ISSN: 2663-9033 (Online) | ISSN: 2616-6224 (Print)

Journal of Language Studies

Contents available at: http://jls.tu.edu.iq

Phonological Analysis of Isochrony in English Speech

Suaad Abd ul-Rahman Eltaif *
General Directorate of Education in Salah Addin
E-mail: harith_abd2016@tu.edu.iq

Keywords:	Abstract
- equivalent intervals - isochrony - rhythm - regular - stressed syllable	This study aims at illustrating the concept of isochrony ,determination its phonological units , emphasizing the existence and the role of this phenomenon. Isochrony refers to the occurrence of stressed syllables at equal time intervals through an utterance. This term is used to specify the rhythm features. Many experiments have been applied by the specialists to find a vivid clue about the presence of isochrony in production. They found modicum assent about the actuality of its principles. They assure its existence at perceptual level. The term "perceptual isochrony" includes a role in two significant psycholinguistic styles "underlying spoken" and written word comprehension , which are word segmentation and lexical access .Isochrony cannot be neglected because it forms the standard of rhythmic system of English. Finally, there is a relationship between isochrony and syntax because the reading of ambiguous sentence requires accurate effort and attention to the meaning during the time of reading.
Article Info	
Article history:	
Received: 12-8-2021	
Accepted: 1-9-2021	
Available online	

* **Corresponding Author**: Suaad Abd ul-Rahman Eltaif , E-Mail: harith_abd2016@tu.edu.iq
 Tel: +9647701807379 , **Affiliation**: General Directorate of Education in Salah Addin -Iraq

التحليل الصوتي للتماثل الزمني في الكلام الانكليزي

سعاد عبدالرحمن الطيف

المديرية العامة للتربية في صلاح الدين – قسم تربية تكريت

الخلاصة :	الكلمات الدالة:-
تهدف هذه الدراسة الى توضيح مصطلح التماثل الزمني وتحديد وحداته الصوتية، وتأكيد وجود ودور هذه الظاهرة. يشـــير التماثل الزمني الى ظهور المقاطع المشـــددة بفترات زمنية متسـاوية خلال النطق . ويستخدم هذا المصطلح الذي هو موضـوع الدراسة الحالية في تحديد مميزات الأيقاع او التناغم. هنالك العديد من التجارب التي اجريت من قبل المختصين في هذا المجال لأيجاد دليل واضح حول وجود هذا التماثل الزمني خلال الشروع بأصداره. لكن النتيجة اشارت الى ظهور موافقة ضئيلة بين المختصين حول حقيقة قواعده. لكنهم اكدوا وجود هذه الظاهرة على المستوى الأدراكي. ان مفهوم التماثل الزمني الادراكي له دور في نمطين على صـعيد علم اللغة النفسي، والذي هو متضمنا بأستيعاب الكلمة المنطوقة والمكتوبة . وهذان النمطين هو تجزئة الكلمات ومنفذها المعجمي . ويمكن التوصل الى نتيجة انه لا يمكن اهمال ظاهرة التساوي الزمني لأنها تشكل اساس النظام الأيقاعي في اللغة الانكليزية. وأخيرا ، هناك علاقة بين ظاهرة التماثل الزمني وتركيبة الجملة ، وذلك لأن قراءة الجملة المبهمة يتطلب جهد متقن وأنتباه الى المعنى خلال زمن القراءة.	– الفواصل المتكافئة – التساوي الزمني -الأيقاع – منتظم – المقطع المشدد **معلومات البحث** **تاريخ البحث:** الاستلام: ١٢ـ٨ـ٢٠٢١ القبول: ١ـ٩ـ٢٠٢١ التوفر على النت

Introduction

This research presents the phonological analysis of isochrony in English speech. It is divided into seven sections:

The first is about the definitions of isochrony from different resources that display the opinions of the authors. The second   explains the hypothesis concerning the phenomenon of isochrony .

While, The third section interprets isochrony in production . The fourth displays isochrony as a perceptual phenomenon .

The content of section five shows the hypotheses of English speech of rhythm that have connection with this topic. Section six includes the conclusions . Finally, section seven exhibits the references of the study.

1-Definitions of Isochrony:

Lehiste (1977 :253   ) claims that in a stressed- timed language like English, isochrony refers to the occurrence of particular phonological units such as stressed syllables at almost equal time intervals.

Bouzon and Hirst (2004: 1) define iscchrony as a process which organizes the speech into parts realized as equal duration.

Crystal (2008: 255-256)   states that the expression isochrony is utilized in phonetics and phonology to mark out the rhythm features of some languages. Isochrony refers to the falling of stressed syllables at nearly orderly intervals – during an utterance. Isochronism is another name for isochrony.

It is the suppose of rhythmic segmentation of time into equal parts by a language . Rhythm is a part of prosody and the others are:
intonation, stress and tempo of speech. (Mathews,2014:157).

2- Interpreting the Hypothesis of Isochrony:

Classe (1939: 90-95) fails to find a 'perfect isochrony' , but he does not disregard it. He claims that 'isochrony' forms the base of rhythmic system of English. It remains a basic inclination of which some other elements at times utterly obliterate the influence. There is no 'absolute isochrony' in objective mensuration. He considers it a subjective phenomenon.

In speech, long groups supplied other circumstances to make subjective isochrony by the listeners or readers, because of speech habits.

Pike (1945: 34) , Donia and Isard (1985: 156) and Abercrombie (1967: 203) divide all the world's languages in to the following divisions that language falls into rhythmic categories , such as:

- (Syllable-timed) the syllables are of equal length , such as: French, Italian, Spanish, Yoruba, and Telegu.

- (Stress –timed) the equality of intervals between stressed syllables   like English , Arabic and Russia with similar length (or isochronous) feet .

- (mora –timed) Equal duration of every mora, such as Japan.

To make measurement for the duration of any structure in speech signal , it is clearly essential to know where, along the time centre, the structure starts and ends. (Hockett, 1955: 52).

Lehiste (1973:109) states that there is a relationship between isochrony (speech timing) and syntax . There is an experiment includes (15) ambiguous sentences produced by (4) speakers and listened by (30) listeners .One of the examples of the sentences is the old men and women stayed at home. It can be interpreted either the men were old , or both of them were old. After reading the sentences by the listeners and pointing to the ambiguities, the speakers uttered the sentences again.

The production of the sentences needs conscious effort and attention to the meaning at the time of reading. So, there are (3) texts of each sentence .

-A pulsive production of one meaning and an intended disambiguated text to utter the first one and then the other meanings .

- The two possible meanings were given to the listeners and asked to identify which of the two the speakers had in mind.

-The speakers would use many methods to fulfill the same goal, that means lengthening of interstress interval: the most straightforward was intromission of a pause , but there were successful means: The way of lengthening one or more than segmental sounds prior the boundary.

-Very high scores had been recorded to some of the sentences, whereas others had no successful disambiguation.

-The spontaneous text had a random score.

- The speakers had used to attain disambiguation.

-The means by which the speakers had increased the interstress intervals which included the relevant boundary had achieved successful disambiguation.

Fowler (1977: 378) discovers that when speakers are asked to generate an isochronous series of stressed monosyllable they produce an acoustic sign in which the anisochronies are only those that listeners" demand" to hear as a sequence like isochronous.

Lehiste (1977: 254-256) in her rehearsal of modern study on rhyme in English speech , exhibits that there has been modicum consent among specialists about the reality of 'isochrony' rules. Lehist's experiments initiated her to conclude and assure the presence of isochrony. She states that "isochrony is most obvious at the perceptual level. She claims that the sensibility of rhythmicality must reflect some features of signal. She made the following:

-Measurements of sound wave.

-producing a clue in favour of particular mensuration of isochrony.

The previous statement can be interpreted that the talkers and listeners concur in inaccurate "anisochrony for isochrony". (Betty & Carol, 1980: 277).

Faure et al (1980 :74) claim that the number of syllable components raises the duration of feet linearly. So, this case rebuts the essential rule of ' strict isochrony' and weak isochrony. Thus, they draw conclusions :

1-There is no syllable force.

2-The notion of regularity comes from the distinction of duration between stressed and unstressed syllable in addition to the happening pitch accents on stress syllable.

Donia &Isard (1985: 156) state that the intervals between sequential stressed syllables , recognized as foot ,are almost commensurate.

Tajima (1998: 100) names the "P – Centre" (perceptual moment of occurrence). In English , the distinct syllable is the latest stressed syllable.

Bouzon and Hirst (2004: 1-3) interpret the hypothesis of 'isochrony' into two ways:

The first is strict isochrony and the second is weak 'isochrony'.

-'Strict isochrony' anticipates the equal duration for different components. For example, the duration of feet should be equal. This means that the complexity of feet should not have any influence on their duration .

-'Weak isochrony ' refers to the propensity of different components to have equivalent duration. According to this rule, the complexity of foot does influence the duration of its entities. Thus, these entities tend to be shorter when they are multiple. The complexity of a constituent on the duration of its sub- constituents was anticipated to appear in the status of weak isochrony.

The comparison of constituent includes five sub- constituents and one sub- constituent is clearly different in length. When the constituents include five sub – constituents will be minimal than five times as long as a constituent comprises only one sub- constituent.

Bouzon & Hirst (2004:1) claim that in general, the expression isochrony has been confined for super level constituents like the stress – group and the syllable. If the same principle is applied at all levels it will worth nothing. So, if the phones are combined into syllables , the result be a syllable with only one phone may be shorter than a syllable with two phones, but not twice as short.

The rules of isochrony had guided to the variation of two kinds of rhythm:

-The systematic occurrence of the stressed syllable of an utterance is made the first kind of rhythm.

-The kind of rhythm is created by the syllables themselves. They make an impression of regularity.

Crystal (2008:256) states that his definition(falling of stressed syllables at regular intervals) refers to 'subjective isochrony' which based on listener's perception. While 'objective isochrony' indicates that intervals measurably congruous.

Bouzon and Hirst (2004: 3) point out that the increase of feet duration is not connected with syllabic compression. They prove their opinion by an evidence. Which is (stressed and unstressed syllables regulate to link the duration of the inter- stress interval to which they belong.

According to the basis of 'strict isochrony' the duration of the foot has to be equal. This case means that the number of phones or syllables in the unit in question should not have any influence on their duration. According to the basis of weak isochrony , the foot should influence the duration of its components that resort to be shorter when they include multiple constituents. So , that leads to an anticipation of seriousnegative influence of the complexity of a foot on the duration of its components.

English speakers do not necessarily lay the phrase final syllable close a simple symmetrical phase. Those speakers appear to look after the final stressed syllable . This explanation assures that English is "stress- timed" language.

(Keiichi , Bushra and Mafuyu, no date: 1).

The importance of stress role in phonological system of the language is obvious. The value of stress role is compared with other languages, such as Japan. In Japan, there is no vivid role for stress in global regulation of speech.

(Tajima, Bushra and Mafuyu, no date: 1).

Bouzon and Hirst (2004:3) claim that with the exception of syllables have only one segment , but there is a positive attachment between mean segment duration and the number of segments in the syllable .

This distinctly paradoxical influence was due to the veracity that longer syllables were more to be stressed. The factor of stress was taken into consideration , a regular effect of compressing was found within the syllable.

Morton et al (1979: 405-408) suggest that the listeners judge the timing of word concatenation that depends on reference points within every word.

The data indicate the following:

1-The longer , the acoustic duration of initial consonant .

2-The longer , the interval between the acoustic onset of the word and position of its reference point. Those authors name the reference point the "P- centre" of a word. This expression is described by Morton , Marcus and Frankish "as the word's psychological moment of occurrence".

Aubanel and Schwartz (2020: 1) state that isochrony represents the opposite of naturalness. Because isochrony is a completely regular timing speech units, while naturalness refers to the occurrence of timing of speech units as they occur in natural way.

3- Isochrony in Production:

Shen and Peterson (1962: 25-34) make their experiment and estimate the space or distance between two primary stresses. They certify that only one primary stress happens per sentence; the last juncture detaching the two sentences was comprised in the stretch of utterance between the primary stresses
-The notes of' this study are:
-The paraphernalia recoded consisted of "written prose.
-In any process , there is no control on the sentence length.
-This study includes three readers, each of them reads different substance.
-The time expansion between primary stresses reached from 410- 1820 ms, for the speaker number (1).
-From 380- 2500 ms, for the speaker number(2).
-And from 550 to 3610 ms for the speaker number (3).
-The time intervals between what Shen and Peterson allocated primary and secondary stressed identified for all readers concerned.

-From 40 to 810 ms between secondary and primary stresses.

-From 190- 990 and between two secondary stresses , from 190 to 880 ms. According to these results , they dismiss the conception of isochrony.

Bolinger (1965: 163) does his experiment with the share of six speakers record to some extent redundant sentences, determined the accents and the intervals . The accents were measured. The out comings of his experiment gave modicum shore to the conception of isochronous rhythm in production .Of the fifty- three intervals , thirteen had almost twice the length of the shortest interval.

Lea (1974:41) studies 'isochrony' in production . He uses 8 talkers read thirty- one sentences. They were divided as following:
-(6) talkers read the rainbow script (a standard text used in speech experiments).
- (2)talkers read a mono syllabic copy.
He examines many hypotheses about isochrony . The first of these hypotheses coincides the standard conception that stressed syllables pursue each other at orderly intervals. This statement presupposes that the number of unstressed syllables between two stresses includes little or no influence on the interstress time intervals.
While his results display that the number of intervening unstressed syllables are basically influence the interstress intervals. The rate of time approximately heightens linearly with the number of intervening syllables. So, there are no similar results . Therefore , the authentic concept of isochrony was refused.

To identify English as a language specified by isochrony, it is essential to organize constraints on production and perception that may affect "isochrony". (Lehiste, 1977: 256).

Allen (1973: 219-220) studies the control of speech timing and optimizes many precedent studies of the temporal variability of speech and he claims the following:

-The variability of production of speech segments matches the variability of other rhythmic activities like, finger-tapping.

-Short speech segments have variability of about 10 □ longer stretches of speech about 4□ , while the total extent for standard mistakes for motor rhythm is about 3-11 □ of the length of the time intervals being produce.

Shen and Peterson (1962: 130) point out that many researchers attempted to present an experimental clue of isochrony in speech at the level of foot. Modicum physical clue in approbation of strict isochrony has been found.

Classe (1939 :85) proclaims the existence of isochrony according to specific and appropriate circumstances :

1-Groups related must include very different numbers of syllables.

2- There must be similarity of the grammatical connexion between the groups and grammatical construction of these groups.

-The phonetic constitution of the component syllable must not vary too widely.

4- Isochrony is A Perceptual Phenomenon:

According to previous studies Lehiste (1973: 1226: 1233) compares the differences of his study with preceded instituted onset for duration. He wonders whether these onsets are immediately viable to his data. Because the remarkable difference has been consisted on the base of stimuli , and his studies are related with series of four intervals.

He reproduces the temporal samples of the four mensuration sentences as non - speech- stimuli. The measures of the duration are copied as noise- filled intervals , identifying the longest or shortest one of the four entities .

In the case of spoken sentences, it is a difficult task for the listeners to decide which were the longest or the shortest .The congruent intervals with non-speech materials were discriminated with much major success.

If the listeners cannot decide the longest or shortest measures in spoken English sentences, the mensuration must look to them have similar duration ; if you cannot tell everyone , they must be in the same way. Isochrony would be a perceptual phenomenon.

Shen and Peterson (1962:23) and Bolinger (1965: 163) state that many studies failed to present a clue proves that the notion of acoustic isochrony , i.e., physical regularity of time intervals between stresses. While isochrony has for sometimes been characterized originally as a perceptual phenomenon . And the phonological units like stress are just heard as happening at regular intervals.

This theory certifies that the utterance of unstressed syllables between syllables will be uttered quickly to get them into the time extension obtainable the following sentence,

(The 'Consequences of her 'action 'Several),

The velocity of utterance of the five syllables after 'con- will be more maximal than the following 'ac. In English , isochrony has forceful tendency .It is referred that English is stress-timed which is adverse to syllable –timed language.

Dauer (1983: 62) and Allen (1975:86) opine that though the absence of experimental evidence in tendency of such as regularity , there is an anticipation that the duration of inter –stress intervals is equal ,if not equal; this state guided the authors to interpret this as meaning that isochrony is fundamentally a perceptual phenomenon.

Laura , Jessica and Christopher (no date ……: 237) , Dilly and McAuley (2008:237) point out that there is an argument whether the listener's grasp increases in regulation in speech more than in other types of aural stimuli , for example , (music , tone concatenation). In addition to that limit the reasons of such differences in perception may happen.

They state that isochrony is a perceptual phenomenon and has a role in two significant psycholinguistic ways implicit spoken and written word comprehension, which are :

1- Word segmentation.
2-Lexical access.

The term Perceptual isochrony proves the utility of word rosters ending with lexically vague syllable series that can either form compound words, for example, (foot -notebook worm) footnote , bookworm , foot notebook worm. (Dilley and Mc Auley,2008:298).

Or can be at the end of embedded words: cry sister nip, crisis turnip / kra I s I st□:n I p.

(Dilley , Mattys and Vinke, 2010: 282).

Cutler and Norris (1988: 117) Claim that   isochrony is a Perceptual phenomenon and can help the listeners to distinguish the occurrence of stressed syllable in upcoming speech paraphernalia.

5-The Hypotheses of English Speech Rhythm

According to Jassem (1952:189-193) who claims that the structure of rhythm in English is set up on two units:

(a) Narrow Rhythm Units (NRU)

(b) And Anacruses (ANA).

- The (NRU) with two syllables is longer than a monosyllabic one ,and so on.

-Individual syllables within a multi syllable (NRU) tend to be of similar length.

- NRU tends to be isochronous , while ANAS are pronounced as fast as physiologically possible.

-The Narrow Rhythm Units (NRUS) include one stressed syllable and any number of following unstressed syllable which both belong to the same word.

-The other unstressed syllables which are not part of Narrow Rhythm Unit (NRU) belong to the (ANA) anacrusis.

There is an important inclination towards isochronous (NRUS) , but there is no noticeable influence in anacruses.

The duration of phones is essentially influenced by variations in length of syllables. The rhythm of English speech can be characterized as a phonetic phenomenon and is specified on completely phonetic rules with no dependence on any other" grade of analysis – synthesis, like grammar or semantics (Jassem & Gibbon , 1980 : 2-4).

Stress , that is now called (accent) , is the influence of temporal regulation of utterance. (Jassem & Gibbon,1980: 2).

Abercrombie (1964: 217) points out that   a syllable and any unstressed syllable follow a stressed syllable with the same foot identifies the beginning of foot. The description of all unstressed syllables is post accentual or (postictic).

-The feature of   " disyllabic foot is triple- time and it can be represented by the following structure:

1- (short – long) (U).

2- (medium- medium) ∩∩

3- or (long- short) U U

- The inner rhythm constitution of a foot is originally connected to its segmental structure , for example , (C) V^1 C V (C)^4 and C) V^2 (C) V (C) both of them produce ∩∩.

-The phonematic structure of the syllable may be quite irrelevant.

- The silent stress is placed when the speech starts with any unstressed syllable. This state being an abstraction proved as zero sound, i.e. not materialized objectively, even "though" actual "psychologically (subjectively").

Abercrombie (1964:219-221) explains the links between rhythm and syntax, for example, the quantities rely on existence of a word frontier. In this example, the rhythmic diversity be when mono- syllable word followed by an unstressed syllable of a word that is not immediately linked syntactically. For example,(take) Grey to London as opposed to Greater (London) and a word followed by an enclitic as in take it, tell him.

Abercrombie (1967: 35) and Ladefoged (1975: 222) state that stress is supposed to enhance energy. The thought of stress is essentially in relation to the thought of rhythm.

Rhythm is considered as a proof for speech processing and listeners can organize their speech more isochronous.

(Pitt and Samuel , 1990: 467)

Heiliel (1982:93) states that there is a noticeable degree of compressing on the level of foot and rhythm unit, but not identical compressing was noticed on the syllable. Syllables include only one segment. This segment is special for its systematically major mean segment duration . This property is due to the fact that such segment includes specific features:

1-They were essentially syllabic nuclie .

2-They were eventually substantially longer.

6- Conclusions

1-Isochrony is confined for super level entities ,such as stress -group and syllable . It cannot be applied to all level in order to reserve its purport content.

2-The world's languages is classified into stressed-timed, syllable –timed and mora – timed. English is specified as stressed- timed language .

3-Narrow rhythm unit and foot include the same definition . The difference is according to the hypotheses.

4-Isochrony is incorporated into the syntax of English. Since, the listener anticipates the occurrence of interstress intervals at approximately similar size.

5- In English, the lengthening of stress intervals is repeatedly utilitized to sign the existence of a syntactic boundary.

6-There is no authentic proof for the existence of isochrony in production.

7-There is no absolute isochrony in objective mensuration . So, it is subjective phenomenon.

 8-"Perceptual isochrony" includes a role in two significant psycholinguistic styles underlying spoken and written word comprehension , which are : word segmentation and lexical access.

9- Perceptual isochrony demonstrates the utility of word ending with lexically uncertain syllable series that can either constitute compound word or can at the end of embedded word.

7-References

-Abercrombie , D. (1967*). Elements of General Phonetics*. Edinburgh University Press. Edinburgh.

------------.(1964). *Syllable Quantity and Enclitics in English.* In D. Abercrombic & al . (eds), In Honour of Daniel Jones. Longman: London.

-Allen, George D. (1973). *Segmental Timing Control in Speech Production.* Journal of phonetics.

------------. (1975). *Speech Rhythm : Its Relation to Performance Universals and Articulatory Timing.* Journal of phonetics.

 -Aubanel , V. and Schwartz, J, L . (2020*). The Role of Isochrony in Speech Perception in Noise.* www. Nature. Com/ Scientific reports.

-Betty Tuller and Carol A. Fowler. (1980).*Some Articulatory Correlates of Perceptual Isochrony.* Haskins Laboratories New Haven , Connecticut . Perception &Psychophysics. Vol.27 (4),277-283.

-Bouzon , Caroline &Hirst, Daniel. (2004*). Isochrony and Prosodic Structure in British English.*French National Centre for Scientific Research(CNRS) &Aix Marseille University.

-Bolinger, D. L. (1965). *Pitch Accent And Sentence Rhthm . I n Forms of English:* Accent, Morpheme, Order. Cambridge, Mass. ; Harvard University Press.

-Classe, Andre. (1939) *The Rhythm of English Prose.* Oxford: Blackwell.

-Crystal, David. (2008). *Dictionary of Linguistics and Phonetics*. (6th. ed) U .S. A: Blackwell Publishing.

-Cutler , A., and Norris , D. G. (1988). The Role of Strong Syllables in Segmentation for Lexical Access. .*Journal of Experimental Psychology: Human Perception and Performance .*

-Dauer, R.M.(1983). *Stress-Timing and Syllable-Timing Reanalyzed. Journal of phonetics.*

-Dilley , L., C., and McAuley ,J., D., (2008). Distal Prosodic Context Affects Word Segmentation and Lexical Processing. Journal of Memory and Language.

-Dilley , L., C., Mattys , L. C. and Vinke, L. (2010). Potent Prosody : Comparing the Effects of Distal Prosody , Proximal Prosody , and Semantic Context on Word Segmentation. *Journal of Memory and Language*.

 -Donia, R. Scott, and Isard, S. D. (1985*). Perceptual Isochrony in English and French.* Centre for Research on Perception and Cognition, University of Sussex, Brighton BN1 9QG, England . Journal of Phonetics.

-Fowler ,C. (1977). *Timing Control in Speech Production.* : Bloomington: Indian University Linguistics Club.

-Faura, G. , Hirst, D. J . and Chafcouloff, M. (1980). *Rhythm in English :Isochronism, Pitch and Perceived Stress. Rhythm in English :Isochronism, Pitch and*

Perceived Stress. The Melody of Language (L.R Waugh and C.H. Van Schooneveld, eds) Baltimore. University Park Street.

-Heiliel, M. (1982). Stress Timing in Modern Literary Arabic.   Al- Arabia.

-Hocket, C. F. (1955). *A Manual of Phonology*.

-Jassem, W. (1952) . Stressin Modern English .   *Bulletin de la Societe Linguistique Polonaise* .

 -------------. & Gibbon , D. (1980). Re- defining English accent and stress . *Journal of International Phonetic*

-Keiichi ,Tajima, Bushra, A. Zawaydeh , and Mafuyu Kitahara. (No date) *A Comparative Study of Speech Rhythm in Arabic , English and Japanes*. Indian University , Bloomington, IN, USA. Art Human Information Processing Research Laboratories, Kyoto, Japan.

-Ladefoged, P. 1975. *A Course in Phonetics*. Harcourt, Brace, Jovanovich: NewYork.

-Laura, C. Dilley , Jessica Wallace and Christopher C. Heffner. (No date). Perceptual Isochrony and Fluency in Speech by Normal Talkers Under Varying Task Demands. *Language* , USA.

-Lea, W. A. (1974). Prosodic Aids to Speech Recognition : IV.A general strategy for prosodically- guided speech understanding.*Univac Report* No.PX1079. St. Paul , Minn: Sperry Univac, DSD.

-Lehist, I. (1973). *Phonetic Disambiguation of Syntactic Ambiguity.* Gloss.

------------. (1977). Isochrony Reconsidered. *Journal of Phonetics* .

 -Mtthews, P. H. (2014). *Oxford Concise Dictionary of Linguistics.* Current on line Version: Publisher : Oxford University Press, Print ISBN-13: 9780199675128.

-Morton ,J ., Marcus, S., and Frankish ,C. (1979*). Perceptual Centres , Psychological Review* .

-Pike, K. (1945*). The Intonation of American English* . , Ann Arbor, Mich. : University of Michigan press.

 -Pitt, M. Samuel, A. G. (1990). The Use of Rhythm in Attending to Speech. *Journal of Experimental Psychology*: Human Perception and Performance.

-Shen ,Y and Peterson G.G. (1962) .*Isochronism in English.*University of Buffalo Studies in Linguistics .

-Tajima, K. 1998. *Speech Rhythm in English and Japanese: Experiments in Speech Cycling.* Published Doctoral Dissertation, India University, Bloomington, IN.

-Tajima, K., Bushra, A.Z. and Mafuyu , K. (n.d). *A Comparative Study of Speech Rhythm in Arabic , English and Japanese.* Indian University, Bloomington, IN,USA. Art Human Information Processing Research Laboratories, Kyoto, Japan.