or /w/ sound between the sounds, as in (5):

- (1) Type 1 – Consonant-to-Vowel Linking: *an error*; *is awesome*; *give in*
- (2) Type 2 – Consonant-to-Same-Consonant Linking: *some music*; *Sue's snake*;
- (3) Type 3 – Consonant-Stop-to-Other-Consonant-Stop Linking: *enthusiastic dad*; *adept*
- (4) Type 4 – Consonant-to-Similar-Consonant¹ Linking: *come back*; *improve further*
- (5) Type 5 – Vowel-to-Vowel Linking: *so exciting*; *diagonal*; *go in*; *play out*

CRM is a recursive process that comprises six key components (Dickerson, 2000):

1. Privacy
2. Oral practice
3. Speech monitoring

¹ Similar consonants are two adjacent consonants made in the same, or nearly the same, place in the mouth. When linked correctly, there is a change of articulation or voicing, but no break (as defined in Hahn & Dickerson, 1999a).

4. Comparing the performance with other models
5. Changing the performance to match the models
6. Practicing the changed performance aloud until fluent

CRM's goals are not only to improve students' ability to hear and articulate English sounds, rhythm, and melody, but also to improve their ability to predict the sounds, rhythm, and melody in words and phrases through the use of orthographically motivated rules and strategies (Hahn & Dickerson, 1999a, 1999b), such as those in (1)-(5) above for improving linking. CRM's instructional goals adhere to the goals of second language strategy research: Learning will be facilitated if students are more aware of and proficient in the use of a broad range of strategies that they can consciously select and use during language learning (Cohen, 1998; Weaver & Cohen, 1994).

Teachers implementing CRM, just as those pursuing strategy instruction (e.g., Chamot, Barnhardt, El-Dinary & Robbins, 1999; Oxford, 1996), explicitly teach students how, when, and why strategies can be used. During private practice, students learn to monitor and evaluate the relative effectiveness of their strategy use, and more fully develop their L2 comprehension, their problem solving skills, and their repertoire of useful strategies for pronunciation improvement. The kind of language produced in covert rehearsal is rehearsed speech focused on form. It is not spontaneous production. While engaged in CRM, students can practice aloud, use different pronunciation strategies, and monitor rule-use without distraction. In this way, CRM promotes students' autonomy and self direction, and empowers them to improve on their own after instruction ends.

RELEVANT LITERATURE

Despite arguments supporting instruction on both prosodic features and connected speech phenomena for improving NNS' fluency and intelligibility (Anderson-Hsieh, 1990; Brown & Kondo-Brown, 2006; Celce-Murcia, Brinton, & Goodwin, 2010; Dauer, 1992; Morley, 1994; Pennington & Richards, 1986), research evidence supporting such instruction has mostly focused on suprasegmentals like English stress and intonation (e.g., Benrabah, 1997; Derwing & Munro, 1997; Derwing, Munro & Wiebe, 1998; Field, 2005; Hahn, 2004; Kang, 2010; Pennington & Ellis, 2000; Sardegna, 2006, 2008, 2009). The few research studies that have investigated linking in the connected speech of NS and NNS suggest that linking is a marker of fluent speech (Alameen, 2007; Anderson-Hsieh, Riney, & Koehler, 1994; Hieke, 1984) and that native speakers' (NS) linking affects NNS' listening comprehension (Henrichsen, 1984). Unfortunately, very little is known about what affects the acquisition of linking and whether it can be learnable through explicit instruction.

Without studies investigating the effects of receiving instruction on linking, it is uncertain whether improved linking through instruction improves NNS' intelligibility or their listening comprehension of NS speech. Yet, despite lack of support from learnability studies, many English pronunciation textbooks teach linking through pronunciation rules and strategies (e.g., Celce-Murcia et al., 2010; Dauer, 1993; Gilbert, 1993; Grant, 2001; Hahn & Dickerson, 1999a; Hewings & Goldstein, 1998).

Studies that have looked at pronunciation strategies have mostly investigated learner's choices of strategies without prior instruction (Eckstein, 2007; Osburne, 2003; Peterson, 2000). In a different approach, Sardegna (2009) explored the long-term effectiveness of teaching students pronunciation strategies to improve English stress privately, and found strong evidence supporting instruction on CRM: over time participants improved significantly their ability to stress words, constructions, and phrases. The study also identified factors that may contribute to greater or lesser improvement with English stress: students' entering proficiency levels and degree of improvement with English stress during the course; their motivations and urgent need to improve their English stress; their prioritization to practice English stress in private; and the quality and, especially, the frequency with which they engaged in covert practice.

The present study answers calls for further research on the long-term effectiveness of pronunciation instruction (Derwing & Munro, 2005; Sardegna, 2009) and strategy instruction (Cohen & Macaro, 2007; Rees-Miller, 1993; Rubin, Chamot, Harris, & Anderson, 2007; Sardegna, 2009). It also answers calls for establishing methods to teach linking to non-native speakers (Alameen, 2007). More specifically, this study attempts to explore CRM's efficacy for teaching linking, and identify the factors that may facilitate or hinder its acquisition.

As this study examines students' improvement with linking while reading aloud, it makes no claims about their improvement in free speech. The analysis is therefore limited to three specific research questions:

1. What are the *short-term* effects of teaching ESL students how to improve linking during covert rehearsal as demonstrated in their reading of a passage at the beginning and end a four-month pronunciation course?
2. What are the *long-term* effects of teaching ESL students how to improve linking during covert rehearsal as demonstrated in their reading of a passage before instruction and from 5 to 38 months after instruction?
3. What factors contribute to greater or lesser improvement over time?

METHOD

Characteristics of the Pronunciation Course: The Teaching Intervention

The course used in this study was for international students at an American university. It taught students how to use pronunciation learning strategies to improve their oral English outside of class. It met for fifty minutes three times a week for four months. The materials, activities, and pronunciation rules given to students followed Dickerson's (1989; Hahn & Dickerson, 1999a) Covert Rehearsal Model (CRM). The basic premise of the model is that teachers should aim at equipping students with the predictive skills, pronunciation rules, and strategies that they need to work on the accuracy of their speech in private.

During the course, students learned a wide repertoire of pronunciation strategies. They also received written and oral feedback both during regular classroom activities and in five thirty-minute private meetings with the instructor. Both the training and feedback focused on improving students' most problematic pronunciation features as identified through a test

administered at the beginning of the course. The targeted features included segmental, suprasegmental, and connected speech features. Therefore, linking was just one of the instructional targets.

To improve their oral skills, students could use any combination of prediction, production, and perception strategies, either simultaneously or in sequence, while they worked under each of the six conditions for practice out of class delineated by CRM. For example, students could use the following combination of strategies for practicing linking:

1. *Privacy*: Find a place to work in private (no strategies involved).
2. *Oral Practice*: Retrieve stored information on how to divide long sentences into meaningful messages units, and on how to link the sounds within those units (remember not to link sounds across message units). Analyze the spelling and apply orthography-based prediction rules for linking (e.g., those listed on Hahn & Dickerson, 1999a, pp. 48-54) to figure out which sounds you should link and how you should pronounce them. Then read the predicted linked sounds aloud for smoothness of articulation.
3. *Speech Monitoring*: Evaluate the accuracy and fluency of your production as you read the phrases aloud many times, use backward build-ups, and apply visual guides (such as a line linking the sounds) to help you focus on the targeted sounds for linking.
4. *Comparing the Performance With Other Models*: Compare your production to a recording of the text, other sources that illustrate the same linking sound(s), or your own models from memory.
5. *Changing the Performance to Match the Models*: After consulting those sources/models, make all the necessary changes, and repair utterances or predictions to match the models.
6. *Practicing the Changed Performance Aloud until Fluent*: Practice the changes by reading aloud the phrases a number of times; and monitor your performance while you practice.

This list of strategies is by no means complete or exhaustive, but rather illustrative of the choices learners have. Students could use these cognitive and metacognitive strategies, simultaneously or in sequence, to predict, produce, and listen for one or more targets. In fact, the output of the process can, and often does, serve as the input to another round of the process.

Participants

Thirty-eight international graduate students (16 females and 22 males) from eight sections of this pronunciation course volunteered to participate in the study. All sections were taught by the same instructor and followed the same syllabus. The participants' ages ranged from 22 to 47 years old. Their native languages were: Chinese (19), Vietnamese (6), Korean (4), Thai (3), Turkish (3), French (1), Portuguese (1), and Spanish (1). The university had made the course a

graduation requirement for 22 of them due to their poor oral performance on the university's ESL Placement Test (EPT). The EPT consisted of an oral exam in which students talked about a topic and read some materials. Of the remaining 16 participants, half took the course because the EPT results recommended them to do so, while the other half took it for personal reasons. A total of 21 participants took the course on their first semester of graduate studies in the US, and eight on their second semester. The remaining nine had not been in the US for more than two years.

Experimental Design

The effects of instruction were investigated through a mixed method analysis that triangulated data from (a) pronunciation accuracy scores from a read-aloud test taken three times by all participants in a period from 18 to 29 months, (b) pronunciation accuracy scores of the same test in (a) taken nine months after the third test by only 23 of the 38 participants, (c) responses to two questionnaires and a survey, and (d) the researcher's notes on participants' comments about their practice in covert rehearsal.

Quantitative data were accuracy scores with respect to linking sounds within and across words from a pre-test (Test #1) and three post-tests (Test #2, Test #3, and Test #4). Using the same test four times allowed for an objective measure of students' progress over time. During the test, participants were told to monitor their production of *all* the target areas studied during the course, and not just focus on linking sounds correctly. Given the duration of the test (15-20 minutes), the number and variety of targets under assessment (segmental, suprasegmental, and connected speech features), and the time that passed between the tests (depending on the student and testing time, from 4 to 25 months), it seemed unlikely that the students would remember the words or sentences in the materials, and if they did, they had no way of knowing what targets were in focus for assessment and in what words or sentences. For example, linking targets were randomly identified for assessment forty times in a long passage, but the materials included not only the passage, but also a list of 22 words and 6 dialogs with other features targeted for assessment. Once a student finished reading the materials aloud, the percentage of incorrect verbal responses for each linking target marked on the rater's template was calculated by dividing the frequency of ticked responses by the total number of targeted instances. The result of this calculation constituted the participant's score for linking on that test.

All participants took Test #1 at the beginning of the course (Time 1/T1), Test #2 at the end of the course (Time 2/T2), and Test #3 from 5 months to 25 months after the course ended (Time 3/T3). The time between T2 and T3 was purposely varied to evaluate whether the variable "length of time after the course" significantly affected student progress. Participants were divided in three groups according to that variable: Group 1 = 5 months, Group 2 = 9 months, and Group 3 = 13-25 months. Only 23 of the participants took Test #4 nine months after Test #3 (Time 4/T4) because the others either graduated before it was administered, or withdrew from the study after T3. The time that passed between T3 and T4 was constant (9 months) because the purpose of Test #4 was to assess whether the trend observed from T2 to T3—forward or backward progress, or maintenance of performance—changed from T3 to T4. The percentage of participants that took Test #4 (60.5%) was considered large enough to generalize findings to all the participants in the study and to other studies of this kind. Table 1 shows the number of students and the time that passed between tests for each group.

Table 1. *Months Between Tests for Each Group*

Groups	N	Test #1 to Test #2	Test #2 to Test #3	Test #3 to Test #4	Total
1	9	4 months ^a	5 months	9 months	18 months
2	18	4 months	9 months	9 months	22 months
3	11	4 months	Over 13 months (13-25 months)	9 months	26-38 months

^a Duration of the pronunciation course.

Qualitative data were collected through two questionnaires and a self-report survey that all participants completed at T3 and T4. The questionnaires elicited information about their practice in covert rehearsal, and personal information, such as their native language, age, gender, and length of stay in the US prior to instruction. The self-report survey gathered detailed information about students' use of pronunciation strategies in the intervening months. Students had to identify the strategies used and specify how much they had used them by choosing a number from 1 to 5 in a Likert scale. To minimize the limitations of self-reported data (as reported in White, Schramm, & Chamot, 2007), the information gathered through these methods was triangulated with participants' test scores, and their oral comments during testing times.

RESULTS

Improvement was calculated against a 100 percent base. For example, students' short-term improvement was calculated by subtracting their T1 mean percentage scores from their T2 mean percentage scores, and so on. A repeated measures ANOVA test was used to examine the overall time effect on students' performance from T1 to T3. This test measures participants' scores across each of the testing times and indicates whether their overall means differ significantly. The results revealed that students' performance differed significantly ($df\text{-within} = 2$; $df\text{-error} = 74$; $F = 111.866$; $p = 0.000$). Pairwise comparisons were computed to determine which mean differences were significant. Table 2 provides the mean percentage scores, standard deviations, and observed maximum and minimum scores for T1, T2, and T3 for the 38 participants. Table 3 shows the results of the pairwise comparisons. These comparisons revealed that participants' test scores increased significantly (30.99 percent, $p = 0.000$) during the course and, although their scores decreased significantly (-8.16 percent, $p = 0.000$) by T3, there is still a significant change (22.83 percent, $p = 0.000$) from T1 to T3 in students' performance (see student progress in Figure 1).

Table 2. Descriptive Statistics for the Mean Percentage Scores for all Participants at T1, T2, and T3

Test	N	M	SD	Minimum	Maximum
Test #1	38	52.171	13.964	12.5	75
Test #2	38	83.158	9.403	65	95
Test #3	38	75.000	12.053	42.5	95

Table 3. Pairwise Comparisons for Linking for 38 Participants that Took Test #1, #2, and #3

Pair	Difference	Pair 1	Pair 2	<i>p</i> -value ^a
Test #1-Test #2	-30.987*	52.171	83.158	0.000
Test #2-Test #3	8.158*	83.158	75.000	0.000
Test #1-Test #3	-22.829*	52.171	75.000	0.000

*The mean difference is significant at the 0.05 level. ^aAdjustment for multiple comparisons: Bonferroni

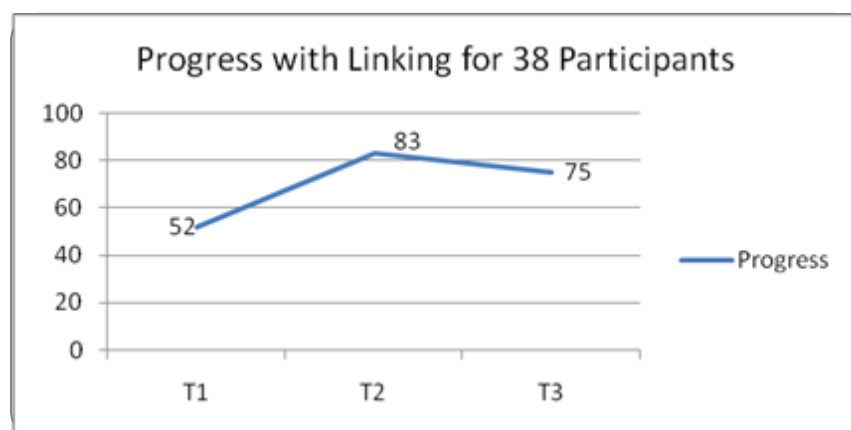


Figure 1. Mean Percentage Scores at T1, T2, and T3 for 38 participants.

Because change in accuracy levels from T1 to T2, and from T2 to T3 could result from a combination of factors unrelated to instruction and/or practice in covert rehearsal during and after the course, two Fixed Effects Models were computed to detect any possible variables affecting progress from T1 to T2 and from T2 to T3. Fixed Effects Models were preferred for these computations to ANOVA because these models do not assume balanced designs like

ANOVA. The factors possibly affecting T1-T2 progress were: native language, gender, length of stay in US prior to instruction, and accuracy level for linking at T1. The model revealed that the only significant factor was accuracy level for linking at T1 [$F(1,26) = 49.201, p = 0.000$, Table 4]. This factor had a strong negative correlation with degree of progress between T1 and T2 ($r = -0.770$ at $p = 0.000$), indicating that the higher the level of accuracy at T1, the smaller the improvement achieved from T1 to T2.

Table 4. *Type III Tests of Fixed Effects for Improvement in Linking From T1 to T2*

Source	Numerator <i>df</i>	Denominator <i>df</i>	<i>F</i>	<i>p</i> -value
Intercept	1	26	124.669	0.000
Language	7	26	1.676	0.159
Gender	1	26	0.091	0.766
Length of Stay in US Prior to Instruction	2	26	0.606	0.553
Accuracy Level for linking at T1	1	26	49.201	0.000*

Dependent Variable: Progress from T1 to T2. *Significant at the .05 level.

The Fixed Effects Model to detect variables affecting progress from T2 to T3 included three factors—group (i.e., length of time between T2 and T3), language, and gender,—and two covariates—progress from T1 to T2, and practice with linking (i.e., amount of practice in covert rehearsal²). Despite the differences in testing time at T3 for the three groups, the test detected no significant difference among the groups [$F(2,25) = 1.383, p = 0.269$]. We therefore conclude that length of time between T2 and T3 did not significantly affect students' scores at T3 (see Table 5).

Table 5. *Type III Tests of Fixed Effects for Improvement in Linking From T2 to T3*

Source	Numerator <i>df</i>	Denominator <i>df</i>	<i>F</i>	<i>p</i> -value
Intercept	1	25	1.990	0.171
Group	2	25	1.383	0.269
Language	7	25	0.954	0.485
Gender	1	25	0.050	0.826
Progress During the Course	1	25	5.940	0.022*
Practice with Linking	1	25	6.817	0.015*

Dependent Variable: Progress from T2 to T3. *Significant at the 0.05 level.

² This amount corresponds to the sum of activities students reported doing to improve linking from T2 to T3 in their self-reported survey at T3.

In fact, the model detected significant differences with two other variables: (a) progress during the course (that is, percentage of improvement with linking from T1 to T2) [$F(1,25) = 5.94, p = 0.022$], and (b) students' amount of practice with linking from T2 to T3 [$F(1,25) = 6.817, p = 0.015$]. The estimate of these covariance parameters was significant ($p = 0.000$) and their association with T2-T3 progress was large enough for two separate but related variables: $r = -0.427$ at $p = 0.004$ for T1-T2 progress, and $r = 0.503$ at $p = 0.001$ for practice with linking. T1-T2 progress negatively correlated with T2-T3 progress, indicating that the higher the percentage of increase in accuracy from T1 to T2, the higher the percentage of decrease in accuracy from T2 to T3. Practice with linking positively correlated with T2-T3 progress, indicating that the more students practiced, the greater their improvement.

With Group having no significant effect on student performance at T3, it was possible to compare means across testing times for the group as a whole. This comparison revealed a clear group trend (Figure 1): significant improvement during and after the course both regardless of the time that passed after T2 and despite the significant decrease in accuracy from T2 to T3. This trend was evident in 30 of the 38 participants. Only eight participants increased their accuracy level from T2 to T3: S#5 by 2.5 percent; S#1, S#2, S#18 by 5 percent; S#22 and S#36 by 7.5 percent; S#24 by 10 percent; and S#25 by 15 percent. The others, with rare exceptions, all decreased generally but by not more than 10 percent. Besides amount of practice, students with higher improvement or maintenance of improvement at T3 reported frequency of practice, high internal/external motivations to improve, such as aspiring to get financial aid with better pronunciation, and prioritization of practice with linking over other targets. For example, S#24, who improved 10 percent from T2 to T3, reported "*I practice once a week at home. I read the newspaper aloud.*" The researcher also observed that some students who did not improve as much despite having reported large amounts of practice were in fact not practicing in the manner instructed during the course. The quality of their practice mattered, too.

To test maintenance of improvement, 23 of the 38 participants (60.5 percent) were tested a fourth time nine months after T3. A repeated measures ANOVA test was used to examine the overall time effect on students' performance from T1 to T4 for the students who took all four tests. The results revealed that students' performance differed significantly over time ($df\text{-within} = 3; df\text{-error} = 66; F = 56.887; p = 0.000$). Pairwise comparisons were also computed to determine which mean differences were significant (Table 6).

Table 6. *Pairwise Comparisons for Linking for the 23 Students that Took Tests #1, #2, #3, and #4*

Pair	Difference	Pair 1	Pair 2	^a <i>p</i> -value
Test#1-Test #2	-32.826*	49.783	82.609	0.000
Test #2-Test #3	9.783*	82.609	72.827	0.001
Test #3-Test #4	-0.3261	72.827	73.152	0.890
Test #1-Test #3	-23.043*	49.783	72.827	0.000
Test #1-Test #4	-23.369*	49.783	73.152	0.000

*The mean difference is significant at the 0.05 level. ^aAdjustment for multiple comparisons: Bonferroni.

These results indicate a clear trend in students' performance over time for improving linking: a large and significant improvement from T1 to T2 (around 33 percent, $p = 0.000$), a significant decrease after intensive instruction from T2 to T3 (around 10 percent, $p = 0.001$), and a plateau from T3 to T4 ($p = 0.890$). Despite students' significant decrease in accuracy from T2 to T3, they maintained a significant change from T1 to T3 (23 percent, $p = 0.000$) and from T1 to T4 (23 percent, $p = 0.000$). In fact, there was almost no difference in progress between T1 and T3, and T1 and T4. Figure 2 shows students' overall performance from T1 to T4.

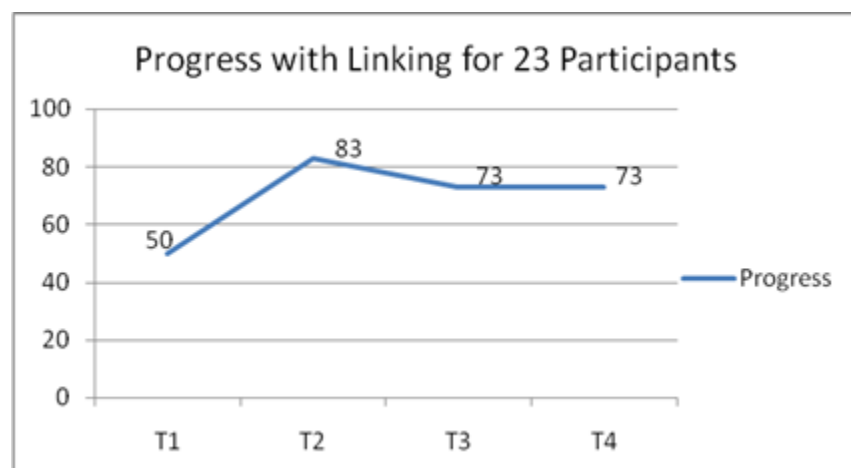


Figure 2. Mean Percentage Scores at T1, T2, T3, and T4 for 23 participants.

DISCUSSION

The evidence from the scores at T1 and T2 as a group (31 percent increase for 38 participants; 33 percent increase for 23 participants) is strong enough to answer research question #1 in the affirmative. Participants clearly showed short-term improvement with linking while reading aloud (Tables 3-6). After four months of instruction on and practice with pronunciation learning strategies for improving linking, students' scores increased significantly. The evidence from the participants' scores from T1 to T3/T4 as a group is also strong enough to answer research question #2 in the affirmative: participants clearly showed long-term improvement with linking while reading aloud. Their scores increased significantly from T1 to T3/T4 (9-34 months after instruction) despite their decrease in accuracy from T2 to T3 (see Tables 3-6) and regardless of the time that passed between T2 and T3 (see Table 5).

In fact, a close look at students' individual scores from T1 to T2, and from T1 to T3 revealed that all participants improved short-term and long-term regardless of individual learner differences. The results indicate that the methodology used during the course may have facilitated such improvement. Like Derwing et al.'s (1998) study, these findings provide evidence in support of the effectiveness of pronunciation instruction. The results also support Dickerson's (1994) claim in favor of empowering students with explicit pronunciation rules that they can use to self-correct and self-monitor their speech production. In addition, they extend the results reported in Sardegna (2009) with respect to English stress to linking. More research is needed to extend this result to other suprasegmentals and to segmentals. Also, to make a stronger claim on the efficacy of the methodology used, the results of instruction should be compared to other studies of the same kind utilizing other methodologies or with groups of students receiving no instruction.

This study's experimental design allowed testing for variables other than "receiving no instruction" which shed some light into the factors contributing to greater or lesser individual short and long-term progress with linking. Differences in improvement during instruction could not be predicted on the basis of students' gender, language background, or length of stay in the target language community before instruction, but it could be predicted on the basis of students' entering proficiencies with linking. Students with a higher level at the beginning of the course improved less than those with a lower level, which corroborates findings from research on other pronunciation features targeted during instruction (Dickerson, 2002; Sardegna, 2006, 2009). Hence, entering proficiencies seem to be strong indicators of students' ultimate accuracy levels at the end of the course.

Maintenance of learning after a course provides evidence that the short-term improvement achieved during intensive instruction is lasting and, therefore, effective (Beebe, 1988; Sardegna, 2009). The study corroborates claims (Beebe, 1988; Sardegna, 2008, 2009) that, after receiving pronunciation instruction, and improving as a result of that instruction, students generally decrease in accuracy, or as Beebe puts it, suffer phonological "backsliding." This trend, therefore, seems to be indicating how pronunciation development takes place: students tend to decrease their accuracy somewhat after increasing it during intensive instruction.

In addition, the study revealed two factors that may have contributed to differences in individual improvement after the course: practice in covert rehearsal and T1-T2 improvement. The more students practiced after the course, the more they improved or maintained the level of

improvement achieved during the course; the higher their improvement during the course, the more they decreased in accuracy at T3. It appears that before students reached a plateau (observed from T3 to T4), they decreased in accuracy, and that decrease tended to be larger if there had been a high increase in accuracy during the course, and especially for those students who reported no or little practice after the course ended. Students' comments revealed three other factors that may have contributed to student differences from T2 to T3: students' frequency and quality of practice, their motivations to improve, and their choice of linking for focused practice.

With this information, we can now answer research question #3: What factors contribute to greater or lesser improvement over time? The factors that may contribute to greater or lesser improvement with linking are the following:

1. Entering proficiency level with linking.
2. Degree of improvement with linking during the course.
3. Quantity, quality, and especially frequency of practice with linking in covert rehearsal.
4. Strong intrinsic and extrinsic motivations to improve.
5. Prioritization of linking over other targets for focused practice.

These factors closely match those reported in Sardegna (2009) for long-term improvement with English stress. It would be interesting to investigate whether these factors also affect long-term improvement with segmentals as well as with suprasegmentals other than English stress.

Also, just like with English stress, students' production stabilized a few months after the course. Students reached a new plateau (see T3 and T4 mean scores in Figure 2). This observation is another indicator that it was the course that was effective in producing a long-lasting effect on students' linking, and not just the students' willingness to improve. In as little as five months after instruction, students' focused practice or motivations did not seem to make much difference, which would explain why the different testing times between T2 and T3 did not affect much the overall group trend, or students' individual scores. As this study shows, to make long-lasting improvements, students first need to improve significantly (which they can only do through intensive instruction). Decrease in accuracy after the course, followed by a plateau, is to be expected. Yet, what students do immediately after the course seems to influence the expected initial decrease.

PEDAGOGICAL IMPLICATIONS

Pronunciation progress is gradual, and does not happen overnight (Dickerson, 1989). It depends on students' considerable commitment of time and effort to improve (Acton, 1984; Murphy, 1991). This study shows that teaching for empowerment provides students the resources they need to improve linking on their own during and after the course. Improvement using this methodology is lasting and effective. It puts the burden on the students, and makes them responsible for their own progress.

However, teachers should be realistic about what to expect from a pronunciation course. Students do not generally progress much on their own after the course ends. In fact, they generally decrease in accuracy by about 10 percent, or more if there was a high increase (e.g., more than 30 percent increase) from T1 to T2. However, if their increase in accuracy during the course is high, they have a high chance of maintaining that accuracy (and not decreasing much)

if they continue their practice in covert rehearsal in the few months following the course. Frequent practice in covert rehearsal makes students focus on forms, systematically, and with accurate rules and models, thereby consolidating the strategies, sound articulations, and melody of English. This practice seems to help students slowly internalize the rules, thereby requiring less processing and practice time. If that is the case, then accuracy changes evidenced in students' ability to stress and link sounds should also eventually become evident in extemporaneous speech. A fruitful avenue for future research would be to test this hypothesis.

It is also hypothesized that, if teachers control somewhat the factors contributing to greater improvement, students may have higher chances of success.

1. Through constant feedback, a teacher can increase students' motivations to work in covert rehearsal. Recognition of students' achievements may increase their sense of self-efficacy (Zimmerman, 2000) and their willingness to continue working on their own after the course ends.
2. A teacher can gauge students' prioritizing and focused practice by providing them with frequent assessments. Students that finish the course knowing what areas they still need to improve are more likely to prioritize practice in those areas after the course ends.
3. A teacher can develop materials that increase quality, quantity, and frequency of practice, and post them online. Students are more likely to continue using the same materials after the course ends if these are readily available for their practice in private.

CONCLUSION

This study provides evidence in favor of CRM for improving students' ability to link sounds within and across words while they read aloud. Students significantly improved over time despite an initial decrease in accuracy after the course ended. Five factors were found to contribute to greater or lesser improvement over time:

- Entering proficiency level with linking
- Degree of improvement during the course
- Quantity, quality, and especially frequency of practice in covert rehearsal after instruction
- Strong intrinsic and extrinsic motivations to improve
- Prioritization of one target over another for focused practice

Teachers can increase students' chances of long-term pronunciation improvement by providing the resources they need to work on their own, and helping them develop a sense of self-efficacy. Students who believe that they can positively change their pronunciation on their own are more likely to engage in covert practice and improve as a result.

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