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The pragmatic influence of articulatory gestures on speech perception of ESL hearing impaired people

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Abstract

Hearing plays a vital role in oral communication as it provides them the opportunities of receiving and interpreting sounds, words, phrases and sentences. It is on this basis that this paper examines the Pragmatic Influence of articulatory gestures on speech perception of English as Second Language (ESL) hearing Impaired People considering the pragmatic-phonetic interface. The theoretical framework of this study is Direct Realist Theory (DRT) and the research sample consists of sixty-six (66) participants that comprised male and female who are ESL hearing impaired adults and patients at the unit of Ear, Nose and Throat (ENT), Aminu Kano Teaching Hospital (AKTH), Kano State. The data were collected using hearing test with the aid of speech audiometry. The test has spondaic words and was presented via headphones which the participants listen to and repeat. The data were analysed qualitatively. The finding of the study revealed that articulatory gestures between first and target languages demonstrate a sensorimotor influence on speech perception in hearing impaired adults as they express their thoughts, ideas and feelings in speech with the aid of pragmatics skills. The study concludes that Hard-of-hearers who are second language learners learn the target language differently from the normal hearers considering their level of hearing perception as they use learning strategies to process oral speeches guided by pragmatic communication from the contexts of syntax, semantics, pragmatics, phonetics and phonology.

Keywords: Pragmatics, Phonetics, Hearing impairment, First Language (L1), Second Language (L2).

Introduction

Hearing is closely linked to spoken and written languages which act as basis for thinking, learning, reading, and writing. It plays a vital role in oral communication as it provides them the opportunities of receiving and interpreting sounds, words, phrases and sentences. Mather (2006) notes that hearing is the *physical* process by which sound pressure changes are TRANSDUCED into electrochemical neural signals suitable for passing along the auditory nerve to the part of the brain responsible for their processing: the auditory cortex. Edwards (2001, 2002) states that "understanding the way in which hearing is affected can lead to improved signal processing algorithms that attempt to normalize auditory perception at the basic psychoacoustic level". It is on this basis that this paper examines the Pragmatic Influence of articulatory gestures on speech perception of ESL hearing Impaired People considering the pragmatic-phonetic interface.

Pragmatic Communication

Communication, according to Merriam-Webster (2017:94) and Nordquist (2017:18), refers to the process of sending and receiving messages through a common system of symbols, signs, or behavior with verbal or nonverbal means. This view is supported by Owens (2014) who opines that language in oral communication involves processing information in terms of perception and production processes ranging from syntax, semantics and pragmatics to phonetics and phonology. "Pragmatic communication is an ability of using language either oral or written in a context, above

comprehension and expressing basic meaningful words (semantics) in the correct grammatical forms (syntax)" (Turkstra et al., 2016). Thus, pragmatics skills, according to Carotenuto et al., (2017) connect language and context, while social cognition combines social interaction and social cue interpretation. Many researchers reveal the relationship between pragmatics and phonetics considering the relevance of phonetics in pragmatics. This is evident in phonetic-pragmatic study conducted by Watt et al. (2013) and Tompkinson et al. (2016) on pragmatics which reveals that speech signal influences the assessment of a listener's utterances.

Previous Works on Hearing Impairment in ESL Contexts

Language acquisition is an interesting area of research especially the hearing impaired with listening and speaking as its vital tool. This is evident in the work of Kirk and Gallagher (2009) who state that deaf children have normal cognitive abilities and their poor academic performance actually stems from their difficulty in hearing properly which affects their reading and writing the English language, not their intelligence. This situation affects their academic performance and their relationship with others as well. Thus, second language learners who are hard-of-hearers find effect communication very difficult unlike the hearing people, and this provides differences in their literacy development. "Understanding speech", according to Kontra, Csizer and Piniel (2015:105) is, of course, not only difficult through the acoustic channel, but also via lip reading, especially in English where the same letter can stand for a variety of sounds and vice versa. Visual learners, as noted by Marschark et al. (2002) prefer to see a demonstration or some type of process of how things are done as they learn mainly with the help of their eyes and rely on them to understand concepts better.

Hard-of-Hearers in ESL Setting

Second language learners who are hard-of-hearers learn languages not the same as that of the hearing people. Dotter (2008) observes that deaf people are forced from childhood to develop strategies to overcome incomplete/defective information, much more than hearing people are. Such strategies are used in different settings where English is used a Second Language. Ellis (1994), O'Malley and Chamot (1990) note that several relevant and related studies in language learning have been provided. These works reveal the relevance of cognitive, social and communicative skills in language learning considering the nature of languages.

Theoretical Framework

Direct Realist Theory (DRT) developed by Fowler (1986, 1996, Fowler and Dekle 1991) was adopted for the study. The DRT assumes that speech perception is, generally, similar to other physiological perceptual processes such as visual perception (Fowler and Dekle 1991). According to Fowler (1996) and Diehl, et al. (2004), although the acoustic signal is produced as a result of combination of articulatory gestures, a given speech signal can be produced using several vocal tract configurations.

Methodology

Population of Study

The participants of this study are hearing impaired adult second language learners of English, and are patients in a teaching hospital. Ten (10) patients/subjects were recorded on each of the eight (8) clinical days by the research assistants who are audiologists and staff of the department. This implies that a total number of eighty (80) patients was recorded from eight (8) of the clinical days and sixty-six (66) was sampled out. The subjects of this study were hearing impaired persons with different qualifications above Senior Secondary Certificate of Education (SSCE). Out of this number, 27 (representing 41%) had conductive and sensorineural hearing loss while the remaining 12 (18%) had mixed hearing loss. Similarly, 32 out of the 66 people studied (representing 48%) suffered from mild hearing impairment while 17 persons (representing 26%) suffered from moderate to severe hearing impairments.

Sample size of the study

Sample is a portion drawn out from the population of the study. In this study, sixty-six (66) hearing impaired adult second language learners of English were sampled out of the target population (80). The justification for this sample is in line with Kreycei and Morgan (1970) that a population of 80 has a sample size of 66. Participants who are hearing impaired must be men and women between the ages of 18 and 65 who are non-native speakers of English. They should also have the ability to communicate in English language. Adults with a manageable hearing loss through surgeries or medication were excluded.

Sampling Techniques

In data collection, every individual observation has equal probability to be selected. It is important that the individuals selected are representative of the population under study. The sampling techniques used for this study are purposeful and random sampling.

Research Instrument

The study used two different tools for data collection. The two research instruments (CID auditory wordlist and E.N.T/A.K.T.H Audiology Assessment Form) that were employed are regulated tools. The research tools consist of the following:

a. Audiometric Evaluation Form

b. Audiological Equipment and Facilities

The instrument used for this study in audiological testing include otoscope, audiometer and tympanometer.

c. Room Requirement for Audiometry

The room used for this study is quiet with very little echo and a sound booth in it. Before employing data collection instrument, participants were given consent form to read carefully and sign as their anonymity and confidentiality were guaranteed. Similarly, the researchers applied and got approval for ethical considerations from the AKTH authorities before the commencement of this study.

Confidentiality and Ethical consideration

Before employing data collection instrument, participants were given consent form to read carefully and sign as their anonymity and confidentiality were guaranteed. Similarly, an approval was granted for ethical clearance/approval by Health Research and Ethics Committee of AKTH to conduct the research from office of the Chief Medical Director (CMD) through office of the Chief Medical Advisory Committee (CMAC) and later Head, Department of Ear, Nose and Throat (ENT).

Data Presentation and Analysis

The study obtained data from participant's audiometric evaluation form which reveals the assessment of hearing threshold of the participants in decibel. Prior to the commencement of the speech audiometry, a Pure Tone Audiometry (PTA), a test that shows whether or not there is hearing lost on the subjects.

Table 1: PureTone Audiometry Test Results

S/N	AUDIO NUMBER	RIGHT EAR	LEFT EAR
01	001	53.3dB	56.6dB
02	002	63.3dB	61.6dB
03	003	27.5dB	26dB
04	004	51.6dB	50dB
05	005	76.6dB	71.6dB
06	006	58dB	120dB
07	007	27.5dB	26dB
08	008	26dB	26.5dB
09	009	35dB	48.3dB
10	110	26dB	26dB
11	011	113dB	113dB
12	012	30dB	31dB
13	013	26dB	26.2dB
14	014	53.7dB	66.25dB
15	015	43.3dB	65dB
16	016	105dB	76.6dB
17	017	46.2dB	53.3dB
18	018	27dB	26.3dB
19	019	46.6dB	51.6dB
20	021	28.3dB	26dB
21	021	75dB	65dB
22	022	27.6dB	35dB
23	023	110dB	108.3dB
24	024	27.5dB	26.7dB
25	025	28dB	28.3dB
26	026	26dB	26.6dB
27	027	28.3dB	106.6dB
28	028	27dB	41.6dB
29	029	95dB	100dB
30	030	55dB	26.6dB
31	031	28dB	113.3dB
32	032	27dB	26dB
33	033	29.3dB	101.6dB
34	034	110dB	110dB
35	035	58.75dB	56.25dB
36	036	61.6dB	120dB
37	037	120dB	76.6dB
38	038	36.25	48.3dB
39	039	28.3dB	26.6dB
40	040	26dB	26.6dB
41	041	28.3dB	30dB
42	042	53.3dB	56.6dB
43	043	45.6dB	48.3dB
44	044	27dB	113.3dB

45	045	27dB	26dB
46	047	28.3dB	26.3dB
47	048	30dB	30dB
48	049	30dB	30dB
49	50	115dB	31.6dB
50	052	83.3dB	96.6dB
51	053	33dB	35dB
52	054	40dB	40dB
53	055	55dB	41.6dB
54	056	31.6dB	35dB
55	057	30dB	30dB
56	058	30dB	30dB
57	060	31.6dB	30dB
58	061	53dB	66dB
59	062	35dB	120dB
60	063	113.75dB	27.5dB
61	064	31.6dB	31.6dB
62	065	67.5dB	61.25dB
63	067	27.5dB	26dB
64	068	51.25dB	32.5dB
65	069	31.25dB	33.3dB
66	070	38.3dB	43.3dB

Table 1 shows the results of the degree of the impairment. All the participants in this study are suffering from one form of hearing impairment or another. Normal hearing is characterised by a threshold of 25 dB HL or less while hearing impairment is realised by a threshold of 26 dB HL or greater. By measuring the air and bone conduction thresholds, the type and the degree of hearing loss can be determined, and often the underlying cause as well.

Results of the Speech Audiometry Test

A test on speech audiometry which is a tool in assessing hearing loss was also conducted on the subjects. It can aid in determining the level and nature of hearing loss in conjunction with PTA. This type of test shows how well a person listens to and repeats words. The test has spondaic words and was presented via headphones that the participants listen to and repeat. The researcher watched the subjects very closely as they listened and repeated the spondee words as presented in Table 2 below.

Table 2: Speech Audiometry Test Results

S/N	Word	Transcription (TR)	Participants Realization (PR)	Correct (TR and PR)	Incorrect (TR and PR)	Total
1	Airplane	/eəplein/	/eplen/	29 (44%)	37 (56%)	66 (100%)
2	Armchair	/ɑ:mʧeə/	/amʧe/	25 (38%)	41 (62%)	66 (100%)
3	Baseball	/beizbɔ:l/	/bezbɔl/	21 (32%)	45 (68%)	66 (100%)
4	Birthday	/bɜ:Ɵdei/	/bɜzde/, /bɜtde/	32 (49%)	34 (51%)	66 (100%)
5	Cowboy	/kaʊbɔi/	/kaʊbɔi/	66 (100%)	0 (0%)	66 (100%)
6	Daybreak	/deibreik/	/debrek/	19 (29%)	47 (71%)	66 (100%)
7	Eardrum	/iədrʌm/	/ədrɔm/	23 (35%)	43 (65%)	66 (100%)
8	Farewell	/feəwel/	/fewel/	40 (61%)	26 (39%)	66 (100%)
9	Greyhound	/greihaʊnd/	/grehaʊnd/	27 (41%)	39 (59%)	66 (100%)
10	Hardware	/hɑ:dweə/	/hɑdwe/	24 (36%)	42 (64%)	66 (100%)
11	Headlight	/hedlait/	/hedlait/	66 (100%)	0 (0%)	66 (100%)
12	Hothouse	/hɔthaʊs/	/hɔthaʊs/	66 (100%)	0 (0%)	66 (100%)
13	Iceberg	/aisbɜ:g/	/aisbɜg/	20 (30%)	46 (70%)	66 (100%)
14	Mousetrap	/maʊstræp/	/maʊstrap/	34 (52%)	32 (48%)	66 (100%)
15	Oatmeal	/əʊtmi:l/	/aʊtmil/	22 (33%)	44 (67%)	66 (100%)
16	Pancake	/pænkeik/	/pankek/	19 (29%)	47 (71%)	66 (100%)
17	Playground	/pleigraʊnd/	/plegraʊnd/	42 (64%)	24 (36%)	66 (100%)
18	Railroad	/reilrəʊd/	/relraʊd/	32 (48%)	34 (52%)	66 (100%)
19	Schoolboy	/skʊ:lbɔi/	/skʊlbɔi/	58 (88%)	08 (12%)	66 (100%)
20	Sidewalk	/saidwɔ:k/	/saidwɔk/	50 (76%)	16 (24%)	66 (100%)
21	Stairway	/steəwei/	/stewe/	17 (26%)	49 (74%)	66 (100%)
22	Whitewash	/waitwɔʃ/	/waitwɔʃ/	66 (100%)	0 (0%)	66 (100%)

Table 2 shows that the speech audiometry (hearing test) for diphthongs has twenty-two (22) spondaic words from Central Institute for the Deaf (CID) auditory wordlist. These words are made up of bisyllables, typically nouns with equal stress placed on each syllable. Most of these words have one or two diphthongs while the remaining few have monophthongs only. Some of the words have greater percentage of realisation than others such as 'headlight' /hedlɑit/, 'cowboy' /kɑʊbɔi/, 'hothouse' /hɔthɑʊs/ and 'whitewash' /wɑitwɔʃ/ while others have less percentage when compared to others such as 'daybreak' /deibreik/, 'stairway' /steəwei/ and 'greyhound' /greihɑʊnd/.

Findings and Discussion

In the present study, the hearing impaired subjects provided evidence of perceived phonetic distance between native language and target language which have similar diphthongs in the spondee words such as /ei/ as inAirplane/eəplein/, railroad/reilrəʊd/,baseball/beizbɔːl/, birthday/b3:Ðdei/, daybreak/deibreik/, greyhound/greihɑʊnd/, Pancake/pænkeik/, playground/pleigrɑʊnd/; /eə/ as in armchair/ɑ:mʧeə/, farewell/feəwel/, hardware /hɑ:dweə/, and stairway/steəwei/.

In this case, there is no any English diphthong among those underlined that received an exact match to its L1 equivalent as shown in Table 3. Both diphthongs /ei/ and /eə/ were replaced by the monophthong /e/ which exists in the indigenous languages of the participants. The words with the diphthong /ei/ were replaced by the monophthong /e/. The pronunciation of the sound begins with Received Pronunciation (RP)/e/ and ends with RP /i/. In the articulation of this front and short vowel, the front of the teeth touches the lower teeth while the lips are spread. The tongue is about midway between the half-close and the half-open position. The /ei/ sound is a narrow diphthong; the movement of the tongue and jaw is relatively slight. Since RP /e/ is naturally quite short in certain contexts (e.g. before unvoiced stops), the participants realised/ei/ as in /e/ in the same contexts. Thus, the subjects pronounced /e/ instead of /ei/ in Airplane/eplen/, railroad/relrɑʊd/, baseball/bezbɔl/, birthday/b3zde/ and/or/b3tde/, daybreak/debrek/, greyhound/grehɑʊnd/, Pancake/pankek/ and playground/plegrɑʊnd/.

Similarly, the words with the diphthong/eə/ were also replaced by the pure vowel /e/. The articulation of this diphthong begins with a half-open front vowel /e/ and moves from there to /ə/ sound. The participants having realised the first part of the diphthong (/e/) failed to do the same for the second part - /ə/. This is because the vowel /ə/which is called schwa sound does not exist in their L1. Therefore, the following words were not realised correctly: /eə/ as in armchair/ɑmʧe/,farewell/fewel/,hardware /hɑdwe/ and stairway/stewe/. This shows that ESL hearing impaired speakers just like the normal hearers find English diphthongs difficult to realise. This is because English has eight diphthongs while some languages have fewer diphthongs.

Therefore, the study reveals that in hearing impairment, any problem encountered in the course of producing or perceiving second/foreign sounds might come from differences or similarities in the articulatory gestures between the first and the target language. This finding demonstrates a sensorimotor influence on speech perception in hearing impaired adults as they express their thoughts, ideas and feelings in speech with the aid of pragmatics skills.

Conclusion

Hard-of-hearers who are second language learners learn the target language differently from the normal hearers considering their level of hearing perception. They use learning strategies to process speech perception and speech production guided by pragmatic communication from the contexts of syntax, semantics, pragmatics, phonetics and phonology.

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