Correct prosody or faster articulation? Exploring the factors impacting student L2 listening comprehension

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Abstract

Given that many EFL learners tend to struggle with understanding spoken English, some scholars identified the pedagogical potential of shadowing and visual shadowing for improving listening comprehension. This paper explores whether different articulation rates for visual shadowing affect the improvement in EFL learners' top-down and/or bottom-up processing, and how other factors such as improvement in prosody or articulation rates influence student English listening comprehension. Given that some research findings from this study (i.e. shadowing helped both higher and lower proficiency learners) contradict the major research findings on shadowing, the author analyzes the potential factors that led to these discrepancies.

Keywords: L2 listening, visual shadowing, articulation rate, university

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Background and context: The ministry's expectation for high English competence and students' struggles in listening at EFL classrooms in Japan

The Ministry of Education, Culture, Sports, Science, and Technology (MEXT) announced two English education policy changes in 1998 and 2003, regarding the required contents of English curriculum for higher educational institutions. The "Action Plan for educating global citizens with high English competence" announced in 2003 specifies that universities should develop student English skills to the level where they feel comfortable communicating in business settings (MEXT, 2003). In addition, MEXT (2003) also states that higher educational institutions should use English proficiency tests such as TOEIC, TOEFL and IELTS as valid measures of student English proficiency.

However, regardless of this recent trend of requiring high English competence to educate "global" citizens, some scholars have also identified that Japanese college students are challenged with communication in English, particularly with processing spoken English (Kadota, 2012; Osuka, 2008). For instance, Kimura (2013) points out that even at one of the academically highest ranked high schools, some students are challenged with processing simple spoken English words that appear very often in high school textbooks such as "local" or "rules". To minimize the gaps between the policy changes aiming for educating global citizens with high English proficiency and the classroom realities (i.e. that some students are even challenged with processing simple spoken English), some educators and scholars have searched for new pedagogies for listening and identified the pedagogical potential of some training methods for simultaneous interpreters, including shadowing, visual shadowing (shadowing with texts), and repeating activities. These activities are expected to help learners to develop a link between acoustic signals and lexical knowledge, and eventually result in improving their phoneme

perception for better listening comprehension in English (Hamada, 2012, 2016 & 2017; Kadota, 2007, 2012 & 2015; Kato & Tanaka, 2015; Miyake, 2009; Mori, 2011; Rost, 2002 & 2006; Shiki, 2011; Tamai, 2002 & 2005).

Although many research findings clarified that shadowing is helpful for improving EFL students' listening comprehension, particularly for their bottom-up processing, what has remained unclear is that how factors such as different articulation rates for shadowing influence the improvement of EFL students' listening comprehension. Especially, articulation rate is supposed to significantly influence their improvement of English listening skills, as some scholars claim that learners' articulation rates correspond with the speed at which they could process the auditory input in their cognitive system, which means that the improvement in the articulation rates indicates the increase in the amount of information they could capture when listening (Baddeley and Hitch, 1974). Therefore, this paper examines how different articulation rates for shadowing influence the improvement of EFL students' listening comprehension at the mixed-level college English classes.

Literature review: Theoretical explanation of why shadowing is helpful for better listening comprehension

As many scholars identify in their research, shadowing is considered a helpful pedagogy to help students improve their L2 listening comprehension (Hamada, 2012, 2016 & 2017; Kadota, 2012 & 2015; Kato & Tanaka, 2015). When listening to spoken English, two different kinds of processing are considered to involve learners' listening comprehension processes: top-down processing and bottom-up processing.

Top-down processing refers to the process of understanding the speech sounds "from whole to part" (Fatemi, Vahedi & Seyyedrezaie, 2014, p. 686). Batova (2013) further identifies that in top-down processing, listeners tend to

"proceed from what [they] already know on the subject and from the lexical knowledge [they] possess" (p. 4). In other words, improving top-down processing requires learners to increase the amount of their existing knowledge pertaining to the contexts of the auditory inputs, such as the amount of lexical knowledge pertaining to the contexts of the speech.

In bottom-up processing, on the other hand, the listening process proceeds "from part to the whole" (Fatemi et al., 2014, p. 686) ; therefore, listeners try to understand the auditory signals by capturing every single word and understand their meanings. Some scholars indicate that shadowing is effective in improving the following factors that influence the efficiency of bottom-up processing: 1) phoneme perception skill, and 2) working memory efficiency (Baddeley & Hitch, 1974; Galantucci, Fowler & Turvey, 2006; Hamada, 2016).

For improving phoneme perception, Galantucci et al. (2006) clarify that EFL learners need to "mimic the speech they hear and … this leads to associations between articulation and its sensory consequences, on the one hand, and the acoustic signals that the movements generate, on the other hand" (p. 3). According to this view, if EFL learners tried reproducing the speech sounds as in the audio they are hearing, exactly as they do when engaging in shadowing, EFL learners will become able to make better associations between articulation and the acoustic signals. Developing this association between articulation and acoustic signals helps them better identify phonemes when listening to spoken English.

Regarding improving the efficiency of working memory through shadowing, Baddeley and Hitch (1974) further clarify the system of working memory that once auditory input enters the cognitive sensory system, the input enters the phonological loop in working memory for bottom-up processing. Baddeley (2007) further deconstructs the phonological loop as "a temporary storage system under attentional control that underpins our capacity for complex

thought" (p. 1). In the phonological loop, the phonological store (inner ear) holds the information in the input for one to two seconds − after two seconds the information goes away − and the articulatory control process (inner voice) rehearses and stores the information from the phonological store, so it can be maintained in the phonological loop for comprehension (Baddeley & Hitch, 1974; Henry, 2011). This process is called *subvocal rehearsal*, and the loop where the phonological store holds the information for short periods of time and the articulatory control process rehearses the information is called the phonological loop (Baddeley & Hitch, 1974).

Given this nature of the phonological loop and that the articulation rate of learners, the number of the words that learners can articulate per minute, corresponds to their subvocal rehearsal rates, the pace at which learners covertly rehearse the stored auditory inputs in their phonological loop for further processing (Kadota, 2015; Miyake, 2009; Shiki, 2011), it is possible to suggest that the increase in the articulation rate of a listener indicates the increase in the amount of information that can be processed in the phonological loop within the two-second time limitation, and thereby, has a potential to improve L2 listening comprehension. In other words, given what Osuka (2008) identifies that the inability to perceive fast rate English speeches is a major impairing factor for Japanese EFL learners, improving the articulation rates and increasing the amount of information that can be subvocally rehearsed in working memory has potentials to solve this impairing factor of "inability to perceive fast speeches". Accordingly, if students need to improve their listening skills, particularly their abilities to perceive fast speeches, they need to improve their own articulation rates.

Given these quotes above, it is possible to suggest that 1) subvocal rehearsal in working memory, which functions to hold the incoming auditory signals for retention and further processing by quietly rehearsing them at phonological

loop in working memory, influences the quality of bottom-up processing, and 2) the speed at which the learners' working memory processes the auditory input in its phonological loop corresponds with the learners' articulation rates, therefore, 3) the improvement in the learners' articulation rates influence the efficiency of working memory.

Regarding these two different types of processing, many scholars support the idea of "interactive model" that assumes these two different kinds of processing happen simultaneously and multidirectionally while listening (Kadota, 2015; Kato & Tanaka, 2015). This interactive model provides a view that while listening to the auditory inputs, individuals are supposedly engaged in these two different types of processing simultaneously and trying to understand what they hear by analyzing both acoustic and contextual cues (Nishio, 2011; Poeppel & Monahan, 2011). Furthermore, the concept of automaticity also provides a view that improving the bottom-up processing through shadowing influences the efficiency of top-down processing that "research findings rooted in the concepts of automaticity and working memory capacity suggest that once readers have reached a certain level of ability in bottom-up processing…more attentional resources can be allocated to top-down processing" (Kato & Tanaka, 2015, p. 189). Accordingly, improving bottom-up processing through shadowing has potentials to increase the efficiency of top-down processing by automatizing bottom-up processing, which allocates more cognitive resources for more accurate top-down processing.

Taken together, it is possible to suggest that improving bottom-up processing skills through shadowing contributes to better L2 listening comprehension by allowing learners to develop the associations between articulation and the acoustic signals necessary for better phoneme perception, and reinforce the function of working memory, and automatize bottom-up

processing of higher proficiency learners for better top-down processing, all of which ultimately lead EFL learners to efficient bottom-up processing.

Differences in influences on listening skills: Shadowing, visual shadowing (shadowing with texts) and repeating

As mentioned in the previous sections, some scholars highlight the distinct reasons that shadowing is helpful for improving listening skills, such as the better phoneme perception and cognitive automaticity that lead to the faster subvocal rehearsal with a larger amount of information. Some other scholars also point out how similar activities, including visual shadowing (shadowing with texts) and repeating, also help listeners develop similar skills for better listening comprehension.

For instance, Kadota (2015) highlights the commonalities and differences between shadowing and repeating. Although both in shadowing and repeating, individuals code the information, form phonological representations, and articulate them, shadowing requires learners to process auditory inputs, whereas repeating requires individuals to process visual inputs such as reading aloud the listening scripts of the audio they just listened to during the pause. Osaka (2002) further clarifies that shadowing is a form of online processing, which requires individuals to repeat auditory linguistic information immediately after they hear it without dealing with the meaning of the texts. Compared with off-line processing such as repeating, Hamada (2014) also identifies that this online processing nature of shadowing is helpful for learners to improve their bottom-up processing because the online nature of shadowing almost blocks learners' top-down processing. Given that this online processing nature of shadowing helps learners focus more on processing sounds than the meaning of the acoustic signals, it is possible that shadowing is helpful for improving learners' bottom-up processing skills.

Repeating, on the other hand, is considered off-line processing in which individuals listen to a certain amount of linguistic information, and repeat it during the pause after the auditory inputs (Kadota, 2015). As repeating with texts visually provides learners with the enough lexical, syntactic and contextual information of the texts, this pause is more likely to allow individuals for various forms of cognitive processing including those in top-down processing: lexical processing, syntactic processing, contextual processing and schema processing (Kadota, 2015). Accordingly, this implies that, compared to shadowing, repeating practices help individuals to become more used to top-down processing of auditory inputs.

Visual shadowing (shadowing with texts) is an activity in which learners orally read the visually displayed auditory inputs, synchronized to the speed of the auditory signals instead of just processing auditory inputs and reproducing them without any visual inputs (Kadota, 2015; Nakayama & Mori, 2012). As visual shadowing offers both auditory and visual inputs simultaneously, it could be less challenging and could be helpful for pre-shadowing level learners, the individuals challenged with working on shadowing without texts because of their insufficient listening comprehension skills, to prepare themselves for shadowing and improve their listening skills (Kadota, 2015). Some scholars also claim that visual shadowing is helpful for learners of various levels of English competency to prepare themselves for the listening section of the certified exams in a short period of time, because learners can read the texts while shadowing, and improve listening skills by enhancing phonological coding skills of the words they already know and cannot auditorily process (Hamada, 2017; Nakayama, 2011; Nakayama & Mori, 2012).

Given that this research was conducted with students in general English mixed-level classes for non-English majors, which basically implies that some lower proficiency students in these classes could be challenged with

shadowing, this paper explores the impact of articulation rates for visual shadowing (shadowing with texts) on students' development of listening skills with two control groups – one group shadowing faster and the other group shadowing slower.

Research methods

Purpose: Given the claims that shadowing and similar output activities including visual shadowing (shadowing activities with texts) are helpful in terms of improving listening skills in L2, and that limited capacity of working memory and inability to understand fast speech and particular English sounds or phonemes are three major factors that impair EFL students' listening comprehension, this paper aims to explore how difference in articulation rate (a pace at which students work on visual shadowing of their texts) – one group works on visual shadowing at a faster pace and the other group works on at a slower pace – influences the improvement of student listening skills in English. An independent variable for this research inquiry is difference in pace of visual shadowing (Group A: articulating slower, Group B: articulating faster) and two dependent variables are differences in: 1) TOEIC listening score, and 2) the articulation rate (the number of the words students articulate per minute) when reading aloud TOEIC listening scripts between pre- and post-tests.

Participants: The participants were 65 non-English major freshmen enrolled in a private women's college, taking mandatory TOEIC preparation classes with the author. Two classes included repeating and visual shadowing (shadowing with texts) activities for the same time duration (approximately for 20 minutes per class session and for the consecutive 10 weeks) and same frequency (once a week).

Materials for visual shadowing: As the classes the author conducted research in were mainly designed to prepare students for TOEIC tests, both slower and faster visual shadowing groups used TOEIC preparation materials as textbooks. Group A (slower visual shadowing group) used an unofficial TOEIC preparation material, while Group B (faster visual shadowing group) used one of the official TOEIC preparation materials published by ETS. Group A's textbook covered only the conversation and narration parts (Parts 3 and 4) of the TOEIC exam, while Group B's listening textbook covered all listening parts of the TOEIC exam (Part 1 through Part 4).

Procedures: First, students took the TOEIC IP test (pre-test as a baseline). To examine if the articulation rates of visual shadowing influenced the development of listening skills or not, students were divided into two groups (Groups A & B) based on their majors. Both groups had repeating practices at the same articulation rate and visual shadowing with texts at different articulation rates (Group A: slower, Group B: faster). After working on these activities for ten consecutive weekly class sessions, students took the TOEIC IP test (post-test) again. The author also conducted pre- and post-interviews with six randomly chosen students from each group to explore 1) if they perceived any changes in the way they perceive or understand English speech after working on visual shadowing with TOEIC listening scripts in the textbook for the consecutive 10 weeks, and 2) if there were any differences observed in the articulation rates between pre- and post-interviews when they read aloud the exact same TOEIC listening scripts in English. The author also asked each case study student to read aloud the TOEIC listening scripts in English both at their natural speed and at their fastest possible rate and calculated the differences in the number of the words case study students can read aloud per minute between pre- and post-interviews to explore if there are any changes

observed in their articulation rate, which in theory corresponds with the rate at which case study students covertly rehearse the stored auditory inputs in their cognitive system.

Statistical analysis and research findings: Do differences in articulation rates for visual shadowing matter?

The independent variable for this research inquiry is difference in articulation rate, the pace at which students articulate sentences in texts when working on visual shadowing, (Group A: slower visual shadowing, 1.07 times faster than the pace at which sentences are pronounced in the original audio, Group B: faster visual shadowing, 1.2 times faster than the original audio), and the two dependent variables are differences in: 1) TOEIC listening scores, and 2) case study student articulation rate in reading aloud TOEIC listening scripts between pre- and post-tests. Comparing listening score increases in Groups A and B highlighted that there are minor differences in the score increase (approximately by six points) between Groups A and B (Appendix 2). Although, Group B − the faster visual shadowing group − showed a slightly larger increase in mean score than Group A, given the claim that the minimum score difference to be considered significant should be 40 points or more (Andrade, 2014), this difference (6 points) in mean score increases should not be considered significant.

Comparing increases in articulation rates (measured by the number of words per minute that case study students read aloud TOEIC listening texts in pre- and post-interviews) among case study students between Groups A and B after working on visual shadowing for ten class sessions in a row indicated that there also are minor differences in the increase in articulation rate (Appendix 1). Comparing pre- and post-interviews highlighted that all case study students improved their articulation rates after working on visual shadowing in

ten consecutive weekly class sessions: Their increases in articulation rates suggested that the rate of their subvocal rehearsal increased in the post-interviews, as a result of visual shadowing. However, no significant differences are observed either in the increases in listening test score or articulation rate between Groups A and B. This result indicates that, as some scholars claim (Kadota 2012; Nakayama & Mori, 2012; Shiki, 2011 & 2015), both faster- and slower-paced visual shadowing has potential to increase learners' articulation rates, and accordingly, their subvocal rehearsal rates in their cognitive system.

Findings from interviews with case study students: Correlations between faster articulation rates for visual shadowing and greater TOEIC listening score increases

It has been debated what level of the TOEIC score increase should be considered significant. Given that some scholars claim that the minimum significant score difference in TOEIC listening score is 40 points (Andrade, 2014), this section mainly explored the interview data with case study students whose score increased by more than 40 points in the TOEIC listening section. The author also made a table (Table 3) of the interview responses (Appendix 3) to explore the correlation between student listening score increases and how much change they have felt in how they perceived English speech since they started working on visual shadowing in class. To further inquire about the correlation, the author also analyzed the interview data by mainly focusing on participants whose score increases were significant, exploring the commonalities in their interview responses. The Table 3 (Appendix 3) indicates that, both in slower (1.07 times faster than the original audio) and faster (1.2 times faster than the original audio) visual shadowing groups, those who claimed that they paid more attention to increasing their articulation rates tended to have greater score increases than those who claimed that they paid

more attention to the prosody and tried mimicking the sound changes or reductions in faster speeches of the model audio. This implies the possibility that for processing faster speech, learners may need to increase the capacity to rehearse more information within the time limitation of working memory rather than learn and become able to articulate sound changes or reductions in faster speeches.

In the interviews with 12 case study students (CSSs), it became clear that eight out of 12 CSSs felt that their own articulation rates improved after working on visual shadowing in class. Case study student B-I (a student in the faster visual shadowing group, her listening score of pre-test was in the range of 250-295 out of 495 points, her listening score increase was 155 points, her increase of articulation rate for reading aloud was 46 word per minute) acknowledged that she felt that she could "read aloud English sentences a little faster than before" after working on visual shadowing in class. She continued that "it feels easier to listen to and understand English speech, but I felt that TOEIC listening test questions were still hard for me to comprehend". Similarly CSS A-A (a student in the slower visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was 20 points, her increase of articulation rate for reading aloud was 32 words per minute) mentioned that "I feel that the speed I read aloud (English sentences) might have increased a bit". She also felt that "after working on visual shadowing, while listening to the TOEIC listening texts, there are moments I feel 'oh, I understand what they are saying!' It felt a lot different when I took TOEIC (pre-test) in April". She continued that she "had no idea what they were saying (at the pre-test) …Now I even can guess the meaning of the whole sentences even when I cannot capture every single word". These quotes indicate that after working on visual shadowing practices, both CSSs felt that the speed they read English sentences improved and felt

easier to understand spoken English.

Given the interactive nature of top-down and bottom-up processing (Kadota, 2015; Kato & Tanaka, 2015), these quotes may mean that their top-down processing and bottom-up processing started working more effectively together. Given that both CSS B-I and A-A mentioned that it became easier to listen to spoken English after working on visual shadowing practices, it also could signal that their phoneme perception processes started becoming automatized to some degree, and accordingly, this automatized phoneme perception helped them become able to allocate more cognitive resources for top-down processing for better understanding the contents they listened. Note that most case study students who responded that they felt it became easier to listen to English speech indicated that they started feeling changes relatively close to the end of the semester (interviews were conducted around the 13th class meeting of the courses, and each semester consisted of 15 class sessions). This implied that if not repeated for particular time duration (approximately 10 weeks), individuals might be less likely to feel the impact of visual shadowing on their L2 listening comprehension.

These series of quotes from the interviews with CSSs in this section indicate that no matter how much the listening test score increased, visual shadowing helped students to improve their listening comprehension skills. Although there were differences in score increases and self-perception of changes in speech perceptions directly reflected in significant score increases, these interview quotes indicated that 20 min. once a week visual shadowing for approximately 10 weeks at either the faster or slower pace helped the majority of the case study students articulate faster, and they also felt that they could better listen to English speech after working on visual shadowing.

Findings about visual shadowing and the perception of English sounds or phonemes

Through her experimental studies focused on the correlational analyses of EFL learners' listening problems and their L2 listening proficiency, Osuka (2008) found that faster rate speech and inability to perceive particular English sounds or phonemes were two major impairing factors for EFL learners in improving their English listening skills. The interview datasets and TOEIC listening score datasets indicated that those who claimed that they paid attention to prosody did not increase their listening scores as much as those who claimed that they paid attention to faster articulation. For instance, CSS B-H (a student in the faster visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was 105 points, her increase of articulation rate for reading aloud was 56 words per minute) mentioned that "I was not sure if I could pronounce all the words with proper intonation or rhythms, but I tried reading aloud as fast as possible when working on visual shadowing". Also, when CSS A-E (a student in the slower visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was 65 points, her increase of articulation rate for reading aloud was 58 words per minute) answered the authors' question on whether there was anything she paid attention to when working on visual shadowing, she responded "I cared about the speed for visual shadowing". These quotes indicate that regardless of the different visual shadowing speed between Groups A and B, those who claimed that they paid more attention to their articulation rates tended to increase their listening test scores.

On the other hand, those who claimed that they cared more about articulating with the correct prosody, including sound changes or reductions in fast speeches, than increasing their articulation rates were less likely to

increase their listening test scores. For instance, CSS A-A (a student in the slower visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was 20 points, her increase of articulation rate for reading aloud was 32 words per minutes) mentioned that she "tried imitating the liaisons, pronunciations and accents of the model audio CD as much as possible" while working on visual shadowing. Similarly, CSS A-B (a student in the slower visual shadowing group, her listening score of pre-test was in the range of 250-295 out of 495 points, her listening score increase was minus 35 points, her increase of articulation rate for reading aloud was 61 words per minute) mentioned that she "couldn't pay enough attention to accent but tried to articulate liaisons of the words as in the sample audio CD". Also, CSS B-L (a student in the faster visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was 15 points, her increase of articulation rate for reading aloud was 60 words per minute) claimed that "I tried pronouncing the liaison as in the model audio". Students from both groups (slow and fast visual shadowing groups), who claimed that they paid attention to prosody aspects showed less increase in their listening scores, compared to those who claimed that they paid more attention to the faster articulation.

This comparison of those who were tested at higher and lower articulation rates highlighted that at least, when improving listening skills for TOEIC, paying attention to/imitating the sound changes or reductions in faster speeches is less likely to help learners increase their scores in the TOEIC listening section (Appendix 3). Instead, students improving their articulation rates (becoming able to read aloud at faster paces at the post-test), and accordingly becoming able to process auditory inputs at faster rates in their cognitive system, tended to score higher on the TOEIC listening section. This result that students who improved their articulation rates (and accordingly

their subvocal rehearsal rates) scored higher also could indicate that increasing the capacity for rehearsing more information within the time limitation of working memory influences listening comprehension more than becoming aware of and mastering the correct pronunciation of the actual sound changes or reductions in faster speech. This research finding that students improved their articulation rates scored higher has an implication, therefore, that if learners have access to pedagogies that provide them with more opportunities to increase their articulation rates, their listening comprehension is expected to significantly improve. Increase in their articulation rates eventually helps students improve the speed at which their brain processes incoming auditory information in their cognitive system, which affects the efficiency of processing in working memory and the entire listening comprehension process.

Statistical analyses of correlation between increase in articulation rates for visual shadowing and listening test scores

Listening test score data and interview data with Case Study Students (CSSs) indicated that becoming able to read aloud visual shadowing texts faster helped learners improve their listening test scores. To further explore the validity of this claim, this section statistically explores differences in articulation rate (for reading aloud the exact same TOEIC listening scripts) among CSSs between pre- and post-interviews. CSSs were asked to read aloud the visual shadowing texts at their natural speed both in the pre- and post-interviews, and were also asked to read at their fastest possible rates in the post-interviews. This section compares whether the differences in articulation rates between the pre- and the post-interviews (the fastest rate) were statistically correlated with the CSSs' listening test score increases or not.

The mean increases in articulation rate were 60.67 for Group A, 66.67 for

Group B, and 63.67 for the all CSSs. The mean listening test score increases were 40.83 for Group A, 53.33 for Group B, and 47.08 for all CSSs. These mean score increases in TOEIC listening tests were considered significant given what Andraide (2014) and Cunningham (2002) identify regarding how researchers should interpret student TOEIC score increases in relation to their progress toward L2 proficiency. According to Andraide (2014), "a student who scored 40 points or more on each section has probably improved in both [listening and reading] skills. 'Probably' refers to a 68 percent confidence level. To reach a 97 percent confidence level, we have to double the points (80 points each)" (p. 16). In addition, because of the Standard Error Measurement (SEM) process for the TOEIC test, "the standard deviation of errors of measurement associated with test scores from a particular group of examinees" used to identify the confidence bands of the individual scores (Harvill, 1991, p. 181), Andraide (2014) further suggests that student TOEIC scores could fluctuate plus or minus 35 points. Similarly, Cunningham (2002) analyzed the correlations between student TOEIC test score increase and their actual progress toward English communication proficiency. Cunningham (2002) identifies that a 25 point score increase could be considered significant progress toward L2 listening proficiency in 67% confidence level, and to reach 99% confidence level, TOEIC listening score increase should be at least 63.5 points. Given these claims that TOEIC listening score increases between 25 and 40 points are enough to be considered significant with 67 or 68 percent confidence level, the possible score fluctuation for the SEM is below 35 points (Andraide, 2014), and TOEIC is scored in increments of 5 points (Liao, 2010), the author considers 40-point score increases or more significant in this study.

The correlation coefficient between the increase in articulation rate and the listening test scores for all CSSs indicated that there was almost no correlation ($r = 0.002$, $n = 12$), Group A (slower visual shadowing group) showed a weak

correlation (r = 0.25, n = 6), and Group B (faster visual shadowing group) indicated negative correlation (r = -0.16, n = 6). If the author limits the sample for analysis to only those CSSs whose listening scores increased from the pre-test, the data with these CSSs showed weak correlations (r = 0.26, n = 10), Group A showed stronger correlations (r = 0.55, n = 5) than Group B (r = 0.14, n = 5). Given what Plonsky and Oswald (2014) identified in their research on the significance of "correlation coefficients, we suggest that *r*s close to .25 be considered small, .40 medium, and .60 large" (p. 12), correlation coefficients between articulation rates and the listening test score increases for students in Group A and the students from both groups having scored better on the post-test are considered significant as the rs for these correlations fell into these ranges of "small" and "large".

Although the interview datasets indicate that those who claimed that they paid more attention to faster rate articulation tended to increase their listening scores, improvements in articulation rates were not always strongly statistically correlated to CSSs' listening score increases. These statistical data analyses contradicted the qualitative research findings from this study that those who claimed that they paid attention to faster rate articulation improved their listening scores more greatly than those who claimed that they paid attention to prosody including sound changes and reductions in fast speech. How faster rate articulation matters to listening skill improvement needs to be further explored with a larger sample size and different measures of listening comprehension skills to explore if faster rate articulation is still statistically not correlated with students' listening comprehension.

Furthermore, participants whose scores decreased from the pre-test were not the students doing poorly in classes. This unexpected research finding also posed a question about the validity of the TOEIC listening section used as a measure of English listening comprehension skills, given that a CSS who

responded that she felt she could articulate English sentences faster and that it was easier to listen to English speech, and whose articulation rate increased in the post-test, still failed to improve her TOEIC listening test scores at the post-test.

Contradictions with previous research findings: Visual shadowing also helped higher proficiency learners to improve their listening scores

In many previous studies on the influences of shadowing or visual shadowing on listening comprehension, most scholars found that shadowing or visual shadowing was more likely to help lower proficiency learners (Kadota, 2007, 2012 & 2015; Kato, 2009; Shinozuka, 2009; Tamai, 2002). In the current study, the author identified that his research's data analyses of pre- and post-tests reinforced these past research findings. However, analyzing the interview datasets and score datasets with randomly chosen case study students clarified that visual shadowing had a potential to help both higher and lower proficiency learners. Interestingly, however, higher proficiency learners were more likely to feel that they could articulate English sentences faster than before when they felt they could better listen to the TOEIC listening texts after working on visual shadowing, whereas lower proficiency learners were more likely to feel only that they could perceive English speech better, and were less likely to notice the changes in their articulation rates even when their actual articulation rates had improved.

For instance, CSS A-F (a student in the slower visual shadowing group, her listening score of pre-test was in the range of below 200 out of 495 points, her listening score increase was 80 points, her increase of articulation rate for reading aloud was 64 words per minute) said "I'm not sure if I feel changes in the speed I speak or read English, but I feel that it became easier to listen to English sentences now…at the beginning (of the semester), I had no idea

what the audio said. Of course, if the text is too long, I can't keep up with listening, but if it's not too long, I can understand what the audio says without reading the script now". Similarly, CSS B-G (a student in the faster visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was 85 points, her increase of articulation rate for reading aloud was 76 words per minute) mentioned "I don't feel changes in the speed I speak or read English aloud, but I feel changes in my listening skills. I feel it has become easier to listen to English". These interview datasets highlighted that lower proficiency learners were less likely to feel changes in their articulation rates, even when both their articulation rates and TOEIC listening test scores actually significantly improved and also when they felt it had become easier to listen to English.

The discrepancy in self-perception and actual improvement of their articulation rates among lower proficiency learners, which was not observed among higher proficiency learners, highlighted the need to inquire in more detail about how visual shadowing helps higher and lower proficiency learners differently, and how this discrepancy is generated. Furthermore, Kadota (2015) claimed that once bottom-up processing becomes automatized to some degree, more cognitive resources could be allocated for top-down processing for better listening comprehension. Therefore, it is also necessary to further explore whether this difference in self-perception of the improvement in articulation rates could be attributed to improvement in the different processing: Higher proficiency learners are more likely to improve their top-down processing abilities as they are supposed to be more advanced at bottom-up processing than lower proficiency learners, who are more likely to improve their bottom-up processing through visual shadowing.

Other potential factors: Improvement in lexical processing

Kadota (2015) claims that when perceiving English speech, bottom-up processing and top-down processing happen simultaneously and interactively, and therefore, the quality of lexical processing influences L2 listening comprehension. My other sets of interview data from this research study reinforced this claim and clearly highlighted that increasing the amount of vocabularies in learners' mental lexicon influenced the efficiency of these processings for L2 listening comprehension. For instance, six different case study students pointed out that learning the vocabularies that frequently appear in the TOEIC listening section helped them better process the listening texts. For instance, CSS A-B (a student in the slower visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was minus 35 points, her increase of articulation rate for reading aloud was 61 words per minute) clarified that whether she knew the vocabulary in the conversations or narrations impacted how much she could understand these conversations and narrations. CSS A-B mentioned "It feels easier to listen when the conversations or narrations include words I know". Similarly, CSS B-K (a student in the faster visual shadowing group, her listening score of pre-test was in the range of 200-245 out of 495 points, her listening score increase was 30 points, her increase of articulation rate for reading aloud was 50 words per minute) stated vocabulary as one of the determinants of how difficult listening comprehension could be in the TOEIC listening section. Therefore, once she learned new and unfamiliar vocabulary in the class, it helped her better listen to the TOEIC listening texts.

> Author (A) : After working on visual shadowing practices, do you feel any other changes in your English? Anything would be fine.
> CSS B-K: I think it feels easier to listen to English speech now.

A: Could you say more on how you feel about that?
CSS B-K: Now it feels easier to capture the words in the speech than before.
A: Do you feel any differences in how tired you are comparing this time (post-test) and the TOEIC test you took in April (pre-test)?
CSS B-K: I was much less tired this time because I knew much more vocabulary in the conversations or narrations I had to listen to.
(Interview excerpts with CSS B-K from December 2016)

This quote clearly indicates that the vocabulary knowledge helped CSS B-K better listen to the listening texts. CSS B-K clearly stated that she was less tired when listening to English texts in the post-test because she knew the majority of the vocabulary showing up in the listening texts. These quotes highlighted that increasing vocabulary in participants' mental lexicon could reduce the cognitive loads for top-down and/or bottom-up processings and could help individuals better perceive or comprehend the spoken English texts they listen to.

Given this second quote in particular in which CSS B-K clarified that it felt easier to listen to the conversations or narrations in the TOEIC listening section after she worked on visual shadowing because she knew the words used in the texts, it is possible to suggest two different analyses of this phenomenon. One possible analysis is that during speech perception, she engaged in top-down processing − such as lexical processing − and referred to the vocabulary knowledge stored in her mental lexicon to recognize the words. This indicates that during the speech perception process, increased amounts of vocabularies in participants' mental lexicon could help learners reduce the cognitive loads for lexical processing, a part of top-down processing, and may have resulted in allocating more cognitive resources for better bottom-up processing. The other possible analysis is that increased amounts of vocabularies helped CSS B-K capture the phonemes and syntactic and

semantic constraints of individual words, and resulted in reducing cognitive loads for her bottom-up processing; therefore, more cognitive resources were allocated for her better-top-down processing. Accordingly, based on either analysis of the CSS B-K's experience, it is possible to suggest that bottom-up processing and top-down processing are more likely to happen simultaneously and interactively, and given this interactive nature of these two processings, memorizing and increasing vocabularies in mental lexicon also helps learners reduce the cognitive loads for one processing and allocate more for the other, and this could result in improving their L2 listening comprehension skills.

Discussion: What is implied by discrepancies between the research outcome of this study and some major previous research findings pertaining to L2 listening pedagogies

This research study explored the influence of visual shadowing upon L2 listening comprehension skill improvement and indicated the following major research outcomes: 1) Differences in articulation rates for visual shadowing between Groups A and B did not significantly matter to the score increase in TOEIC listening section, 2) Those who claimed that they paid more attention to faster articulation than articulating with the correct prosody, sound changes or reductions tended to greatly increase their scores in TOEIC listening section, 3) Increases in articulation rates were not statistically strongly correlated with students' listening score improvement, 4) Visual shadowing also helped higher proficiency learners to improve their listening scores supposedly by improving their cognitive efficiency for top-down processing, and 5) Reinforcing lexical processing and/or bottom-up processing by increasing the amount of vocabularies in learners' mental lexicon helped them improve their L2 listening comprehension.

Among these research outcomes, those who claimed that they paid more

attention to faster articulation tended to have greatly increased their scores in TOEIC listening section, and visual shadowing also helped higher proficiency learners to improve their listening scores, contradicted previous research studies and the theoretical understanding of how shadowing or visual shadowing contributes to improve learners' listening comprehension skills in the following points: 1) Visual shadowing is mostly helpful for lower proficiency learners (Kato, 2009; Shinozuka, 2009), and 2) Listeners should be able to perceive the sounds or phonemes if they can articulate them correctly (Kato & Tanaka, 2015; Liberman & Mattingly, 1985;), therefore, paying attention to articulating with the correct prosody including sound changes or reductions in fast speeches while visual shadowing should be helpful to improve their L2 listening comprehension.

Regarding point 1, visual shadowing is helpful for lower proficiency learners, it was impressive to see, from the quotes from the interviews, that the most proficient learners in each group worked on visual shadowing on their own, even outside the classrooms, and they still felt the improvements in their articulation rates as a result, and also felt that it became easier to listen to English speech than previously after working on visual shadowing activities. This indicated that even after developing the particular level of bottom-up processing skills, visual shadowing still helped learners improve their top-down processing skills for better listening comprehension. Learners of both lower and higher proficiency felt that it became easier to listen to English speech, and actually increased both their articulation rates and TOEIC listening scores. Nevertheless, lower proficiency learners were less likely to feel that their articulation rates increased, while higher proficiency learners were more likely to feel the improvements in their articulation rates. This difference in self-perception of changes in articulation rates indicated that further research is needed to explore how this difference was generated, how

much self-efficacy influenced these perceptions and whether lower self-efficacy negatively influenced their listening skill development.

Regarding point 2, listeners should be able to capture the words they can articulate; therefore, paying attention to prosody (i.e. sound changes or reduction) while visual shadowing should be helpful for improving their listening, it was interesting to see the interview data from this study highlighted that 1) those who claimed that they paid more attention to improving their articulation rates increased their scores much more than those who claimed that they paid attention to articulating with the correct prosody including sound changes or reductions in fast speeches; however, 2) both CSSs, both those who focused on faster rate articulation and those who focused on prosody while visual shadowing, responded in interviews that they felt they could articulate faster after working on visual shadowing for approximately 10 weeks in class, and listening felt easier. Further research is needed to explore how this discrepancy between self-perception of "being able to listen to English speech" and their actual listening test score increases was generated, and to inquire into whether it was just a matter of students who were good at test-taking or it posed a question if TOEIC test is a valid measure for listening skill improvements or not. This result also indicated that paying attention to the sound changes or reductions in faster speeches was less likely to help learners increase their scores in TOEIC listening section. Instead, these sets of interview data highlighted that those improving their articulation rates for visual shadowing practices, and subsequently becoming able to improve the efficiency of subvocal rehearsal, tended to score higher on TOEIC listening section. This discrepancy with the former research outcomes also indicated that increasing the capacity for rehearsing more information in working memory more strongly influenced learners' listening comprehension than becoming aware of and/or able to articulate the actual sound changes or

reductions in the faster speeches. This research outcome has an implication, accordingly, that learners should have access to the pedagogies that allow them to have more opportunities to increase their articulation rates for improving their listening comprehension.

Given these two discrepancies between the research outcome of this study and some major previous research findings, it became clear that 1) visual shadowing was helpful for learners of both higher and of lower proficiency, and the difference to note is that lower proficiency learners were less likely and higher proficiency learners were more likely to feel their improvement, and 2) students' fast articulation rates mattered more for their listening skill improvement than mastering correct prosody, including sound changes or reductions in fast speeches. For providing more effective EFL listening pedagogies, 1) whether these differences in the self-perception of learners' improvements were generated because visual shadowing improved the different types of processing, top-down processing for higher proficiency learners and bottom-up processing for lower proficiency learners, or generated from the differences in self-efficacy, 2) how much students should care about prosody while visual shadowing to improve their listening comprehension, 3) how fast students should be able to articulate English words or sentences to feel comfortable in listening to the English speech at the natural speed, and 4) whether TOEIC should be considered as a valid measure for listening comprehension, are the four further avenues for investigation.

Disclaimer: Limitations of this research

Different research outcomes could have been generated if the data had been collected in classes in which the author could adjust variables in treatments (i.e. making greater differences in articulation rates for visual shadowing), as the data was collected in required English classes with unified curriculums in

which it was very difficult to make greater differences in treatments given the fair access to the same quality academic contents for all students. Note that due to this limitation by the course structures, only one option for the data collection was in the classes the author was responsible for teaching with 34 students maximum per class. Given that 34 is a relatively smaller sample size for completely statistically valid data analyses, if the same study would be conducted with a larger sample size, there is a possibility that it could generate a different set of statistical data.

References

Andrade, M. (2014). TOEIC Scores: How many points are enough to show progress? *Sophia Junior College Division Faculty Journal*, (35), 15 – 23.

Baddeley, A. D., & Hitch, G. (1974). Working memory. In G.H. Bower (Ed.), *The psychology of learning and motivation: Advances in research and theory* (Vol. 8, pp. 47 – 89). New York: Academic Press.

Baddeley, A. (2007). *Working Memory, Thought and Action.* Oxford University Press.

Batova, N. (2013). Academic Listening: is there a place for bottom-up processing? *International Journal of Education and Research*, 1(4), 1 – 10.

Cunningham. C. R. (2002). The TOEIC test and communicative competence: Do test score gains correlate with increased competence? a preliminary study. Master's Dissertation, University of Birmingham. Retrieved from: https://www.birmingham.ac.uk/Documents/college-artslaw/cels/essays/matefltesldissertations/Cunndiss.pdf

Field, J. (2001). *Lexical segmentation in first and foreign language listening*, PhD Dissertation, Cambridge University. Retrieved from: https://ethos.bl.uk/OrderDetails.do;jsessionid=8B251ADD27096989F3F63C902D3B422C?uin=uk.bl.ethos.411216

Fatemi, A. H., Vahedi, V. S., and Seyyedrezaie, Z. S. (2014). The Effects of Top-down/Bottom-up Processing and Field-dependent/Field-independent Cognitive Style on Iranian EFL Learners' Reading Comprehension. *Theory and Practice in Language Studies*, 4(4), 686 – 693.

Galantucci, B., Fowler, C. A., & Turvey, M. T. (2006). The motor theory of speech perception reviewed. *Psychonomic bulletin & review*, 13(3), 361 – 377.

Goh, C. C. (2000). A cognitive perspective on language learners' listening comprehension problems. *System*, 28(1), 55 – 75.

Hamada, Y. (2012). An effective way to improve listening skills through shadowing. *The*

language teacher, 36(1), 3－10.

Hamada, Y. (2014). The effectiveness of pre- and post-shadowing in improving listening comprehension skills. *The language teacher*, 38 (1), 3－11.

Hamada, Y. (2016). Shadowing: Who benefits and how? Uncovering a booming EFL teaching technique for listening comprehension. *Language Teaching Research* 2016, 20(1), 35－52

Hamada, Y. (2017). *Teaching EFL learners shadowing for listening: Developing learners' bottom-up skills*. New York: Routledge.

Harvill, L. M. (1991). An NCME module on Standard Error of Measurement. *Educational Measurement: Issues and Practice*, 10(2), 181－189.

Henry, L. (2011). *The development of working memory in children*. London: SAGE Publishing.

Kadota, S. (2007). *Shadowing to ondoku no kaagaku* [*Science of shadowing, oral reading, and English acquistion*]. Tokyo: Cosmopier Publishing.

Kadota, S. (2012). *Shadoingu to ondoku to eigoshutoku no kagaku* [*Science of shadowing, oral reading, and English acquisition*]. Tokyo: Cosmopier Publishing.

Kadota, S. (2015). *Shadowing, ondoku to eigo communication no kagaku*. [*Shadowing, repeating, and the mechanism of English Communication*]. Tokyo: Cosmopier Publishing.

Kato, S. (2009). Kokueigo noryoku shomei shutoku wo mezashita listening shido no kosatsu [Listening activities for the acquisition of Aviation English proficiency test]. *Bulletin of Chiba University Language and Culture*, 3, 47－59.

Kato, S. and Tanaka, K. (2015). Reading aloud performance and listening ability in an L2: The case of college-level Japanese EFL users. *Open Journal of Modern Linguistics*, 5(2), 187－206.

Kimura, T. (2013). Heated up classrooms: How a Japanese top high school teaches English vocabularies? - A key person to change English education in Japan. (Hakunetsu kyoshitsu nada-kou wa eitango wo kou oshiete iru.)
Retrieved from: http://toyokeizai.net/articles/amp/14511?page=5

Liao, C. (2010). TOEIC Listening and Reading test scale anchoring study. *TOEIC Compendium*, 5, 1－9. Retrieved from:
https://www.ets.org/Media/Research/pdf/TC-10-05.pdf

Liberman, A. and Mattingly, I. G. (1985). The motor theory of speech perception revised. *Cognition*, 21, 1－36.

MEXT. (2003). *Eigo ga tsukaeru Nihon-jin ikusei no tame no koudou keikaku* [*Action plan for educating global citizens with high English competence*]. Retrieved from:
http://www.mext.go.jp/b_menu/shingi/chukyo/chukyo3/004/siryo/04031601/005.pdf

Miyake, S. (2009). Cognitive processes in phrase shadowing: Focusing on articulation rate and shadowing latency. *JACET Journal,* 48, 15－28.

Mori, Y. (2011). Shadowing with oral reading: effects of combined training on the improvement of Japanese EFL learners' prosody. *Language Education & Technology*, 48, 1－22.

Nakayama, T. (2011). Visual shadowing no koka [Effectiveness of visual shadowing]. *Remedial Kyoiku Kenkyu* [*Remedial Education Research*], 6, 151 – 159.

Nakayama, T. and Mori, T. (2012). Efficacy of Visual-Auditory Shadowing. *Eibei-Bunka* [*The Society of English Studies*], 42, 55 – 68.

Nishio, Y. (2011). *Jido no Eigo Onsei Chikaku Mekanizumu: L2 Gakushu katei ni oite* [*Mechanism for Speech Perception in English among school-aged children: In the process of learning L2*]. Tokyo: Hitsuji Shobo Press.

Osaka, M. (2002). *Noh no memo choh: Working memory* [*Notepad in your brain: Working Memory*]. Tokyo: Shin-yo-sha, Inc.

Osuka, N. (2008). What factors affect Japanese EFL learners' listening comprehension? In K. Bradford Watts, T. Muller, & M. Swanson (Eds.), *JALT2007 Conference Proceedings*. Tokyo: JALT.

Plonsky, L. and Oswald, F. L. (2014). How big is "big"? Interpreting effect sizes in L2 research. *Language Learning*, 64(4), 1 – 35.

Poeppel, D. and Monahan, P. J. (2011). Feedforward and feedback in speech perception: Revisiting analysis by synthesis. *Language and cognitive processes*, 26(7), 935 – 951.

Rost, M. (2002). *Teaching and Researching Listening* (*2nd Ed.*). Harlow, UK: Longman.

Rost, M. (2006). Areas of research that influence L2 listening instruction. In E. Usó-Juan, and A. Martínez- Flor (Eds.), *Current trends in the development and teaching of the four language skills*, pp. 47 – 74. Berlin: Mouton de Gruyter.

Shinozuka, K. (2009). Bunpo yakudoku ho to tsuyaku kunren ho ni okeru TOEIC score no nobirsitsu oyobi sono no-gengo-gaku teki kosatsu [Exploring effectiveness in increasing TOEIC score between interpreting training methods and reading based on word-to-word translation]. *Seijo Univ. Monograph*, 44, 105 – 131.

Shiki, O. (2011). Exploring the relationship between shadowing instruction and L2 reading comprehension among Japanese university students. *Kwansei Gakuin University Humanities Review,* 15, 51 – 63.

Shiki, O. (2015). A pilot study comparing the effects of shadowing and oral reading on oral reading rate. *Kwansei Gakuin Humanities Review*, 19, 289 – 298.

Tamai, K. (2002). Listening ryoku kojo ni okeru shadowing no koka ni tsuite [On the effects of shadowing on listening comprehension]. Keynote lecture at the 3rd Annual Conference of JAIS. *Interpretation Studies*, 2, 178 – 192.

Tamai, K. (2005). *Listening shidoho to shite no shadowing no koka ni kansuru kenkyu* [*Research on the effect of shadowing as a listening instruction method*]. Japan: Kazama.

Appendices

Table 1
Case study students' articulation rates for reading aloud at the pre- and post-interviews

Case Study Student	Pre-interview	Post-interview	Rapid	Increase
CSS A-A	132	142	164	32
CSS A-B	104	120	165	61
CSS A-C	122	136	204	82
CSS A-D	128	128	165	37
CSS A-E	108	134	196	88
CSS A-F	68	86	132	64
CSS B-G	90	136	156	66
CSS B-H	110	192	208	98
CSS B-I	96	134	142	46
CSS B-J	116	138	196	80
CSS B-K	78	108	128	50
CSS B-L	96	138	156	60

Table 2
Case study students' average articulation rates for reading aloud at the pre- and post-interviews

	Pre-interview	Post-interview	Rapid	Increase
A-class CSS Average	110. 3	124. 3	171. 0	60. 7
B-class CSS Average	97. 7	141. 0	164. 3	66. 7
Average score among all CSS	108. 8	133. 2	167. 7	63. 7

Table 3
Case study students' TOEIC listening scores at the pre- and post-tests

Case Study Student	Pre-Test	Post-Test	Score Increase
CSS A-A	200-245	250-295	20
CSS A-B	250-295	200-245	-35
CSS A-C	350-400	400-445	55
CSS A-D	250-295	300-345	60
CSS A-E	200-245	300-345	65
CSS A-F	below 200	200-245	80
CSS B-G	200-245	250-295	85
CSS B-H	200-245	300-345	105
CSS B-I	250-295	400-445	145
CSS B-J	300-345	250-295	-60
CSS B-K	200-245	250-295	30
CSS B-L	200-245	250-295	15

Table 4
Case study students' average TOEIC listening scores at the pre- and post-tests

	Pre-Test	Post-Test	Score Increase
A-class CSS Average	256. 7	297. 5	40. 8
B-class CSS Average	247. 5	304. 2	53. 3
Average score among all CSS	270. 8	315. 8	47. 1

Table 5
Statistical analyses of the pre- and post-test scores

	Mean Score			Standard Deviation		
	Slower (Class A)	Faster (Class B)	All students	Slower (Class A)	Faster (Class B)	All students
Pre-Test	232.79	238.5	235.47	34.57	33.89	33.85
Post-Test	272.06	283.67	277.5	54.13	47.17	51.31
Score increase	39.27	45.17	42.03	43.5	51.1	47.2
Score range	-55 to 95	-60 to 165	-60 to 165	n/a	n/a	n/a

Table 6
Analyses of case study student interview responses

Type of CSSs	After visual shadowing		Self-study	While visual shadowing	
	Listening felt easier	Articulated faster	Visual shadowing at home	Tried mimicking the prosody	Tried faster articulation
All (n = 12)	10	8	7	6 (Accent 2, Liaison 3, Syllables 1, Rhythm 1, Pronunciation 2 *Some claimed multiple.)	6
40 points or more score increase (n = 7)	6	4	4	2	5
35 points or less score increase (n = 5)	4	4	3	2	1
Above 250 (50%) at pre-test (n = 5)	1	5	2	1	3
Below 245 at pre-test (n = 7)	7	5	3	3	3