

A brief history of shadowing

An oft-cited definition of shadowing is the following:

“Shadowing is a paced, auditory tracking task which involves the immediate vocalization of auditorily presented stimuli, i.e. word-for-word repetition, in the same language, parrot-style, of a message presented through headphones” (Lambert, 1988, p. 266). This form of shadowing, characterized by an extremely short reaction time between aural reception and vocal production, is known as *phonemic shadowing*. Although this is the most widely recognized form of shadowing, some cognitive psychologists make a distinction between this form and *phrase shadowing*, where the subjects listen to and shadow longer semantic chunks (Norman, 1976).

Shadowing was originally used in cognitive psychology as a way of testing selective attention. In general, subjects in such experiments are required to shadow a passage played to them through headphones while simultaneously performing a task that is unrelated to the shadowing. The shadowing usually acts as a distractor that diverts attention from, and negatively affects performance on, the other task.

Shadowing has also been used as a technique for training simultaneous interpreters (Tanaka, 2002). The idea behind trainees performing shadowing tasks is that one must become able to listen and speak simultaneously in the L1 before moving on to simultaneous cross-language listening and speaking. While this idea is widely accepted in Japan, it is not the case in other countries, where opinion is divided between those who favor it and those who feel it is inefficient, detrimental, and even dangerous for emphasizing simple repetition over analysis. Strong evidence for either

view, however, is still lacking (see Appendix 1 for more on this topic).

Shadowing has only recently come to be used as a pedagogical technique in language education. Recent years have seen shadowing tasks included in commercially available ESL textbooks, but usually as short supplemental tasks. The concept appears to be even more widely accepted in Japan, as several books designed specifically for the Japanese market focus on shadowing as a core fluency-building technique (Tamai, 2005a, 2008; Okazaki & Nitta, 2006).

Shadowing in SLA pedagogy

With its long history of use as a distractor in cognitive psychology, and its somewhat contentious use as a training tool for increasing the cognitive processing capacity of interpreters, it is hardly surprising that second language acquisition (SLA) researchers have shied away from conducting research on shadowing as a pedagogical tool. After all, shadowing is unnatural behavior; the human brain is not able to simultaneously process input and output, at least not effectively, without first receiving specialized training.

Cognitive psychologists conducted much of their seminal research on human memory in the 1950s and 1960s. As George Miller first hypothesized in “The Magical Number Seven, Plus or Minus Two” (1956), human brains appear to have a limited channel capacity, and most evidence seems to support the notion that information overload will result in selective or serial processing, whether it be through a

cognitive filter (Broadbent, 1958) or similar information bottleneck mechanisms (Norman, 1968). The act of simultaneous interpreting—and by association shadowing—requires simultaneous attention to listening, speaking, and listening to one’s own verbal output. The evidence suggests that such a large number of input streams imposes a cognitive load on the human brain that is both unnatural and strenuous.

Experiments measuring comprehension after simultaneous interpreting and shadowing have produced mixed results, with comprehension generally poor with short latencies (i.e., closer to phonemic shadowing) but better with longer latencies (i.e., closer to phrase shadowing) (Welford, 1968; Chistovitch, Aliakrinskii, & Abilian, 1960; Gerver, 1974; Carey, 1971) (see Appendix 2 for a summary of shadowing research in the Japanese literature).

Reducing the cognitive load

If shadowing is a cognitively unnatural activity that is not applicable to real-life discourse, why force it upon our students? This commonsense argument against shadowing as a language teaching tool is an understandable one, yet an increasing amount of anecdotal evidence suggests that shadowing can produce positive results. In our study, students were assigned shadowing tasks for homework only after they had studied the shadowing passages in class. It is likely that prior exposure to the content significantly eases the cognitive load. Although students were not allowed to read the script while performing the shadowing task, it can be surmised that they were already familiar with the topic, vocabulary, and much of the content prior to performing the task.

Thus, the form of the task implemented in the present study falls somewhere in between full-fledged phonemic shadowing and synchronized/parallel reading. (Shadowing requires the student to rely solely on aural cues, while parallel reading allows the student to both listen to and read the text while reciting it.) Phonemic shadowing was chosen over phrase shadowing in order to reduce the syntactic processing that is required; the study was designed to assess the effect of shadowing on pronunciation and, by reducing the other factors that come into play with phrase shadowing, the effects of the task on the prosodic features of pronunciation (vocal effects that extend over more than one sound segment in an utterance, such as pitch, stress, and juncture) could be more confidently inferred. It can be said that, for foreign language learners, prosody deserves increased attention in comparison to other features of pronunciation, as it strongly influences perceptions of how native-like a learner’s accent is (Cruz-Ferriera, 1989; Sugito, 1989).

University overview and needs analysis

The present study was conducted at Kyushu Sangyo University (KSU), a private university in Fukuoka, Japan, with approximately 11,000 students. Although English is not offered as a major, it is a required subject for all freshman and sophomore students. Classes are held twice a week: one with a Japanese teacher (reading, writing, grammar) and the other with a native English speaker (listening, speaking, vocabulary). Classes range from 20 to 30 students. Motivation to learn English is generally low. Leaving the pros and cons outlined in the previous section aside,

shadowing was chosen as a homework task for the following reasons:

1. It lends a participatory element to listening tasks, which can often be passive in nature.
2. It is a way to bridge listening and speaking skills.
3. It gives listening assignments an observable output.

The final reason is especially important for large institutions like KSU where there are limited opportunities for students to use English. Large, infrequent classes limit student exposure to the teacher, and in-class communicative activities among native Japanese speakers, in our opinion, rarely encourage unmotivated students to attempt native-like pronunciation. In contrast, shadowing allows students to focus on their pronunciation and, perhaps most importantly, interact with the listening material for an extended period as independent study, on their own time. A shadowing program can be designed to give a large number of students the opportunity to produce vocal output for homework. Moreover, the simplicity and relative automation of the system allows teacher to easily hold students accountable for this output.

Method

In order to implement a shadowing program that can handle any number of students, the following three software applications were used:

1. Box.net (online file storage) www.box.net
2. Freecorder (mp3 audio recorder—currently available only for Windows) applian.com/sound-recorder

3. Gmail (Web-based email) gmail.google.com

*Student access to Internet-ready computers equipped with headsets is also required.

(see Appendix 3 for a more thorough description of these software applications.)

The students were required to access a specific Box.net URL once a week and record themselves shadowing the assigned audio file using a headset and Freecorder. The recorded mp3 audio file, saved on the desktop, was then sent to the teacher (using the correct plus-address extension—see Appendix 3) as an email attachment. The teacher then quickly listened to the files in Gmail (automatically sorted by class) and graded the assignment for completion. Checking whether the student actually shadowed the audio or simply read the text was easily done by comparing the length of the shadowed audio to that of the original audio.

Ratings by native speakers in a double-blind study

Once a week for 10 weeks, approximately 400 first and second-year university students performed shadowing tasks and sent the audio file of their recorded voice to their teachers via email in accordance with the procedure described above. Again, the task was performed as phonemic shadowing—the recitation of a passage while it is listened to through headphones, with little delay between the listening and speaking. Students recorded the same shadowing file once at the beginning of the semester, before receiving any shadowing instruction, and again at the end of the semester, after completing 10 shadowing assignments over a span of 13 weeks.

Twenty-one students were randomly selected (from those who had completed all 10 shadowing assignments), and 21 audio files consisting of excerpts from their pre and post instruction shadowing recordings were compiled using audio editing software. Each audio file was thus comprised of two shadowing excerpts—one pre and the other post—recited by a single student. The order of the excerpts within each audio file was randomized (i.e. the pre instruction excerpt did not necessarily precede the post instruction excerpt). Eight native English speaking raters listened to the audio files and rated which of the two recordings they thought represented the more natural English pronunciation. The raters were unaware of which recording within each audio file was the post instruction shadowing. To track the effects of shadowing instruction by proficiency level, students were grouped into three proficiency levels: those with TOEIC Bridge scores of 0-100 (hereafter referred to as “Low”), TOEIC Bridge scores of 101-120 (“Mid”) and TOEIC Bridge scores above 131 (“High”).

It should be noted that distribution of scores for the TOEIC Bridge lies mostly below that of the regular TOEIC, with minimal overlap. (A TOEIC Bridge score of 140 equates to approximately 395 on the TOEIC.) The TOEIC Bridge scores of the students in our study ranged from 86 to 138. Thus, it can be said that the proficiency level of all of the students in our study was lower than what can be accurately measured by the regular TOEIC.

The raters were asked to judge the shadowing audio in a global sense. That is, the pre/post or post/pre shadowing pairs that comprised each audio file were judged on the basis of overall quality (i.e. closeness to native-like pronunciation)

rather than on any specific element of pronunciation. In the case that both of the recordings in a pair were initially regarded as being equal in quality, the rater was instructed to listen repeatedly until they could make a decision (even if it had to be, in the end, a “gut” decision). Since any improvements in pronunciation were expected to be small, a third option of “no difference in quality” was not included in the research design. This helped to insure that raters would listen closely for even the slightest differences in each shadowing pair.

The ratings were tallied to determine whether a majority of the raters had judged the post instruction recordings to be “better” than the pre instruction recordings. Students whose post instruction recordings were considered to represent better pronunciation by a majority of raters (5 of 8) were regarded as having improved. A second, more stringent standard of 6 of 8 raters or greater, giving an inter-rater reliability of 0.75 or higher, was also examined.

Results

Table 1 shows the percentages of students within each proficiency level whose pronunciation was regarded as having improved. The ratings pertaining to two students, one at either extreme of rater agreement (i.e., students for which all eight raters were in agreement), were regarded as outliers and not included in the calculations, reducing the total number of students in the analysis to 19. The left column shows the percentage of students whose pronunciation improved according to five or more of the eight raters. The right column also shows pronunciation improvement, but with a stricter rating criterion: Six or more of the raters had

to agree on the correct pre/post ordering of the shadowing audio. Ideally, a greater number of raters would be used in the study, but as our study only used eight raters, two rating criteria were applied in order to show the gap between proficiency levels that only becomes apparent under the stricter “six or more” rating criterion.

Table 1. Improvements in students’ pronunciation as determined by native speaker raters

Proficiency levels	Post instruction shadowing rated as “better” than the pre instruction shadowing	
	> 5 raters agree	> 6 raters agree (IRR=0.75)
Low (N=6)	83% (5 out of 6 students)	67% (4 out of 6 students)
Mid (N=6)	50% (3 out of 6 students)	50% (3 out of 6 students)
High (N=7)	86% (6 out of 7 students)	29% (2 out of 7 students)
Averages	73% (14 raters)	48% (9 raters)

Total N=19; 8 raters

Under the less strict rating criterion (left column), a clear majority of the students were rated as having improved their pronunciation. Under the stricter rating criterion (right column), a wide gap emerges between the low and high proficiency levels, with over twice the number of low-level students showing improvement (67% vs. 29%). These results corroborate the findings of Tamai (2005b), who tested the effects of shadowing on listening comprehension with students at three proficiency levels and found that students at the lowest level showed the greatest gains.

Student survey

Table 2 shows the results of a student survey administered after completion of the semester-long shadowing cycle.

Table 2. I believe that shadowing...

	Student proficiency level			Averages
	Low	Mid	High	
...improved my listening skills.	78%	95%	86%	86%
...improved my pronunciation of individual words.	38%	89%	75%	67%
...improved my overall intonation.	56%	76%	86%	73%
...had overall educational value.	75%	79%	85%	80%

N=89

These figures suggest that students had an overall positive experience with the shadowing tasks. However, a disparity arose between the subjective perception of pronunciation improvement in the low-level group and this group’s “actual” improvement as perceived by raters (seen in Table 1). This result may be influenced by low self-efficacy (the belief that one has the capability to attain a certain goal) or other factors relating to achievement motivation. A follow-up study on this disparity would be required to investigate this phenomenon more thoroughly.

The survey also allowed the students to write comments about shadowing. 64% of these comments were classified as positive, and 34% as negative (see Appendix 4 for charts and sample student responses).

Discussion

The results of this pilot study suggest that one semester of weekly shadowing tasks can produce empirically observable improvements in pronunciation. It is possible that the greater gains exhibited by the low level students is caused by a ceiling effect limiting the degree to which mid and high level students could improve. The sharp contrast between the students' subjective experiences of shadowing and the rater-detected improvements, especially for the low proficiency students, is also notable and worthy of further study.

An important feature of the experimental design is that the raters must choose either the pre instruction or the post instruction shadowing as being the more natural sounding of the two; there is no third option for "no differences." This forces the rater to listen very closely to the two audio clips being compared and perhaps make a "gut" decision when no significant differences are perceived. Thus, the improvements detected by the raters may have been extremely slight and virtually undetectable to the casual listener. A larger number of students and raters would clearly produce more robust data, but several issues regarding the raters would still require serious consideration:

1. Rater fatigue: Even with 21 pairs of audio clips, most raters complained of fatigue near the end of their rating sessions.
2. Rating criteria: This pilot study asked raters to compare pronunciation holistically, but it is impossible to account for individual biases toward the importance of certain features of pronunciation. Again, for robust data, such an

approach requires a large number of students and raters.

3. Rater background: For this study, all of the raters were English instructors with over 5 years experience teaching at the tertiary level in Japan. Would raters who were not language teachers, or who had no experience living in Japan, or who had non-standard English accents, rate differently?

Ideally, a study on shadowing would employ more discrete criteria for measuring improvement. It is difficult, however, to isolate specific features of pronunciation for rating, not to mention the lack of any kind of codified standard of what defines "good" English pronunciation. The measurement of pitch range by a machine could be applied to phonemic shadowing, much in the same way that it was applied to phrase shadowing by Yamane, Saito, and Yashima (2004). Although an increase in pitch range does not necessarily indicate more native-like pronunciation, it is, at least, one component of pronunciation that can be isolated and measured as a relatively discrete variable. Similarly, a study on phrase shadowing could measure, fairly empirically, improvements in speech rate (the number of words spoken within a given period of time) and connected speech (e.g. the use of weak forms like "fish 'n' chips" and the length of silence between words).

Even if empirically detectable improvements are slight, it is important to respect the affective benefits of shadowing, as it may play an even more important role in overall benefits to the student. The subjective belief that one's English had improved was strong, particularly for mid and high level students, while the belief that listening skills

had improved held strong across all three levels (Table 2). In an English program characterized by limited class time, large class sizes, and low proficiency levels (keep in mind that the “high” students are still below TOEIC 450), regular homework tasks that require L2 speech can be motivating and rewarding. This may be simply because speaking and listening have so long been missing from students’ English education, since they are so often supplanted by grammar and writing in Japanese high schools. Another reason may be that shadowing homework allows students to experiment with risky L2 pronunciations without fear of “losing face,” which may be an issue in many Japanese classrooms.

Unfortunately, one major problem with the shadowing activity was the discomfort that accompanied performing the task in the university computer rooms. KSU lacks a specialized language lab, and students who lacked a computer with Internet access at home had no choice but to complete the shadowing homework in crowded computer rooms amongst many other students. This kind of environment negates the face-saving characteristics of the shadowing task, possibly contributing to the high percentage of negative comments claiming discomfort and dislike of the task (Appendix 4, Figure 1). It is also likely that shadowing in the computer lab negatively affected the quality of some students’ performance on the shadowing tasks. Future studies could allow students to listen to audio on CDs and record their shadowing tasks using the audio recorder on their mobile phone, thereby allowing students without computers to complete their shadowing homework in the privacy of their own home.

Conclusions

Although shadowing has recently come to be more accepted as a valid pedagogical tool in the language teaching community in Japan, the perceived difficulty of its implementation still keeps most teachers from integrating it as a core element of their curricula. Computers and user-friendly software, however, have now made it easy for even the least tech-savvy of teachers to quickly set up their own shadowing program. The results of this pilot study suggest that although shadowing provides affective benefits to students at all three proficiency levels, it is the low-level students who see the most empirically observable benefits from performing shadowing tasks.

There is a clear need for more psycholinguistic research to investigate what actually happens in shadowing, and why improvement occurs. As so often is the case with research in this field, it is difficult to isolate variables in order to determine a clear one-to-one cause and effect relationship (e.g., a simple increase in time-on-task may account for many linguistic improvements rather than any one pedagogical technique). Further research should attempt to take into account some of these issues by directly comparing the improvements elicited by shadowing as opposed to other kinds of tasks, as well as comparisons of different types of shadowing (mainly phrase shadowing as opposed to phonemic shadowing).

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Appendix 1

Uses of shadowing outside language education

Today, cognitive psychologists continue to use shadowing as an experimental tool. It was recently used in an experiment that gave evidence for the role of language in theory of mind. In this experiment, Newton and Villiers (2007) found that subjects who performed a shadowing task while observing a false-belief scenario (one in which the subject must assess a situation from the perspective of another person) were less able to put themselves in the other's shoes. Tapping out a musical rhythm instead of shadowing, on the other hand, did not produce this effect.

While the use of shadowing in cognitive psychology is firmly established, its usefulness as a training tool for simultaneous interpreters remains controversial. Several teachers at the ESIT (Ecole Supérieure d'Interprètes et de Traducteurs) school of interpretation in Paris oppose shadowing for its emphasis on repetition over analysis, and instead favor techniques that force trainees to pay close attention to the meaning of the auditory input, thereby preventing the formation of bad listening habits (Kurz, 1992; Seleskovitch & Lederer, 1989, as cited in Gile, 1995; Thiery, 1989, as cited in Gile, 1995). In fact, a pilot study comparing performance on shadowing tasks by professional French-English interpreters and novice interpreting students found that the professionals had more difficulty performing the tasks accurately and with fluency, possibly because they were relying on processing strategies different from those used in shadowing (Moser-Mercer, Frauenfelder, Casado, & Kunzli, 2000).

Appendix 2

Findings in the Japanese literature

Despite the shortage of shadowing studies published in the English literature, several Japanese researchers have published promising findings on the topic. Torikai, et al. (2003) make claims that shadowing can have positive effects on a multitude of skills, including pronunciation (particularly reduced forms, connected speech, and prosody), listening (by forcing the shadower to keep pace with the audio), comprehension (by retaining the content in the working memory for a longer period of time), and speaking. Yamane, Saito, and Yashima (2004) found that through conducting repeating exercises (basically phrase shadowing), the pitch range of student speech increased from 17.7% to 68.3%. Tamai (1992) reported greater improvements in listening skills through shadowing over transcription tasks.

Appendix 3

Software required for easily creating a large-scale shadowing program

Box.net (www.box.net) is an online file storage service where the audio files to be shadowed are saved. It is completely online (nothing to download) and costs approximately US\$80 for a one-year, 5 gigabyte subscription. This subscription is necessary to avoid bandwidth restrictions. It is accessible from anywhere, meaning students with Internet access at home can do the shadowing tasks in the privacy of their room. The service features an online audio-player applet (a software component that runs in the context of another program, for example a

Web browser) that automatically plays audio files, allowing the student to listen to the file at any computer terminal, regardless of the media software installed on it. Box.net also features password protection.

Freecorder (applian.com/sound-recorder) is freeware used for recording the shadowing tasks. It downloads onto your computer and installs as a toolbar in your Web browser. It is simple to use and saves audio as mp3 files on the Windows desktop. Although it works with both Internet Explorer and Firefox, it is currently not available for the Mac OS.

Gmail (gmail.google.com) is an email service that is completely online and free. It provides over 7 gigabytes of storage and many useful functions for handling a large number of student assignments. The four functions essential for handling shadowing files are:

1. Plus-addressing: This allows the teacher to give a separate email extension for each class, e.g. teacher+tue1@gmail.com, teacher+tue2@gmail.com, teacher+wed1@gmail.com, etc.
2. Mail filters: Filters allow the teacher to automatically sort incoming emails by their plus-address extension, e.g. +tue1 emails automatically receive a “Tue 1” label. Incoming emails with shadowing file attachments can also be sorted in order to differentiate them from student questions, for example a “Tue 1 Shadowing” label.
3. Vacation responder: This function automatically sends a reply to students to assure them the teacher has received their email.
4. Built-in audio player: The Gmail audio player, similar to the one in Box.net, is an applet that allows audio files to

be played directly within Gmail. This makes downloading and opening files on an external media player unnecessary, saving the teacher tremendous time when checking shadowing homework.

Teachers possessing server space and considerably higher technical expertise may want to streamline the entire process by using the Moodle learning management system (moodle.org) combined with the Gong Moodle Module (gong.ust.hk).

Appendix 4

Categorized and sample responses from the free-response item on student survey

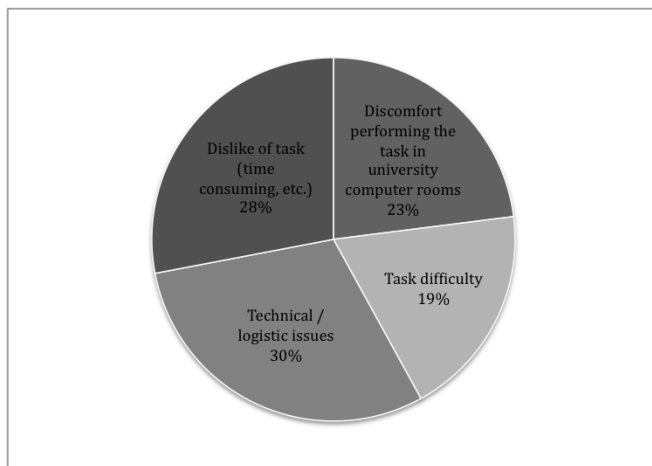


Figure 1. Negative student comments

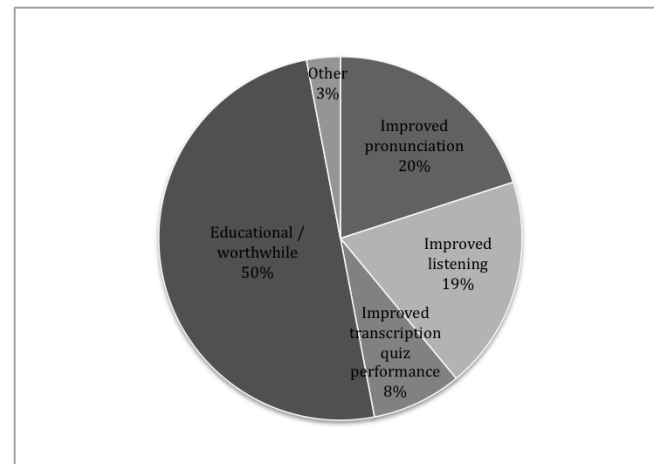


Figure 2. Positive student comments

Sample positive comments (translated from the original Japanese)

The improvements come slowly, but I think my listening improved, and it helped me focus on my pronunciation and intonation. I think it's a good activity for me.

Doing shadowing for the first time was difficult, but it became more fun as I did more, and I could tell that I was improving. I want to try my hand at shadowing more difficult things.

Sample negative comments (translated from the original Japanese)

There are always a lot of people in the computer room and it's very quiet there, so doing the shadowing was always embarrassing.

Shadowing was difficult. I couldn't keep up with the audio. But I really tried hard to keep up with the audio, and since we also read the script beforehand, we could learn the meaning, which I thought was good.