Factors Influencing the Semantic Context Benefit to Foreign-accented Word Recognition

Kailun Zhao[1]

[1] Ocean University of China, Qingdao, China
Correspondence: Kailun Zhao, Ocean University of China, Qingdao, China.

Abstract

The current review discusses about the nature of semantic context benefit in accented listening comprehension by reviewing and analyzing the main listener and stimulus factors influencing the benefit of semantic context. This review investigates the impact of various factors, including age, vocabulary knowledge, second language proficiency, accent strength, noise interference, and accent familiarity, on the effectiveness of semantic context in aiding the comprehension of accented speech. Semantic context plays a crucial role in facilitating comprehension but its efficacy varies across different characteristics. Understanding these factors can inform the development of effective strategies for improving accented speech perception and optimizing language learning environments. Identifying the interplay between these variables is essential for addressing challenges in intercultural communication and promoting linguistic diversity in multilingual contexts.

Keywords: context benefit, word recognition, foreign accent

1. Introduction

In international communications, English has increasingly been used as Lingual Franca and 64% of English users are non-native speakers (Crystal, 2003, p. 65), but accented speech is almost unavoidable for late (second language) L2 learners, even among those who have spent several years engaged in the L2 environment (Flege et al., 1995). Foreign-accented speech is less comprehensible, thus requiring more time to process than native speech (Munro & Derwing, 1999; Munro, 1998; Floccia et al., 2009). It is relatively common to see that a strong accent restrains interlocutors from successfully identifying a word. However, research shows that the addition of semantic context effectively facilitates the recognition of foreign-accented words (Creel et al., 2016; Bent et al., 2019). Concerning the internal processing mechanism, Miller et al. (1951) and Miller (1962) pinpointed that sentence context inflicted constraints on all the candidate words that were potential words at a particular position in a sentence. In line with their studies, by investigating the intelligibility of words in sentences with different degrees of predictability, Duffy and Giolas (1974) discovered that words in sentences with higher degrees of predictability were easier to identify.

In general, words in highly constraining sentence contexts are more comprehensible than words in weakly constraining sentence contexts (Kalikow et al., 1977; Holt & Bent, 2017), and words in meaningful sentence contexts are more comprehensible than words in isolation (Creel et

al., 2016; Bent et al., 2019). Moreover, most studies on the topic of semantic context benefit have proved that the context benefit is stronger for native listeners than for nonnative listeners (Bradlow & Alexander, 2007; Clopper, 2012), for adults than for children (Bent et al., 2019), for younger adults than for older adults (Federmeier et al., 2002; Bieber et al., 2022), and at quiet environment than at noisy environment (Fallon et al., 2002; Bradlow & Alexander, 2007; Sheldon et al., 2008). But there are also studies indicating contradictory conclusions as in the study of Dubno et al. (2000) which reveals that older adults benefit as much as younger adults do from semantic context at different degrees. Besides, there are some factors such as the listener's second language (L2) proficiency and the strength of accent have been rarely taken into consideration. Furthermore, the number of studies probing into the semantic context benefit in reading is smaller than that in listening and studies that have investigated the context benefit in foreign-accented speech comprehension are much fewer than those studies examining context benefit in native speech.

2. Factors Influencing the Context Benefit to the Perception of Accented Words

According to the comprehensive review of Rubin (1994), there are 5 major factors influencing listening comprehension as follows. "First, text characteristics (variation in a listening passage/ text or associated visual support); Second, interlocutor characteristics (variation in the speaker's personal characteristics); Third, task characteristics (variation in the purpose for listening and associated responses); Fourth, listener characteristics (variation in the listener's personal characteristics); Fifth, process characteristics (variation in the listener's cognitive activities and in the nature of the interaction between speaker and listener) (Rubin, 1994, p. 199)." In Rubin's summary, the text and listener characteristics are more extensively explored than the interlocutor and task characteristics and do not bring in the complex internal behaviors that require more delicate devices like the ERP or EEG technology as the process characteristics. Thus, the current review focuses on the effects of the text (called the characteristics of speech stimulus in this study) and listener characteristics in L2 listening comprehension.

In terms of Rubin (1994), the characteristics of

speech stimulus mainly includes the factors of acoustic-temporal variable (e.g., speech rate, and hesitation and pause phenomena), acoustic-other variable (e.g., level of perception, sandhi, and stress and rhythmic patterning perception), morphological and syntactic modifications (e.g., syntactic modifications, redundancy, and morphological complexity), text type (e.g., written and spoken text; news, lecturette, and dialogue). For the listener characteristics, Rubin (1994) divided them into the such categories as language proficiency level, memory, attention, effect, age, gender, learning disabilities in L1, and background knowledge, while Wang, M. and Treffers-Daller (2017) classified them into general language proficiency, vocabulary knowledge, listening strategy use, metacognitive awareness, and working memory and processing speed. Considering that the study concentrates on the topic of semantic context benefit in foreign-accented speech, the scope of related factors would narrow down.

A large amount of research has proved that the semantic context benefit in foreign-accented speech comprehension could be diminished or enhanced due to the influence of the characteristics of speech stimulus, mainly including noise (Fallon et al., 2002; Bradlow & Alexander, 2007; Holt & Bent, 2017) and the type of accent (Goslin et al., 2012; Bent & Atagi, 2017; Kang et al., 2019), as well as the influence of listener features, mainly involving age (Federmeier et al., 2002; Bent et al., 2019; Bieber et al., 2022), vocabulary size (Vafaee, 2020; Du et al., 2022), accent familiarity (Adank et al., 2009; Clopper, 2012), and L2 proficiency (Vandergrift, 2006; Francis et al., 2018; Medina et al., 2020). The current review intends to draw a brief picture of the 6 main factors from listener and stimulus characteristics influencing the semantic context benefit in listening to foreign-accented speech.

2.1 Age

The age factor has been more extensively discussed for the context benefit in accented speech perception, compared to vocabulary size, L2 proficiency, and accent familiarity among listener characteristics. In terms of Cristia et al. (2012), infants, children, and adults may all have difficulties in processing unfamiliar accents, and people in different age periods such as infancy and toddlerhood, childhood, early adulthood, and late adulthood have different initial

processing costs. Relative studies discussing age variety can be classified into two branches which are children (5-12 years old) versus adults and younger adults versus older adults.

Regarding the comparison between younger adults and older adults, some research into the factors influencing the context advantage uncovers that older listeners have excessive dependence on semantic context compared to younger listeners (Sommers & Danielson, 1999; Rogers & Wingfield, 2015), while some other studies suggest that older listeners show a decrease in predictive processing skill compared in contrast to younger listeners (Federmeier et al., 2002; Federmeier et al., 2003; Wlotko et al., 2012; Gordon-Salant et al., 2015).

In Sommers and Danielson (1999), one of the two experiments has three types of materials which are ''single words (SW), low-predictability (LP) sentences, sentences that are syntactically correct but that contained little or no semantic support for the target item, and high-predictability (HP) sentences, syntactically correct sentences that also provided strong semantic support for the target word'' (pp. 459). All participants are required to write down the spellings of the single word or the final words in the sentences and all spelling will be scored. Results show that for the identification of hard words (i.e., words with many lexical neighbors), older adults get lower scores than the younger adults in both the SW and LP contexts, but in HP contexts, older and younger adults exhibit nearly equivalent identification scores, revealing that the older adults gain more contextual support than the younger adults. Analyses of two experiments together found that older adults' ability to inhibit candidate words is reduced which leads to their difficulty in identifying words with many candidates and that provided enough semantic support, age-related deficiencies in word recognition can be reduced or even removed. For the other study that has similar findings, its experiment task and stimulus are different from those of Sommers and Danielson (1999). In Roger and Wingfield (2015), the stimuli contain 234 prime — target pairs and "participants heard same numbers in neutral prime (e.g., Jaw-PASS), semantic prime (e.g., Row-BOAT), and semantic lure conditions (e.g., Row-GOAT) (pp. 138)." Participants need to repeat loudly the target word after each word-pair had been presented. Results display that compared to younger adults, older adults

are more likely to report a word that is not the target word but is semantically related the prime word, suggesting that older adults have greater tendency to misidentify words with their semantic context. However, the second research only points out that older adults are more prone to utilize semantic context to assist word recognition than younger adults do, but does not directly compare the benefit the two groups gain from the semantic context.

On the other hand, the studies of Federmeier et al. (2002), Federmeier et al. (2003) and Wlotko et al. (2012) demonstrate that although older adults can take usage of semantic context to facilitate comprehension, in normal listening comprehension of sentences, older adults tend not to utilize the predictive processing in perceiving sentences or in contrast, take advantages of predictive processing with a delay compared to younger adults. The above studies only consider context benefit in perceiving native language and a later study from Gordon-Salant et al. (2015) discussed the effects of age in recognizing unaccented and accented multisyllabic words. Results showed that for accented multisyllabic words, older adults performed poorer than younger adults in word recognition. A point to notice is that the research of Gordon-Salant et al. (2015) does not take context benefit into consideration.

However, unlike the above two points of view, Dubno et al. (2000) investigated word recognition of young and old listeners in sentences with and without context, finding that provided with identical speech audibility, older and younger listeners would gain identical benefit from sentence context.

The inconsistency of the mentioned three perspectives may derive from the distinction of the task content of experiment or the different methods to describe the context benefit such as behavioral and electrophysiologic outcome measures as explained by Bieber et al. (2022). More recently, based on reflections of the previous studies, Bieber et al. (2022) examined the context benefit in native and nonnative accent for younger and older adults with high-predictability sentences and low-predictability sentences as speech stimuli by combining both behavioral and EEG measures. Results showed that even though older adults performed poorer in the condition of low-predictability and nonnative accent, their ability to use context for word recognition did

not get weak, which was in line with the first point of view. Future studies can further reflect the reasons for inconsistency among the prior studies and conduct duplicate test. Besides, future work should focus more on the context benefit for older and younger adults in accented speech to enlarge the existing findings.

In terms of the comparison between the extent to which children and adults benefit from semantic context, existing studies have not reached a consensus. On one hand, one perspective of view is that children can obtain more benefit from the semantic context than adults and younger children than older children (Nittrouer & Boothroyd, 1990; Bent et al., 2019). On the other hand, a conflicting viewpoint holds that the degree of context benefit is equal for children at various age periods and adults (Fallon et al., 2002). However, a point worth noticing is that the listening environments provided in the above research are not the same, and only one of the studies (Bent et al., 2019) have considered the variable of nonnative accent. Specifically, Nittrouer and Boothroyd (1990) explored the word recognition under the three conditions that are zero-predictability (syntactically wrong) sentences, low-predictability sentences (syntactically correct and semantically appropriate) and high-predictability sentences (syntactically correct and semantically anomalous) without degraded listening interference for children (4-6 years) and older adults (over 62 years). Results showed that children's ability to utilize the semantic context was not as good as the that of the older adults. Partially different from the study of Nittrouer and Boothroyd (1990), Fallon et al. (2002) investigated the benefit of semantic context to word recognition in noise by 5 and 9-year-old children and adults with using the high- and low-predictability sentences. Results demonstrated that though the ability of 5-year-old children to utilize the semantic context was not as good as that of the 9-year-olds and adults, listeners in all age groups presented comparable benefit from sentence context in both levels of noise. At a more recent study, Bent et al. (2019) took the nonnative accent into account, and examined the sentence context facilitation for the word recognition of children (5-7 years) and adults (18-35 years) of native- and nonnative-accented speech. Stimuli included 32 isolated words and 32 sentences, and participants were instructed to

repeat the words or the sentences as much as they can. Results exhibited that children and adults benefited from sentence context under the condition of both native and nonnative accents, and that although the 2 age groups showed a similar degree of context benefit for native-accented stimuli, adults showed a more remarkable benefit than children for nonnative-accented stimuli. Besides, children's benefit from the semantic context positively correlated with their age. In summary, research into the comparison between the benefit of children and adults gained from semantic context is relatively scarce in number and it is valuable to add the variable of nonnative accent to research of this topic. Furthermore, regarding age variety, there has been few research only targeting at young adults to consider the individual difference in using the semantic context to facilitate the recognition of nonnative-accented speech.

2.2 Vocabulary Knowledge

Although vocabulary knowledge is key to second language (L2) listening comprehension, and has been heatedly discussed as a variable in L2 listening comprehension in recent years (Vafaee, 2020; Du et al., 2022; Du & Man, 2022; Zhang & Zhang, 2022), it is rarely has been examined as a variable in the investigation of semantic context benefit in accented listening comprehension. Only in Bent et al. (2019), the relationship between children's (from 5 to 7 years) vocabulary scores and their ability to benefit from sentence context has been examined and results exhibit that children occupying large vocabularies are better able to employ the semantic context regardless of the talker's accent. One key point to notice is that when partial correlations that controlled for age were conducted, the correlations were no longer significant, suggesting two possibilities as follows. One is that the effect of vocabulary size is independent of age when listening to both native and nonnative talkers. The other possibility is that considering vocabulary and age are highly correlated, eliminating the age factor removes the common variance between the two factors.

In contrast, as for the role of vocabulary knowledge in L2 listening comprehension, related studies and findings are various. For example, Zhang and Zhang (2022) combined more than 100 individual studies and generated 276 effect sizes from a sample of nearly 21000

learners, discovering that the overall correlation between vocabulary knowledge and L2 listening comprehension was 0.56 (p<0.01). Vafaee (2020) testified the predictive power of second language breadth and depth of vocabulary for successful L2 listening comprehension, and found that the test scores of the depth of vocabulary knowledge better predicted listening comprehension than the ones of the breadth of vocabulary knowledge. Besides, given that an indispensable aspect of vocabulary knowledge is vocabulary size (Milton & Hopkins 2006), there are a few studies that have considered the role of vocabulary size in L2 listening comprehension. For instance, Du and Man (2022) probed into the effect of vocabulary size together with other person factors as well as strategic processing on L2 listening comprehension and proved that aural vocabulary size significantly predicted L2 listening comprehension. In line with Du and Man's (2022) findings, Du et al.'s (2021) study further elaborated on the relationship between oral vocabulary size and L2 listening comprehension with 288 Chinese tertiary EFL learners who were at the intermediate level of language proficiency as participants. Data demonstrated that aural-vocabulary size's predictive power toward L2 listening comprehension reduced as the language proficiency of L2 listeners advances.

2.3 Second Language Proficiency

Several typical studies on the influence of L2 proficiency in listening comprehension are as follows. Feyten (1991) adopted a department-created test for testing 90 non-native English speakers whose first language was Spanish or French to investigate the relationship between listening ability and foreign language (FL) proficiency, and between listening ability and FL listening proficiency skills. Correlation analysis exhibited a positive relationship between listening ability and FL proficiency as well as FL listening proficiency skills. A small deficiency of the research method lies in the test for measuring participants' listening skills because only the type of examination is roughly mentioned but the details of questions or examples are not provided, suggesting the test may be not standardized enough. Findings from later research into the influence of L2 proficiency on L2 listening comprehension are compatible with Feyten's results. Moreover, Vandergrift (2003) investigated the types of strategies used and the differences in strategy used by more

skilled and less skilled listeners and found that less skilled L2 listeners depended more on bottom-up processing as segmenting spoken speech word by word. Furthermore, in Vandergrift (2006), 75 Grade 8 English students who learn French complete listening comprehension tests to evaluate the contribution of L2 proficiency to L2 listening comprehension ability. Data analysis reveals that L2 French proficiency emerges as a significant predictor of L2 listening comprehension for it explains 25% of the variance in L2 listening ability. Additionally, according to Vandergrift (2007), the degree to which bottom-up and top-down procedures are employed depends on characteristics like overall language proficiency. In conclusion, L2 listening proficiency does affect the comprehension of accented speech perception but there is nearly no existing evidence on how strong the effect is or whether this effect is always statistically significant.

Concerning the measurements for assessing L2 proficiency, the majority of listening studies apply expert judgment, course level, or performance on a non-standardized test to the measurement of language proficiency. In addition, Medina (2020) pointed out that possibly one of the only L2 studies to combine a standardized proficiency test with listening comprehension was that of Carrell et al.' (2002) study which employed the paper-based and computer-based Test of English as Foreign Language (TOEFL). As a result, the inclusion of listeners' L2 proficiency measured in a standardized test in the study on the semantic context benefit deserves more attention in future work.

2.4 Accent Degree

Although a few studies have investigated the semantic context in the condition of native and nonnative talkers (Holt & Bent, 2017; Bent et al., 2019; Bieber et al., 2022), accent strength as a variable has seldom been explored in the study on the context benefit in listening comprehension, but it is of significant value to review related findings and include accent in future work because communicating with others in a second or foreign language is common in the global world.

Although a few studies have investigated the influence of the strength of accent on spoken language comprehension, a more specific examination of this influence on context benefit

has been more of less ignored. Only the study by Behrman and Akhund (2013) that discusses the question that whether or not the effect of semantic context on comprehensibility and intelligibility rely on level of accentedness gives some hints on this issue. In the study, listeners are 80 monolingual American English college students between the ages of 17 and 22 years and speakers are 20 Spanish English learners who consider themselves proficient in American English. Speech stimuli consist of three types of semantic contexts which are true-false, semantically meaningful and semantically anomalous sentences with no control over the phonetic content and three degrees of accented which respectively are strong accent, mid-level accent and mild accent. In the experiment, listeners are required to complete three tasks after hearing each stimulus in the following order: transcription, accentedness rating and comprehensibility rating. Results suggests that the interaction effect between semantic context and accentedness on both comprehensibility and intelligibility is statistically significant. More specifically, for the group of stimuli with strong accent, semantic context is crucial in all settings. The listeners find it far simpler to understand and accurately transcribe the real-world context, and as semantic contextual facilitation effect declined, comprehensibility and intelligibility become increasingly more challenging. For the group of mid-level accentedness, semantic context influences comprehensibility and intelligibility only in contrast to true-false and anomalous contexts. However, in the group of mild accentedness, semantic context has little impact on intelligibility and the effect on comprehensibility is not steady across three types of contexts. Therefore, the context effect weakens for the speech stimuli with milder accents, which according to Bent et al. (2019) is a result of ceiling effects (i.e., scores for the mildly accented nonnative talkers are between 99% and 100% correct). Future work should pay more attention to the impact of accent degree on context benefit, and in doing so, the existing findings of semantic context benefit will be completed and perfected. Besides, the enrichment of accent-related studies will guide listeners to make better usage of semantic context in real-world second and foreign language communication.

2.5 Noise

There are a few studies that have examined the effect of noise in accented listening comprehension (Bent & Atagi, 2015) or with only semantic contexts (Fallon et al., 2002), but the studies probing into the influence of noise on semantic context benefit to foreign-accented word recognition are relatively rare. Regarding noise in accented listening comprehension, some research has found that speech presented with apparent background noise or reverberation is less intelligible for non-native participants with high English proficiency compared to native listeners, but on the condition that the speech is presented with less noise or in quiet background, the accuracy of speech recognition by the non-native participants is equivalent to that of native listeners. According to Bradlow and Alexander (2007), there are two potential reasons. One is that the prime cause of the more distinct decrease for nonnative than native listener speech-in-noise comprehension is at the segmental level and native listeners are more experienced in taking full usage of the overall range of cues for any given phoneme when the masking effects of noise interrupt the perception of the acoustic cues. Another possible reason is that the noise has detrimental effects at all levels of processing and final nonnative levels of presentation on word recognition in noise tasks reflect cumulative effects of noise all through the processing system. In terms of noise added in high and low semantic contexts, Fallon et al. (2002) examined the ability of children of 5-year-old and 9-year-old, and adults to recognize the final words in low- and high-predictability sentences in background noise. Although 5-year-old children performed poorer than 9-year-old children and adults did, the 5-year-olds were as proficient as older listeners at applying degraded semantic cues in a sentence to facilitate their perception of other information in that sentence.

Bradlow and Alexander (2007) investigated the influence of noise as well as semantic context for native and non-native listeners in listening comprehension. For nonnative listeners, regarding the low predictability sentences in plain speech, the accuracy of final word recognition was enhanced by 9 percentage points (from 51% to 60% correct) when occurred with clear speech. However, in the plain speech style, the nonnative listeners nearly did not show benefit for word recognition accuracy from low predictability sentences to high predictability sentence contexts (from 51% to

50% correct). These data suggested that noise did restrain nonnative listeners from obtaining benefits from the semantic contexts. On the other hand, for native listeners, as to the low predictability sentences contexts in plain speech, the accuracy of final word recognition was enhanced by 15 percentage points (from 58% to 73% correct) when occurred with clear speech and by 19 percentage points (from 58% to 77% correct) when presented with high predictability sentences, which was in opposite to that of the nonnative listeners. That indicated that noise did not hamper the benefit of semantic context.

2.6 Accent Familiarity

Several studies have proved that familiarity to (or experience of) an accent helps listeners to improve listening comprehension of the speech with that type of accent (Ockey & French, 2016; Perry et al., 2018). For example, Perry et al. (2018) investigated the listeners' ability to "shadow" (read after) the speech either with a familiar or an unfamiliar accent and results showed that shadowing latencies and errors and comprehension errors increased for unfamiliar relative to familiar speech conditions. In addition, Floccia et al., (2006) claimed that listeners perceived foreign-accented speech more slowly than unfamiliar native-accented speech, which was consistent with the study of Goslin et al. (2012) that adopted the event-related potentials (ERPs) to explore the normalization mechanisms in processing regional and foreign accent and found that foreign-accented speech required more top-down lexical intervention than regional-accented speech.

However, similar to the previous 4 factors except for the age factor, the influence of accent familiarity has seldomly been taken into account as an influencing factor for the context benefit in accented listening comprehension and Kennedy and Trofimovich (2008) are two of the very few researchers who have investigated accent experience together with the context benefit. In their study, the role of listener experience (previous exposure to or experience of nonnative speech) and semantic context in L2 listening comprehension has been explored. Specifically, 6 Mandarin Chinese speakers and 6 native English speakers recorded sentences in English and 24 native English speakers (half of them are English teachers) are listeners. Besides, the sentence materials were organized in four sets, and within each of the four sets, there were

24 T-F (True-False) sentences, 12 semantically meaningful sentences, and 12 semantically anomalous sentences. Although listeners with more exposure to nonnative speech understand more speech than those with less exposure, listener experience does not have an impact on the semantic context benefit received by listeners. The results suggested that the fact that experienced listeners perform better in L2 listening comprehension is due to their wider and deeper knowledge of the distinction between L2 pronunciation and native pronunciation instead of their greater ability to take advantage of semantic context. However, considering that semantic context in this study refers to not only the degree but also the type of semantic information and that the listeners are all native speakers, the above conclusion should be verified by more replication studies to ensure its feasibility.

3. Conclusion

In summary, the exploration of factors impacting the semantic context benefit in accented speech comprehension underscores the multifaceted nature of this phenomenon. Key among these factors is the characteristics of the speech stimulus, encompassing acoustic-temporal variables, syntactic modifications, and text types, which significantly shape comprehension processes. Concurrently, listener characteristics such as language proficiency, vocabulary knowledge, and accent familiarity exert substantial influence on comprehension outcomes. Moreover, age emerges as a pivotal factor, with distinct processing patterns observed across different age cohorts. While vocabulary knowledge has attracted considerable attention in L2 listening comprehension, its role in semantic context benefit remains underexplored but promising. Furthermore, L2 proficiency stands as a critical determinant of comprehension abilities, albeit with notable variations in assessment methodologies. Accent degree and noise presence are additional factors impacting comprehension, each contributing to the complex interplay of comprehension processes. Despite these insights, accent familiarity remains relatively underexplored within the context of semantic context benefit, suggesting avenues for further investigation. Overall, this comprehensive examination underscores the intricate dynamics in accented speech comprehension, with implications for language

learning pedagogy and future research endeavors aimed at enhancing comprehension strategies in diverse linguistic contexts.

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