

Critical Review:
Is Speech Rate Reduction an Effective Strategy to Increase Listener Comprehension of Accented Speech?

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Accent modification is a service offered by Speech-Language Pathologists (SLPs), typically for clients that have acquired English as their L2 (second language) and are seeking to change, reduce, or eliminate their accent. The purpose of this review was to explore therapeutic strategies for prospective clients whose goals are to be more comprehensible to their listener without changing the integrity of the accent itself. One such strategy is speech rate reduction; thus, this critical review examines the effectiveness of reducing the speaking rate of accented speakers in order to increase listener comprehension. Four studies were selected for review. Three of the articles employed a single group design, and one article contained two experiments: one with a single group design and one with a randomized control design. Overall, the literature provides suggestive evidence that speech rate reduction is not an effective strategy for accented speakers to increase listener comprehension. Recommendations for further research are discussed, and the implications of the findings of this review for clinical practice are explored.

Introduction

Accent modification is an elective practice offered by Speech-Language Pathologists (SLPs) through which a speaker's native accent is reduced, minimized, and re-formed (Kim, 2012). Munro & Derwing (1998) define accentedness as "the extent to which an L2 [their second language] learner's speech is perceived to differ from native speaker norms". The authors further describe that accentedness, as perceived by a listener, is related to relatively objective factors, including segmental errors, frequency, prosody, acoustic dimensions, age of L2 learning, and diminished phonemic sensitivity (Munro & Derwing, 1998; Munro & Derwing, 2003).

According to Statistic Canada's 2017 census, 22.9% of Canadians reported having a mother tongue that is not one of Canada's three official languages – English, French, or Aboriginal languages (Statistics Canada, 2017). Based on this statistic, it is likely that a considerable number of Canadians possess accented speech. If all 22.9% of Canadians reporting a non-official language mother tongue spoke with an accent, this would approximate 8 million people.

Individuals who speak with a non-native accent may seek accent modification services for a number of reasons, including: the desire to assimilate,

elimination of any hindrance to their professional development, to increase perceptions of social class, prestige, and intelligence, and a reduction in stigmatization and discrimination (Müller et al., 2000; Gluszek, 2010; Nelson, 2018). There is an evident, albeit complex, relationship between the accents of individuals speaking English as a Second Language (ESL) and their personal identity (Sung, 2016). Given this close intersection of accent and identity, there is merit in exploring therapeutic strategies for prospective clients whose goals are to be more comprehensible to their listener without changing the integrity of the accent itself.

Chang (2018) described how speech rate reduction of ESL classroom instructors who were native English speakers has been shown to improve comprehension for students that were non-native English speakers. These findings led to the question of whether the reverse may be true; that is, if a reduction in the speaking rate of L2 speakers would improve their comprehensibility. This strategy is explored in this critical review, which evaluates the effectiveness of reduced speaking rate of L2 speakers to increase listener comprehension of accented speech.

Objectives

The primary objective of this paper was to critically analyze the existing literature pertaining to the effectiveness of speech rate reduction as a speaker strategy to increase listener comprehension of L2 speakers. The secondary objective was to propose clinical implications and evidence-based recommendations for SLPs practicing in accent modification therapy.

Methods

Search Strategy

Online databases (PROquest, CINAHL and Google Scholar) were searched using the following terms:

[(accent) AND ((speech rate) OR (speaking rate)) AND (comprehens*)].

Selection Criteria

Studies selected to be included in this review were required to be peer-reviewed scholarly articles. Chapters from textbooks and summaries included in periodicals were excluded. All studies were required to have a component involving listener evaluation of L2 speech.

Data Collection

Based on the aforementioned selection criteria, the literature search yielded four articles included for analysis. One article employed a single-group design, which yields level 3 evidence. The remaining three articles contained two experiments each. Two of these articles employed single-group designs for both experiments, and one article employed a single-group design and a randomized controlled trial, the latter of which yields level 1 evidence.

Results

Single Group Designs

Single group designs administer the same intervention or treatment to a single group of participants (Paulus, Balk, Dahabreh, Avendano, & Lau, 2013). Advantages of this design include high internal validity and flexibility in methodology (Alnahdi, 2015). A disadvantage to this design is the lack of

control groups to compare outcomes, which reduces the strength of evidence. (Paulus et al., 2013).

Anderson-Hsieh and Koehler (1988) conducted a single group design study to determine how comprehension of accented speech was affected by speech rate manipulations. Three native Chinese speakers with varying English proficiencies —low, moderate, and high— were randomly assigned 2 of 6 passages to read at a slow, normal, and fast rate. As a control variable, one native English speaker read all 6 of the passages at a slow, normal, and fast rate. Two-hundred and twenty-four native English speakers were randomly assigned to listen to two of the recorded passages: one by the native English speaker and one by a non-native English speaker. The recordings were randomized such that the listener could hear the fast, regular, or slow recording of either speaker.

Listeners rated the speech rate and accentedness of the recordings. The rating scales used ranged from 1 (too slow/heavy foreign accent; very difficult to understand) to 5 (too fast/no foreign accent; very easy to understand). Comprehension was measured using 6 multiple choice questions based on the reading passage. Listeners also completed a questionnaire about attitudes and feelings towards foreign speech and foreigners.

Appropriate statistical analyses were conducted. Results showed that comprehension scores were lowest when the passage were read at the fast rate than the normal rate for all subjects. There were no statistically significant differences between comprehension scores of paragraphs read at the slow and normal speaking rates for all speakers. Increased speech rate resulted in a greater decrease in comprehension for the most heavily accented speaker. The questionnaire on attitudes and feelings revealed that listeners who reported more positive attitudes towards foreigners had assigned higher comprehensibility scores to the non-native speakers, even if they had rated them as heavily accented speakers. The authors argue that this suggests that people who have more positive feelings towards foreign speech will make a greater effort to comprehend non-native speech, even when it is more difficult to understand.

The authors of this study provided sufficient information about the methodology, including the passages that were used, which yields a high replicability factor. The study is also strengthened by the use of natural speech rate adjustment, as opposed to digitally modified recordings, which increases the generalizability of the study. Additionally, the use of supplementary questionnaires accounted for bias or unconscious effort that listeners may use when communicating with accented speakers.

This study was limited in their implementation of impressionistic ratings to evaluate their variables. The authors used subjective evaluation of the complexity of the passages provided to the speakers, reporting that they were impressionistically judged to be of equal difficulty. Thus, the complexity of their vocabulary, length, or grammar complexity was not controlled for. The researchers also did not report the basis of which they made their impressionistic ratings. The recordings used in this study were from a small sample size and all non-natives were from the same linguistic background, which impacts the generalization of findings. The study also is limited in the lack of control of suprasegmental changes when the speech rate was altered, so it is difficult to know what characteristics of speech affect comprehension.

Overall, this paper provides equivocal evidence that reduced speech rate does not increase comprehensibility of L2 speakers, largely due to the methodology, lack of control variables, and the use of subjective impressionistic ratings.

Munro and Derwing (1998) conducted two single group experiments to evaluate how native English speakers rated the degree of accentedness and comprehensibility of native Mandarin ESL speakers at different speaking rates.

In the first experiment, 10 Mandarin ESL speakers and 10 Canadian English speakers read a simple narrative, which was recorded at two speaking rates: normal and slow. The Mandarin speakers' accents ranged from moderate to strong, and they all had a high level of English proficiency, indicated by their Test of English as a Foreign Language (TOEFL) scores. Twenty native English-speaking listeners rated the recordings for both accentedness and comprehensibility. The

rating scales used ranged from 1 (no accent/high comprehensibility) to 9 (very strong accent/low comprehensibility).

Appropriate statistical analyses were conducted. Analysis of mean speaking rates (syllables/second, or syll/sec) revealed that Mandarin speakers tended to speak slower than native English speakers in both the normal and slow conditions. Both the Mandarin ESL speakers and the Canadian English speakers were rated as less comprehensible in the slow rate condition relative to the normal rate condition; however, Mandarin ESL speakers were rated significantly more accented and less comprehensible in the slow condition in comparison to Canadian English speakers.

In the second experiment, a different group of 20 Canadian English-speaking listeners were recruited. The normal rate recordings from the first experiment were used as a "normal rate" set. These recordings were then digitally modified to create 3 additional sets: a "mean English rate", adjusted to the mean speaking rate of English speakers [4.9 syllables/second (syll/sec)]; a "mean Mandarin rate" set, adjusted to the mean speaking rate of Mandarin speakers (3.8 syll/sec); and a "reduced rate" set, adjusted to be 10% slower than the mean Mandarin rate (3.4 syll/sec). Listeners rated the recordings on accentedness and comprehensibility using the same 9-point scale used in the first experiment.

Appropriate statistical analyses revealed that lower ratings of comprehensibility were assigned for recordings of the Canadian English speakers modified to the "mean Mandarin" and "reduced" rates. Recordings of Mandarin ESL speakers received significantly higher ratings of comprehensibility only under the "mean English" condition; thus, a reduction of their speaking rate did not contribute to improved comprehensibility.

The authors also provided specific descriptions of listener and speaker criteria (e.g., English proficiency of speakers, absence of second language fluency in listeners). This increases the replicability of their study; however, the design is limited by the lack of citation or presentation in appendices of the narrative passages read by the speakers. This study is also

limited by the homogeneity of the speaker's linguistic backgrounds. Given that non-native English speakers with different linguistic backgrounds than Mandarin ESL speakers may have different baseline speaking rates, this decreases the generalizability of the findings.

The authors conducted both experiments to control for potential distortions due to deliberate rate adjustments. Informal examination of the recordings from the first experiment revealed increased variability in pause time and unnatural intonation in both native English and Mandarin ESL speakers in the slow condition, as well as pronunciation errors by one Mandarin ESL speaker. Although these errors were not statistically significant, addressing this factor to confirm the findings of the first experiment by digitally manipulating the recordings to maintain phonetic accuracy strengthens their overall conclusions.

Overall, this research presents suggestive evidence that reduced speech rate does not increase comprehensibility of L2 speakers. Given that the Mandarin speakers tended to speak more slowly than the English speakers without deliberate modification, the authors conclude that reducing speech rate as a broad strategy would not be a beneficial goal for improving comprehensibility of accented speech.

Munro and Derwing (2001) conducted two follow-up single group experiments to further investigate the extent of the effects of speaking rate on perceived accentedness and comprehensibility following their (1998) study.

In the first experiment, 48 adult ESL students, from various linguistic backgrounds, participating in full-time intermediate level ESL courses were recruited as speakers. Control stimuli were recorded by four native Canadian English speakers. This data was not included in analyses; rather, they were used to ensure that listeners were using the rating scales accurately. Twenty-seven native Canadian English speakers, none of whom spoke an L2 fluently, rated the recordings on accentedness and comprehensibility using the same 9-point rating scales employed by Munro & Derwing (1998).

The authors hypothesized a curvilinear relationship between speaking rate and listener ratings of accented speech. They propose that there is an optimal speaking rate for the lowest accentedness and highest comprehensibility ratings.

Appropriate statistical analyses were employed to analyze the data. The authors confirmed their proposed curvilinear relationship as it was revealed the optimal speaking rates for the lowest accentedness and the highest comprehensibility scores were 4.76 syll/sec and 4.23 syll/sec, respectively. Speaking rates that deviated from the optimal rates were rated as less comprehensible, or more accented. The optimal rates identified were higher than the mean normal speaking rate (3.24 syllables per second), indicating that native and non-native speakers tended to speak slower than the statistically optimal speaking rate.

In their second experiment, 10 Mandarin ESL and 7 native Canadian English speakers were recruited to record sentence-length utterances, using the same stimuli from the first experiment. Sentences were recorded at a normal speaking rate, which provided the "natural rate" set. These recordings were then digitally manipulated to increase and decrease the speed by 10%, to create "fast rate" and "slow rate" sets, respectively. A new group of Twenty-seven Canadian English speakers were recruited as listeners to rate the recordings on perceived accentedness and comprehensibility using the same scale described in the first experiment.

Statistical analyses revealed that listeners assigned higher ratings of comprehensibility, and lower ratings of accentedness to recordings of Mandarin ESL speakers in the "fast rate" set. Mandarin ESL speakers were rated as less comprehensible in the "slow rate" set in comparison to the "natural rate" set; however, there were no significant changes to ratings of accentedness.

Similar to their aforementioned 1998 study, the authors provided specific details of listener and speaker criteria and the preparation of their stimuli, increasing the replicability of their study design. The authors demonstrated improvements in this study design by selecting stimuli sentences that controlled for syntactical content, each of which consisted of a

single clause with high-frequency words. The authors also controlled for potential errors due to mispronunciation by reading each of the sentences aloud prior to recording in order to identify and pre-teach unfamiliar words as this would have an impact on ratings of accentedness and/or comprehensibility.

This study presents some limitations in that the authors did not provide a comprehensive description of how they determined English proficiency of the Mandarin ESL speakers in their second experiment. They also did not cite nor include appendices for the stimuli sentences read by the speakers. Together, these factors decrease the overall replicability of the study and its conclusions.

Overall, this research presented highly suggestive evidence that reduced speech rate does not increase comprehensibility of L2 speakers.

Randomized Control Trial

The following study employed a single-group design in their first experiment, and a randomized control trial (RCT) in the second experiment. RCTs implement random allocation of participants into two or more groups. An advantage of RCTs is that the design allows for controlled manipulation of variables. The ethical nature of RCTs provides a disadvantage for this design; however, the type of research involved in this critical review does not require the withholding of treatment from participants, which allows for stronger conclusions to be drawn.

Matsuura, Chiba, Mahoney, & Rilling (2014) conducted two studies to investigate accent familiarity effects on listener comprehension.

In their first experiment, a single group design, one native English speaker and one non-native English speaker were recruited to record reading passages. The non-native speaker was selected from an initial “outer group” of 10 graduate students studying in the U.S. Each member of the outer group recorded a reading passage, which were rated by 4 evaluators — 2 native English instructors and 2 native Japanese-speaking English Instructors. Two statements were presented: (1) “This speaker's accent is different from a North American English accent” and (2) “This speaker read the passages fluently”. Statements were rated using a

7-point scale, ranging from 1 (strongly agree) to 7 (strongly disagree). The speaker who had the least familiar accent, but most fluent score was selected, which was an Indian-English speaker. The two speakers read 15 reading passages and the speech samples were recorded digitally.

Seventy-five Japanese students listened to both recordings, two weeks apart, and rated them based on comprehensibility, accentedness and speech rate using test items from the Test of English for International Communication (TOEIC) workbook and guidebook. The presentation of the passages was counterbalanced to control for any order effects. Additionally, 3 statements were presented to measure listener perceptions on measures of comprehension, accentedness and speech rate: (1) “It is easy to understand this speaker”, (2) “This speaking accent is unfamiliar to me”, and (3) “This speaker's English is fast”. Listeners scored these statements using the aforementioned 7-point scale”.

Appropriate statistical analyses were implemented to analyze the data. Results showed that both groups rated the North American accent as more familiar and more comprehensible than the Indian-English accent. This indicates that, regardless of language fluency, less familiar accents were rated to be more difficult to understand.

The second experiment, a randomized control trial, investigated whether a slowed rate of speech would increase comprehensibility of accented speech, and if speaker proficiency influenced these ratings. The recordings came from the same pool as the first experiment. The top 4 most unfamiliar but most fluent speakers were selected to record the passages. The recordings were digitally modified to create a “slow” recording, in which the original recording was stretched by 20%. The listeners were a new group of 104 Japanese university students taking at least one English language course. Participants listened to 5 passages recorded by the same speaker, then completed the TOEIC comprehension test items and answered the statements. 2 weeks later, the listeners were randomly assigned into two groups. The experimental group listened to the “slow” recording, and the control group listened to the original normal-

rate recording. Participants were blinded to the conditions of the study. Then, listeners completed the comprehension test and rated the statements.

Appropriate statistical analyses were implemented to analyze the data. Results from a between groups t-test showed that reduced speech rate did not increase listener comprehension. Only the participant identified as having the heaviest accent showed an increase in comprehension with the modified (slow) speech condition.

The authors of this study provided detailed descriptions of methodology. Thorough recruitment criteria were used (e.g., speakers had to be native speakers of a language other than English and were selected using measures of accentedness and familiarity to native and non-native English speakers). However, the authors did not include details concerning the reading passages nor did they include any measurements used to standardize the reading passages or control for reading passage difficulty. These factors together reduce the replicability of the study. Potential for practice effects presents limitations to the methodology of the second experiment as the same participants listened to the same stimuli at both time-points. Although participants waited two weeks between sessions, practice effects may have subconsciously skewed listener comprehension scores, introducing a confounding variable. Additionally, this study was only conducted on native Japanese speakers, and the number of speakers and varieties of English were limited as well. Finally, the speech rates were non-standardized, as they were only able to adjust speech rates by 10, 20, or 30% than the original recordings.

Despite the many limitations to this study, the use of a randomized control study drastically increases the level of evidence. This study is judged to be highly suggestive that speech rate reduction does not improve listener comprehension overall. However, accent familiarity may play a role in listener comprehension —as concluded in the first experiment— and speech rate reduction may improve comprehensibility for heavily accented speakers —as concluded in the second experiment.

The conclusions drawn from both experiments indicate that speech rate reduction may improve comprehensibility for heavily accented speakers, and that accent familiarity may play a role in listener comprehension.

Discussion

Overall, the results of this critical review provided suggestive evidence that reducing the speaking rate of L2 speakers does not increase listener comprehension.

While some of the studies presented relatively strong methodologies, all except for an experiment in one of the studies evaluated, employed a single-group design, which yields level 3 evidence. The low level of experimental evidence provided by this type of research design weakens the strength of the findings obtained as there were no control or comparison measures employed.

The studies evaluated in the current review also presented variability in the standardization of stimuli used for speaker recordings, which decreases the overall replicability of their research designs. Munro & Derwing (2001) presented adequate details for the standardization of their stimuli; however, they were limited by the lack of detailed and objective standardization papers presents the question of whether fluency, and ultimately ratings of accentedness and/or comprehensibility, was impacted due to the complexity of passages, which was not described nor addressed in the other papers.

Matsuura et al. (2014), Munro & Derwing (1998), and Munro & Derwing (2001) each ran two separate experiments, one with the speaking rates naturally modified by the participants, and one speaking rate digitally modified. This methodology strengthens the evidence of the findings presented by these papers as there can be a comparison drawn between a subjective manipulation of rate, by having speakers monitor and slow down their rate, as well as an objective manipulation of speech rate through digital manipulation.

All of the papers in the current review implemented one-way listening tasks, in which monologue-like recordings were listened to and evaluated by listeners, rather than engaging in two-way discourse with the

speakers, such as a conversational task. This method increases the strength of the evidence evaluated for a number of reasons. Munro & Derwing (2001) note that this is standard in research evaluating L2 speech production; the nature of this listening task reduces the complexity of data analyses as differential prejudices can be held controlled for.

Another consideration for one-way listening tasks is that they control for sociolinguistic variables. Although accentedness is described to be a fundamentally objective perceptual phenomenon, the literature also confirms that stereotyping of foreign accents and people does influence listeners' evaluations of accented speech (Munro & Derwing, 1998). The Anderson-Hsieh & Koehler (1988) paper further accounts for this variable in their study, providing a questionnaire to listeners assessing their attitudes and feelings towards foreigners and foreign accented speech. Their finding that listeners that had reported more positive attitudes rated non-native speakers as more comprehensible supports this notion that stereotyping plays a role on listener judgements, which highlights the role of listener biases

Though one-way listening tasks have their benefits, there is also value in further research investigating the role of speaking rate reduction in conversational tasks. Spontaneous discourse has different speech and acoustic qualities; thus, it is relevant to explore the role of speaking rate reduction in this context. Albeit more complex than one-way listening tasks, the level of evidence obtained can be strengthened in the research design by controlling for other variables, such as participant randomization into control and experimental groups. Generalizability of findings can be strengthened by including participants from a variety of linguistic backgrounds and evaluating effectiveness within cohorts arranged by the speakers' L1 (or first language). It is recommended that future research conducted simulating more naturalistic, conversational tasks as these are the speaking environments that prospective clients seeking accent modification services would be participating in.

Conclusion

The literature evaluated in the current review indicates that speech rate reduction is not an effective strategy

for accent modification services. Although the overall findings indicate that reducing the speaking rate of L2 speakers does not improve listener comprehension of accented speech. The low levels of evidence in the research designs implemented, and the limitations of the one-way listening tasks on real-world application, indicate that further research should be conducted.

In order to ascertain whether or not speech rate reduction has an effect on listener comprehension, future research should employ research designs that yield higher levels of evidence. In addition, future research should include comparison group measures, and evaluations of spontaneous discourse through two-way conversational tasks, to allow for more meaningful conclusions to be drawn.

Clinical Implications

Speech rate reduction of accented speakers is not an effective broad strategy for SLPs to implement in accent modification services. However, the literature does demonstrate that it may be beneficial to explore what an individual's "optimal" speaking rate is (Munro & Derwing, 2001). Analyses of listener ratings from the Munro & Derwing (1998) paper revealed that one Mandarin speaker had a statistically significant improvement in comprehensible speech in the slow condition; thus, speech rate reduction was effective for this speaker. Although this recommendation cannot be applied broadly, the evidence indicates that, in certain cases, it may be effective for SLPs to employ speech rate reduction in order to shift their speaking rate into an optimal range. Clinicians should monitor client outcomes to determine whether the intervention was successful.

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