Charles University

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BACHELOR THESIS

Nature of Epenthesis in the Speech of Japanese Learners of English

Epenteze v mluvě japonských studentů anglického jazyka

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I hereby declare that this bachelor thesis “Nature of Epenthesis in the Speech of Japanese Learners of English” is my original work and no other sources than those listed on the Works cited page were used in its compilation. I further declare that this thesis was not used to obtain another academic title.

Prague, June 2024

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Marek Maxa

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ABSTRACT

The aim of this bachelor's thesis is to determine to what extent Japanese learners of English employ epenthesis in the production of English consonant clusters. The theoretical part compares the syllable structure of English and Japanese languages, as well as the consonant clusters allowed by each language. Furthermore, it provides a detailed description of the phenomenon of epenthesis, its types, and previous studies on epenthesis in Japanese, Korean, and Arabic. The practical part presents the results of the perceptual analysis of recordings made by Japanese speakers of English. The analysis involved consonant clusters in both onset and coda to determine the frequency and nature of epenthesis in Japanese English. The findings suggest that the most problematic consonant clusters are /skw/, /stj/, /str/, /kr/, /kw/, /sw/, and /gz/ for A1-B1 level learners and /kr/, /kw/, /skr/ for B2-C1 level learners.

KEYWORDS

epenthesis, consonant clusters, phonotactics, Japanese English

ABSTRAKT

Cílem této bakalářské práce je zjistit do jaké míry japonští studenti angličtiny využívají epentezi při produkci souhláskových shluků. Teoretická část porovnává slabičnou strukturu angličtiny a japonštiny a také souhláskové shluky, které jsou v těchto jazycích povoleny. Následně jsou popsány rozdíly mezi těmito dvěma jazyky. Dále následuje podrobný popis fenoménu epenteze, jeho typy a předchozí studie o epentezi v japonštině, korejštině a arabštině. Praktická část popisuje výsledky percepční analýzy nahrávek pořízených japonskými mluvčími angličtiny. Aby bylo možné určit frekvenci a charakteristiku epenteze v japonské angličtině, analýza zahrnovala souhláskové shluky v prétuře i v kodě. Z výsledků vyplývá, že nejproblematičtějšími souhláskovými shluky jsou /skw/, /stj/, /str/, /kr/, /kw/, /sw/ a /gz/ pro studenty na úrovni A1-B1 a /kr/, /kw/, /skr/ pro studenty na úrovni B2-C1.

KLÍČOVÁ SLOVA

epenteze, souhláskové shluky, fonotaktika, japonská angličtina

Contents

Introduction

The English language is one of the most spoken languages in the world. Being a global language, it attracts many learners no matter what their nationality is. However, when learning it, students might come across many difficulties not only in grammar but also in sounds or word structures that they have never encountered before. Thus, when acquiring a second language, learners may experience struggles with the production of certain aspects that do not exist in their mother tongues (L1), for instance, complex consonant clusters such as /str/ at the beginning of a syllable or /dʒd/ at the end. To overcome these difficulties, second language learners whose L1 does not allow consonant clusters may unconsciously use certain strategies, the most common of which are deletion and epenthesis. Both of these phenomena have been studied for a long time but there are still aspects that need further investigation.

The aim of this work is to find out the extent to which Japanese learners of English employ epenthesis in the production of consonant clusters. In this regard, recordings made by Japanese speakers of English were analysed to determine the tendencies exhibited by this specific group of L2 learners.

The theoretical part scrutinises the differences between English and Japanese syllabic structures. Specifically, it provides a detailed description of consonant combinations in both languages and explains the function of mora in Japanese. The final chapter describes the phenomenon of epenthesis, its types, and key studies that provide a foundation for the practical part.

The practical part describes the methodology of the research, it offers basic information about respondents and the material that was used for the research. It also provides a perceptual analysis of the recordings made by Japanese speakers of English and the most relevant and interesting findings.

Theoretical part

If not stated otherwise all the phonetic transcriptions presented throughout this bachelor's thesis are written in the International Phonetic Alphabet (IPA) (International Phonetic Association, 2015).

1 Syllable

Before delving into the phenomenon of epenthesis, the syllable structure and subsequently consonant clusters in both English and Japanese will be explored in greater detail. That will provide a foundation for exploring the epenthetic tendencies in Japanese, Arabic and Korean L2 learners of English (see chapters 2.3 to 2.5).

The definition of a syllable is different based on the scope of the linguist. Some view, a syllable as a unit of pronunciation typically larger than a single phoneme but smaller than a word (Crystal, 2011, p. 267; Collins, 2013, p. 16). Others, such as Roach (2009), emphasise its significance as a fundamental unit in both phonetics and phonology. In general, the syllable is considered to be the fundamental unit of speech production and perception in a language (Roach, 2009, p. 56).

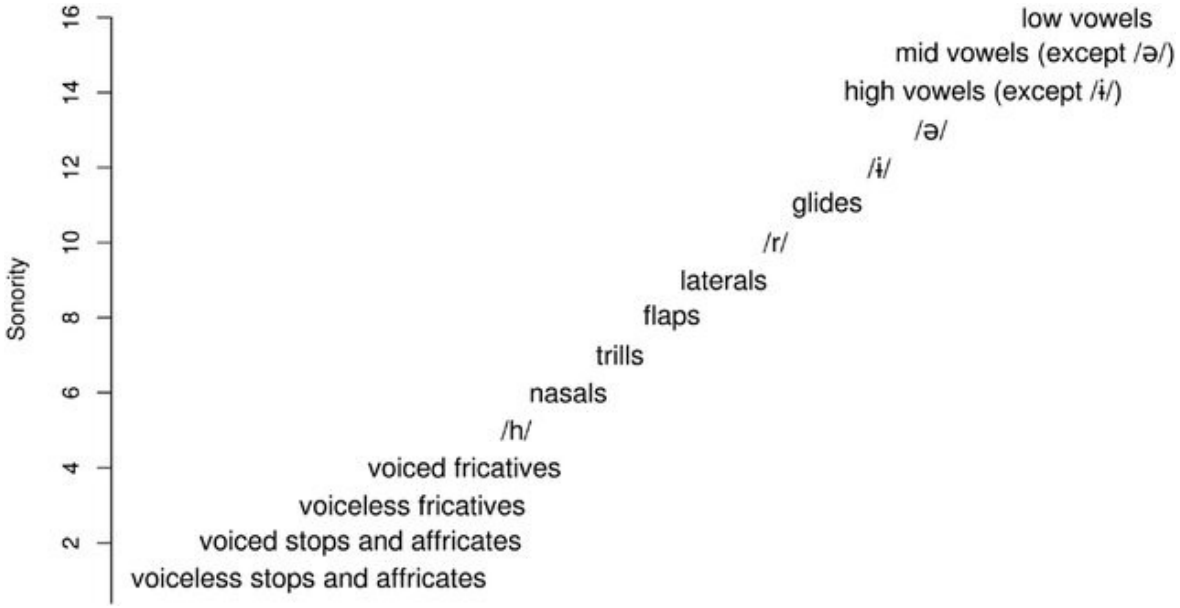
In phonetics, syllables are analysed in terms of articulatory characteristics, where air obstruction plays an important role. The syllable is characterised by its centre, known as the peak or nucleus, which is characterised by no obstruction of the air. Since the air escapes unimpeded through the vocal tract, it is primarily formed by a vowel, either by a monophthong or a diphthong (Burleigh, 2011, p. 65). The peak is the only obligatory element, and it may be preceded by one or more non-syllabic consonants forming the onset of the syllable. Additionally, it can also be followed by either one or more non-syllabic consonants, forming the coda of the syllable (Burleigh, 2011, p. 69).

From the auditory point of view, both the onset and coda involve weaker loudness of a sound than the nucleus. In other words, the sonority is lower than the peak which corresponds to Trask (1996) who stated that a syllable is a unit consisting of a single peak of intrinsic sonority. Sonority can be therefore defined as a term corresponding to the loudness and carrying power of speech sounds, where some sounds have greater sonority than others. A primary role of sonority is to organise segments within syllables (Parker,

2011, p. 1195). For instance, vowels exhibit the highest level of sonority and tend to occupy the core position within a syllable, while consonants possess the lowest level of sonority and tend to occupy the initial and final part of the syllable (Roach, 2009, p. 62). The relationship between the sound intensity of vowels and consonants can be easily understood from the sonority hierarchy by Johansson (2019) in Figure 1 below. The sonority hierarchy ranks sounds based on their sonority from the least sonorous to the most sonorous. The hierarchy slightly varies among different authors. For example, the hierarchy described by Cruttenden (2008), ranks elements from the most sonorous to the least sonorous as follows: open vowels > close vowels > glides > liquids > nasal > fricatives > affricates > plosives.

Figure 1

Sonority hierarchy.



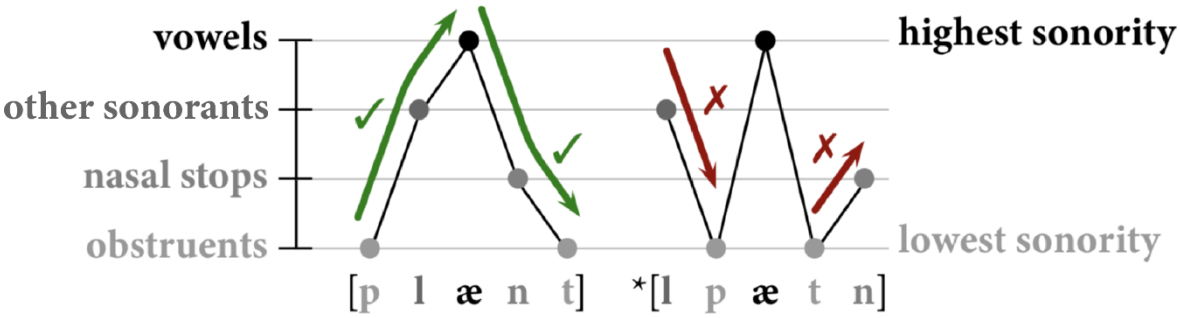
Note: (Johansson, 2019, p.8)

In essence, the sonority of a consonant cluster is either rising, falling, or maintaining the same intensity. Usually, the sonority rises in the onset clusters achieving its peak of the sonority in the nucleus before beginning to fall in the coda cluster. The syllable boundaries are identified at the beginning and at the end of the syllable with the lowest sonority. The components of the onset are connected in such a way as to achieve the perfect ascent of the

sonority towards the nucleus (See Figure 2 below). The sounds begin from the least sonorous and increase throughout the cluster to the nucleus, which is also the sonority peak. The coda is connected in the same manner but in the opposite direction, starting from higher sonorous components next to the nucleus and ending with the lowest sonorous component (Šturm, 2013, p. 12).

Figure 2

Example of correct and incorrect sonority pattern in a word.



Note: (Anderson, 2022, p. 149)

From a phonological point of view, a syllable is defined as a group of sounds organised according to specific rules. The branch of phonology that deals with the rules of phoneme combinations is called phonotactics. Roach describes phonotactics as an important part of phonology that deals with the organisation of phonemes into a syllable of a language (Roach, 2009, p. 57). As syllables are language-specific, each language has distinctive phonotactic rules and constraints that are applicable only in that language. These rules and constraints define all possible combinations of phoneme sequences of consonants or vowels.

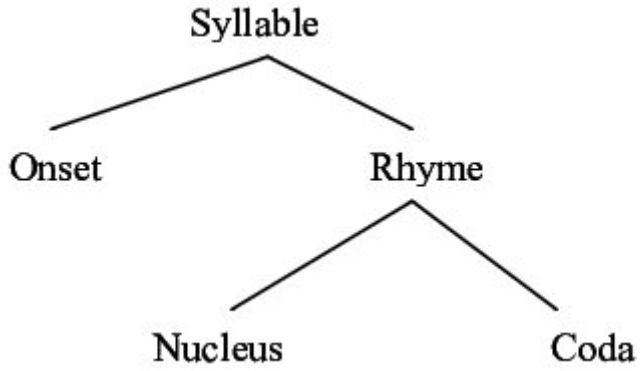
Syllables can be classified into open and closed syllables. Open syllables end in a vowel, whereas closed syllables end in one or more consonants. According to Collins (2013), every language must have an open CV syllable type. Nonetheless, not all languages use the syllable as the primary phonological unit. In languages such as Japanese, the primary phonological unit is often considered to be a mora, rather than a syllable. Some authors venture that there is no term in Japanese that would remotely correspond to the concept of a syllable (Vance, 2008, p.115).

1.1 English syllable structure

The main components of the English syllable are the onset, peak (also referred to as the nucleus), and coda. The peak is the only compulsory element of the syllable and together with the coda forms rhyme, as visible in Figure 3.

Figure 3

English syllable structure.



Note: (Cruttenden, 2008, p. 49)

In the English language, the peak of a syllable is primarily formed by vowels. However, in some instances, the nuclear position could be occupied by a syllabic consonant /l̩/ or /n̩/, as is the case in words such as *people* /piː.pl̩/ and *cotton* /kɒt.n̩/ (Carr, 2013, p. 136). Both of these consonants are part of the sonorant class and have greater carrying power similar to vowels. These syllabic consonants are longer and more prominent than typical consonants. Every word where a syllabic consonant forms a peak of the syllable can be also transcribed with schwa instead of the syllabic sonorant /piːpəl/ or /kɒtən/ (Collins, 2013, p. 81).

There are twelve relatively pure vowels and eight diphthongs in English that can take the position of the nucleus. In BBC English or GB (General British), vowels are further classified into high vowels, /iː/, /ɪ/, /uː/, /ʊ/, mid vowels /e/, /ə/, /ɜː/, /ɔː/, and low vowels /æ/, /ʌ/, /ɑː/, /ɒ/, based on the tongue position when produced. Diphthongs are classified into centring diphthongs /ɪə/, /ʊə/, /eə/, which glide towards /ə/ and closing diphthongs /eɪ/, /aɪ/, /ɔɪ/, /əʊ/, /aʊ/ which glide towards /ʊ/. English sounds can be quite complex, for

example, the word *hour*, where the combination of diphthong and vowel, /aʊə/ is called triphthong (Roach, 2009, p. 19).

1.1.1 Phonotactics

The boundaries that frame the possible phoneme combinations are set by the phonotactics rules. We can look at English syllables through the lances of phonotactics by looking at all possible combinations of phonemes at the beginning after a pause. This way we are able to work out that a word can start either with a vowel or with up to three consonants. The same method can be used to distinguish every possible combination at the end of the word before a pause, which would be a resultant word that can end with a vowel or one to four consonants (Roach, 2009, p.57). Nevertheless, there are several phonotactic rules specific to the English language that form all the possibilities for English words. The examination of the English phonotactic rules in the initial and final positions is divided into those for vowels and those for consonants.

The rules concerning vowels are:

1) diphthongs and long vowels cannot proceed final /ŋ/
2) /e, æ, ʌ, ɒ/ cannot occur in the final position

The rules concerning consonants:

1) /ŋ/ never occurs in the onset position
2) /ʒ/ occurs initially very rarely and only in borrowed words
3) No consonant cluster can be formed out of /tʃ, dʒ, ð, z/
4) In the onset cluster the second element is never lenis fricative /v, ð, z, ʒ/
5) /h, j, w/ never occurs in the coda position
6) /r, j, w/ can occur in a cluster but only as a non-initial component
7) In non-rhotic English /r/ never occurs in codas
8) /l/ can occur only in front of the non-syllabic /m, n/
9) Stops and nasals never combine in the onset position
10) Onset clusters are never formed with the combination of nasals and stops
11) Onset clusters are never formed with the combination of /t, d, θ/ and /l/
12) Three consonant clusters always start with /s/

13) Initial clusters such as /fs, mh, stl, spw, pn, ps, vw/ do not exist (Crutenden, 2008, p. 253; Collins, 2013, p. 79).

Based on phonotactic rules a fully acceptable word in English can contain just one vowel indicating the minimal possible syllable structure in English (Cruttenden, 2008, p. 254). The maximal possible syllable structure in English has its syllabic structure in the form of CCCVCCCC (Roach, 2009, p. 57). These rules also show the only possibilities of consonant clusters which are CV, CCV, CCCV in the onset and VC, VCC, VCCC and VCCCC in the coda (Cruttenden, 2008, p. 257).

However, this does not mean that combining these clusters will provide all the possible words that can occur. In English, there are exactly 17 types of syllable structures that can occur as a word: V: *owe* /əʊ/, VC: *up* /ʌp/, VCC: *ask* /ɑːsk/, VCCC: *ants* /ænts/, CV: *go* /gəʊ/, CVC: *cat* /kæt/, CVCC: *lamp* /læmp/, CVCCC: *tests* /tests/, CVCCCC: *texts* /teksts/, CCV: *fly* /flaɪ/, CCVC: *clap* /klæp/, CCVCC: *stand* /stænd/, CCVCCC: *stamps* /stæmps/, CCCV: *spray* /spreɪ/, CCCVC: *split* /splɪt/, CCCVCC: *straps* /stræps/, CCCVCCC: *sprints* /sprɪnts/ (Ishida, 2021, p. 14).

1.1.2 English consonant clusters

English features 24 consonants which are categorised into six main groups: plosives /p, b, t, d, k, g/, fricatives /f, v, θ, ð, s, z, ʃ, ʒ, h /, affricates /tʃ, dʒ/, nasals /m, n, ŋ/, lateral /l/ and approximants /w, r, j/ (Roach, 2009, p. 52). Based on their acoustic properties, they can be classified into obstruents and sonorants. Obstruents are those sounds whose production causes noise by significantly obstructing the free flow of air. They include plosives, fricatives and affricates. Sonorants, on the other hand, are sounds that do not have any noise component due to the free flow of the air, which is achieved by alternative release through either the nasal or oral cavity. Sonorants contain nasals, approximants and all vowels (Anderson, 2022, p. 111; Cruttenden, 2008, p. 29).

As previously demonstrated, the maximum syllable structure in English is CCCVCCCC, with 17 different types of syllables available in the English language. In this subchapter, we will delve into discovering specific phoneme sequences in both the onset and coda. The

method used in this chapter follows the approach of Roach (2009), where we look at the clusters through phonotactic rules.

In order to make the explanation more comprehensive, some terminology needs to be defined. In the English language, a syllable can have an onset consisting of up to three consonants. To clearly understand which specific consonant is talked about, every consonant of the cluster is referred to as pre-initial, initial, or post-initial, depending on its position in the cluster. For example, the first consonant in a three-consonant onset cluster is termed pre-initial, the second or middle consonant is referred to as initial, and the third consonant is called post-initial. In cases where the onset cluster consists of two consonants, the first is labelled as pre-initial and the last as initial. For a single consonant in the onset position, the term initial is used. Similarly, each element in the coda cluster is called pre-final, final, post-final, or post-final 2 (Roach, 2009, p. 57).

Firstly, all viable consonants and consonant clusters in the onset position are examined. The CV syllable can take any consonant in the onset position, with the exception of /ŋ/. Additionally, the phoneme /ʒ/ occurs only rarely and only in loanwords before /iː, ɪ, æ, ɑː, ɒ/ (Cruttenden, 2008, p. 254).

Two-consonant clusters could be formed from many combinations of the 24 English phonemes. However, according to Cruttenden (2008), there are exactly 49 possible two-consonant clusters. These CC clusters begin with either plosives /p, b, t, d, k, g/, nasals /m, n/, lateral /l/ or fricatives /f, v, θ, s, ʃ, h/ in the pre-initial position and one of lateral /l/ or approximants /r, j, w/ in the initial position. However, not all combinations from these groups are possible. For illustration, the clusters /tl, bw, dl/ are not possible in English. Exceptions to the previously mentioned rules are clusters with /s/ in the pre-initial positions. In English, the fricative /s/ can be followed by one of the following consonants /l, r, j, w, p, t, k, m, n, f, v/ (Cruttenden, 2008, p. 255; Roach, 2009, p. 57).

Three-consonant clusters share some similarities with two-consonant clusters. The first element of the CCC clusters is invariably /s/, followed by a voiceless plosive /p, t, k/. The final consonant of this cluster is one of the approximants /l, r, j, w/, in a similar manner to CC clusters (Cruttenden, 2008, p. 255). Nevertheless, not all twelve combinations of these

three-consonant clusters are used. In English, only eight CCC clusters are used /spl, spr, spj, str, stj, skl, skr, skj, skw/ (Roach, 2009, p. 57).

Now let us examine all possible coda clusters. Phonotactic restrictions prohibit certain consonants like /w, h, j/ from appearing finally in the VC syllable, and in non-rhotic accents the sound /r/ is also not permitted.

A total of 59 distinct kinds of final CC clusters are categorised into two types. The first type is nasal, lateral, or /s/ followed by a consonant. The second type starts with a consonant and is followed by one of the apicals[1] /t, d, s, z, θ/. We can take a step further and observe patterns in the two-consonant coda clusters; (1) /t, d/ occurs predominantly in non-syllabic suffixation of past tense, and (2) /s, z/ are used in possessive, plural or third-person forms (Cruttenden, 2008, p. 256).

Final CCC coda clusters mainly follow short vowels and are categorised into two patterns, the majority of which involve suffixation: (1) simplified to /m, n, ŋ, l, s/ followed by a consonant and one of /t, d, s, z, θ/ in the last position. (2) consonant plus application of two different elements from /t, d, s, z, θ/ (Cruttenden, 2008, pp. 256-257).

The four-consonant cluster is the least common type of consonant cluster and is a result of the suffixation of /t, s/ to CCC clusters. However, these four-consonant clusters are commonly reduced to CCC for easier pronunciation. The word *texts* for example would be reduced to /teks:/ instead of /teksts/ (Cruttenden, 2008, p. 257).

1.2 Japanese syllable structure

Although the main unit of the Japanese language is a syllable, the whole syllable structure is heavily influenced by mora. This is further implied by the fact that the language itself is considered to be a mora-counting language (Auer, 1989, p. 1072). Hence the explanation of mora is essential for a profound understanding of the syllable structure. According to Bloch (1950), mora is characterised as a unit of both duration and sound. This is true for Japanese as well, where each mora is represented by a kana character of the Japanese writing system (See Figure 4 below).

[1] Sound produced with the tip of the tongue.

Figure 4

Hiragana[2] alphabet with IPA transcriptions.

Hiragana	あ	い	う	え	お
Transcription	ɑ	i	ɯ	e	o
Hiragana	か	き	く	け	こ
Transcription	ka	ki	kɯ	ke	ko
Hiragana	さ	し	す	せ	そ
Transcription	sɑ	ɕi	sɯ	se	so
Hiragana	た	ち	つ	て	と
Transcription	tɑ	tɕi	tsɯ	te	to
Hiragana	な	に	ぬ	ね	の
Transcription	nɑ	ni	nɯ	ne	no
Hiragana	は	ひ	ふ	へ	ほ
Transcription	hɑ	ɕi	ɸɯ	he	ho
Hiragana	ま	み	む	め	も
Transcription	mɑ	mi	mɯ	me	mo
Hiragana	や		ゆ		よ
Transcription	jɑ		jɯ		jo
Hiragana	ら	り	る	れ	ろ
Transcription	ɾɑ	ɾi	ɾ	ɾ	ɾo
Hiragana	わ	を			ん
Transcription	wɑ	o			ɴ

Note: The table shows hiragana characters, where each character represents one mora. Its realisation form can be seen in the IPA transcription column (Kubozono, 2015, preface; Whitman, 2022, pp. 1-4).

[2] Hiragana is one of three Japanese writing systems

Nevertheless, the function of mora in Japanese is rather specific and encompasses multiple functions. Firstly, mora functions as a basic unit of temporal regulation. Unlike syllabic languages where the timing of the syllables varies, each mora in Japanese is produced with approximately the same duration to produce in speech. This consistent timing is crucial in forming rhyming verses like haiku[3] and helping to tune the tone of Japanese songs (Kubozono, 2017, p. 32). The duration of speech rhythm in mora timing languages is determined by the number of morae[4] present in each unit (Kubozono, 2015, p. 777). Another role of mora is to measure the phonological length. This is important for determining the accentuation rules and some morphological rules, as they are often generalised by mora length in Japanese. Additionally, mora functions in compound accentuation, which examines how the stress and pitch of words change when they are combined to form compounds. Finally, mora plays a significant role in word formation processes. A good example of this phenomenon can be seen in the blending process of two words, where the resultant word retains the same number of morae as the second source word. The final part of this second word then leaves its final position and is transferred to the new word (Kubozono, 2017, p. 34). For example, blending two words *gorilla*, in Japanese ゴリラ (3 kana symbols = 3 morae) and *whale*, in Japanese クジラ (3 kana symbols = 3 morae) into *godzilla* in Japanese written as ゴジラ remains the number of morae as in the second word *whale,* which was used in the blending process (Kubozono, 2017, p. 37). Additionally, mora helps with segmentation and works as a unit that helps to break down words or speech into chunks. Every word can be split into morae in terms of a mora boundary where both short and long syllables are formed by those boundaries because the number of morae and mora boundaries in those syllables are identical (Kubozono, 2015, p.758).

Mora is further divided into independent regular/full mora having the open syllable structure consonant-vowel CV and deficient/special mora (Labrune, 2012, p. 132). Special mora appearing in the form of either C or V, more specifically as (Vance, 2008, p.117):

[3] Haiku is a Japanese poem composed of 17 syllables.

[4] The plural form of mora.

1) the first half of the geminate consonant, a duplicate of the immediately following consonant of the following syllable produced with an inaudible release /ʔ
2) a moraic nasal /ɴ/[5]
3) a second part of the long vowel /ː/
4) a second part of a diphthong

Although these special morae do not occur with the same frequency, they are significant in forming Japanese syllables (Kawahara, 2016, p. 170).

In Japanese phonology, syllables are allowed to take only two forms: short (open) syllables and long (closed) syllables. Both of these types of syllables are formed by morae and the type of a syllable is determined by the number of morae present in the syllable. Specifically, open syllables are always constituted by one full mora, whereas long syllables are always formed from one full and one special mora (Vance, 2008, p. 117). This aligns with the statement by Paradis that a syllable has a maximum of two morae (Paradis, 1988, p.18). It is clearly apparent from the Japanese words realised by kanji[6] characters. The Japanese word 子 for example, which means *child,* is pronounced as /ko/. As these kanji characters are primarily for visual meaning, they can be transcribed into the Japanese kana writing system, in this case to one kana symbol こ. Because this word has only one kana symbol, it also has only one mora. Conversely, the word 高, meaning *high*, pronounced as /koː/ has two kana symbols こう, and therefore is comprised of two morae (Vance, 2008, pp. 131-132). Japanese short syllables must contain a short vowel and might be preceded by a consonant. However, in a similar manner to English syllables, the vowel in the Japanese syllable is the only compulsory element. Thus, the Japanese syllable structure has an obligatory vowel and can be preceded by an optional consonant which might be followed by an optional palatal glide /j/. An example of all three types of open syllable structures is shown in the following words (Vance, 2008, p.133):

1) the syllable structure V in the word 絵, meaning *picture* and pronounced as /e/
2) the syllable structure CV in the word 子, meaning *child*, produced as /ko/

[5] /ɴ/ is IPA symbol for uvular nasal.

[6] Kanji is one of the Japanese writing systems adapted from Chinese.

3) the syllable structure C/j/V in the word 巨, meaning *gigantic* pronounced as /kjo/

Based on these existing syllable structures a simple diagram of open syllables can be written as CCV, where the second consonant is strictly limited to the palatal /j/ glide (Vance, 2008, p.118; Kubozono, 2015, p. 769).

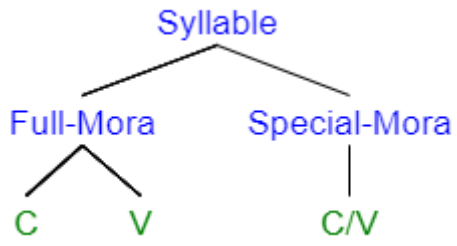
Although the structure of the closed syllables follows the same analogy as the short syllables for the onset, is a little bit more complex due to the coda position which can be occupied by one of the following elements (Vance, 2008, p.134):

1) another vowel V, as in the word 恋, produced /koi/ meaning *love*
2) the vowel length phoneme /ː/, as in the word 高 produced /koː/ meaning *high*)
3) the moraic nasal /ɴ/, as in the word 全 produced /zeɴ/ meaning *all*
4) the mora obstruent (geminate), as in the first syllable /kek̚/ of the word 結果 produced /kek̚ka/ meaning *result*

Therefore, in Tokyo Japanese, long syllables are limited only to two types: CVC, which is the result of the above-mentioned examples 3) and 4), and CVV, which is the consequence of the examples 1) and 2) (Kubozono, 2015, p. 765). Furthermore, Kubozono (2015) also suggests that in contemporary Japanese, short syllables occur approximately two times more frequently than long syllables. The long syllable structure is illustrated in Figure 5.

Figure 5

Structure of Japanese closed syllable.



Note: Inspired by (Satoshi, 1991, p. 160).

Figure 5 shows that the nucleus of a syllable is constructed by the vowel of the first syllabic mora and the onset is the consonant of the same mora. The mora can be a single vowel, in which case the onset would not be present. The coda may consist of an optional non-syllabic special mora either as a vowel or consonant (Satoshi, 1991, p. 160; Vance, 2008, p. 118).

In some literature e.g. Kubozono (2015), Vance (2017), and Labroune (2012), there are mentions of a third "superheavy" type of syllable containing three morae, yet the existence of it is usually disqualified by the constraints of mora and syllable boundaries (Kubozono, 2015, p.84). To illustrate this, the English word *sign*, which is in the Japanese language produced /sɑiɴ/, would appear to have a syllable structure CVC. However, even though /ai/ forms a diphthong in English, it is not necessarily the case in Japanese. When the second part of the diphthong is followed by a coda consonant, the word is divided into two syllables. In this instance, the word is divided into the open syllable /sa/ and the closed syllable /in/. If the word did not contain the final moraic nasal /ɴ/ and would look like /sai/, the word would be represented by a single closed syllable CVV (as previously mentioned, the coda position can be taken by a second vowel see the page above) (Vance, 2008, p. 79).

1.2.1 Japanese consonant clusters

As it has been shown above, the Japanese syllable system is relatively restrictive resulting in only a few consonant clusters that can exist in modern Japanese. These clusters are known as "yōon" or "palatalised consonants" and can only be found in the onset position before a nuclear vowel. These consonants can be found in Chinese borrowings, which still remain a very common part of Japanese vocabulary, but they can also be found in loanwords from other languages. There are two rules that restrict the formation of Japanese consonant clusters. Firstly, the consonant clusters appear only before the Japanese back vowels /ɑ/, /ɯ/[7], and /o/. Secondly, the pre-initial consonant is only permitted to be followed by a /j/ glide. These constraints limit all of the consonant clusters to have a syllable structure of the onset in the format C+/j/. There are exactly eleven consonant clusters that are used and formed this way: /pj/, /bj/, /tj/, /dj/, /kj/, /gj/, /fj/, /hj/, /mj/, /nj/, /rj/. It should be noted that it is not possible for each consonant used in the Japanese

[7] "/ɯ/ sound is similar to American /u/ with less rounded lips" (Nagao, 2017, p. 2)

writing system to form a cluster. Clusters such as /sj/, /cj/, /zj/, /cj/, /jj/, /vj/, and /wj/ do not occur (Vance, 2008, p. 92). One example of an allowed /kj/ cluster is the English loanword *cute* produced by Japanese as /kjɯː.to/.

As previously explored in the Japanese syllable section, no type of consonant cluster can appear in the coda position. The only candidates for coda clusters would be geminate and moraic nasal, however, moraic nasal can occupy the coda position of a syllable only as the sole element of the coda, and geminate is always split into two syllables (Kubozono, 2015, p. 85). Thus, the word /kɑk̄koː/, meaning *appearance,* becomes divided into two syllables /kɑk̄/ and /koː/. It might be easier to understand this splitting process if we look at the same word /kɑk̄koː/ written in Japanese hiragana characters かっこう. This word contains four kana symbols, which means it has four morae. From Figure 5 above, it is clear that the Japanese syllable can be formed from a maximum of two morae, therefore the word also must be divided into the two syllables /kɑk̄/=かっ and /koː/=こう. Both of these two syllables contain two kana symbols and thus have two morae (Kubozono, 2015, p. 81).

1.3 Comparison of Japanese and English syllable structure

Both English and Japanese are simultaneously monosyllabic and polysyllabic languages. This means that they contain one-syllabic words as well as words that contain more than one syllable. Examples of such monosyllabic words are *cat* /kæt/ in English and *mosquito* 蚊 /kɑ/ in Japanese. Examples of polysyllabic words are the English words *computer* /kəm.ˈpjuː.tə/ and Japanese 大学 /dɑi.gɑ.kɯ/ meaning *university*.

The obligatory element of a syllable in both languages is the nucleus, which allows words to have just one vowel sound in order to be viable options. These words are called minimal syllable words and in English, they are quite limited, some examples are *I, a, are, owe, or*. In Japanese, such minimal syllable words have much more freedom. Thanks to the Chinese writing system, which allows a lot of possibilities for homophones. Quite often several symbols have the same pronunciation. In particular, the following words: *stomach* 胃, *rank* 位, and *medicine* 医 are all produced with the same vowel phoneme /i/ (Vance, 2008, p. 117). Furthermore, the possible vowels that can occupy the peak or be present in a syllable are restricted to all vowel phonemes /ɑ/, /i/, /ɨ/, /ɯ/, /e/ and /o/ that modern Tokyo Japanese

has. Whereas, in English, all seventeen vowel sounds can occupy the peak of the syllable (Kubozono, 2015, p.70; Whitman, 2022, p. 3).

Compared to English, Japanese does not combine peak and coda to form a rhyme but rather uses mora as a rhyming element. As a result, depending on a word and its syllable structure, the rhyming element in Japanese can be either a full mora or a special mora (with the exception of the geminate as it cannot appear as a final element of a word).

Unlike English where the main unit of a syllable is phoneme, in Japanese the mora is the unit responsible for forming syllables. As a consequence, the Japanese permits only two types of syllables, namely light (open) and heavy (closed). Looking at the syllable structure from a phonotactic perspective, the Japanese system allows a total of nine different types of word-syllables: V, as in 胃 /i/ meaning *stomach*; CV, as in 蚊 /kɑ/ *mosquito*; CVC, as in 分 /bɯɴ/ *part*; CVV, as in 恋 /koi/ *love*; CCVC, as in ぴょん /pjoɴ/ *jump*; CCVV, as in 今日 /kjoː/ *today*; CCV, as in 巨 /kjo/ *gigantic*; VC, as in 案 /ɑɴ/ *idea*; VV, as in 愛 /ɑi/ *affection* (Kubozono, 2015, p. 769). On the other hand, English allows 17 distinct syllable structures in total: “V, VC, VCC, VCCC, CV, CVC, CVCC, CVCCC, CVCCCC, CCV, CCVC, CCVCC, CCVCCC, CCCV, CCCVC, CCCVCC, CCCVCCC” (Ishida, 2021, p. 14).

So far, we have seen how distinct English and Japanese syllable structure and phonotactic systems are. While English allows a wide variety of consonant clusters, Japanese prohibits consonant clusters almost completely due to its restrictive nature. The knowledge of the differences is important for understanding what Japanese speakers of English do to produce words that have otherwise syllable structure that is prohibited in their native language.

2 Epenthesis

In this section the strategies commonly employed by L2 students, when having difficulties with L2 acquisition, are briefly described, followed by a thorough exploration of the phenomenon of epenthesis and its types. The last part of this chapter focuses on the analysis of several studies that have examined the occurrence of epenthesis in various L2 languages and their comparison.

According to numerous studies, L2 acquisition is commonly influenced by the phonetic and phonological differences of the learner's first language. Some languages, such as English for example, allow a variety of consonant clusters and thus its syllable structure is more complex than the structure of many other languages, which poses specific challenges for L2 learners. As a result, differences in L1 syllable structure, phonetic inventory, and phonotactic constraints often shape or even hinder L2 production and perception. To deal with the challenges, L2 learners frequently use simplification strategies such as epenthesis/vowel insertion or consonant deletion (Lavitskava, 2021, pp. 255-256). The process of deletion involves removing a sound, usually a consonant, from the produced word (Park, 2012, p. 7). Epenthesis, on the other hand, refers to any process where an extra sound, traditionally a vowel but it can also be a consonant, as we will see later, is inserted into an utterance where no sound was previously present (Crystal, 2011, p. 171). When learning English as a second language, L2 speakers of some languages (e.g. Korean, Turkish, Spanish, Japanese, Chinese) tend to utilise vowel epenthesis, while other speakers (e.g. Dutch, Vietnamese, Cantonese) prefer using consonant deletion (Daly, 1972, p. 6; Hall, 2011, p. 1589; Lavitskava, 2021, p. 260). These strategies help to create unmarked syllable structures that are easier to produce because they align with the learners' L1 phonological rules. The simplification processes are driven by factors including L1 transfer, markedness, and sonority principles, which help learners in creating unmarked structures (Lavitskava, 2021, pp. 257-258).

The violation of L2 syllabic structure after inserting epenthetic vowels is attributed to the negative L1 transfer, caused by simplification. Although L2 speakers resort to employing epenthesis, they tend to use a sound that will make the output phonetically similar to that of the target word (Lavitskava, 2021, p. 258). Thus, depending on the language the place of

the epenthesis and the nature of the epenthesis differs. Some languages permit consonant clusters in both onset and coda, whereas other languages restrict consonant clusters heavily. For example, Spanish allows consonant clusters apart from those starting with the /s/ phoneme, leading to the occurrence of epenthesis primarily in these instances due to L1 influence (Pirogova, 2017, p. 42). However, other languages that restrict consonant clusters almost completely, like Korean or Japanese, will result in very frequent epenthesis (Kubozono, 2015, p. 526).

Generally, epenthesis can serve various functions across different languages, and each language uses distinct types of epenthesis when dealing with L2 acquisition. According to Hall (2011), there are multiple motivations for the occurrence of epenthesis. The most common motivation for epenthesis is to deal with phonotactic constraints of the language and thus violate the L2 structure to align with the L1 language. Furthermore, the epenthesis can enhance the perception of some consonants, which helps learners of the L2 language to identify consonants that would otherwise be difficult to perceive without adjacent vowels (Hall, 2011, p. 1577).

Types of epenthesis, not only as a strategy to deal with L2 acquisition, vary depending on the language. Some linguists classify these types of epenthesis differently than others. For instance, Daly (1972) and Lombardi (2002) identify three main types of epenthesis in phonology: consonant epenthesis, glide epenthesis, and vowel epenthesis. In a similar way, Poulidakis (2022) suggests that the epenthesis can involve the insertion of consonant, vowel, glide or even a whole CV syllable. By contrast, other linguists like Blevins (2008) and Uffmann (2007) argue that consonant epenthesis should involve inserting glides /w/ and /j/ to a vowel adjacent. This means that glides or even glottal stops are tied to consonant epenthesis (Ufffman, 2007, p. 456).

2.1 Consonant epenthesis

The insertion of consonant elements into a word is a phenomenon observed in various languages, in particular, it is very commonly seen among speakers of English in Hong Kong and Singapore (Deterding, 2003, p. 1). Morley (2018) is of the opinion that the intrusive /r/ in English represents a form of consonant epenthesis as well. This view is also

supported by Uffman (2007), who says that the intrusive /r/ is an epenthetic non-etymological /r/ which appears in hiatus[8] position in several non-rhotic English dialects, such as GB.

The topic of consonant epenthesis was investigated by Idiatov (2017) and Poulidakis (2022) who focused their studies on consonant epenthesis in the speech of Nigerian speakers of English and in the production of child speakers of Greek. The study reveals that the main motivation for children to make vowel or consonant epenthesis is to sustain the unmarkedness of a word and therefore create an unmarked CV syllable (Poulidakis, 2022, p. 2). This transformation is found in some examples in which the vowel hiatus is resolved by the insertion of the glide /j/. For illustration, the change from /la:dua/ to /la:duja/ meaning *in my hand*. In some cases, an epenthetic vowel /e/ is added to resyllabify consonant /n/ from the coda to the onset position. Such transformation involves making /natine/ from /natin/ meaning *here she is*. This research also shows that children tend to use consonant insertion as a form of epenthesis rather than creating partial reduplication of a consonant (Poulidakis, 2022, p.2). In the English L2 speakers of Nigeria, the insertion of the consonant /t/ and /s/ has been recorded by Idiatov (2017). /s/ epenthesis occurs mainly after a word-final /t/, and consonant /t/ is usually inserted after /n/, /l/ or /s/ (Idiatov, 2017, p.321). Similarly, tendencies were found in some Creole English, where /t/ was inserted at the end of a word always after a word-final /n/ (Holm, 1988, p. 142).

Additionally, glides commonly function as hiatus breakers and can be observed for example in Czech, the input *naive* will change from /naivɲi:/ to /najivɲi:/. Since glide is the least marked consonant, they typically occupy the position in the peak of the vowel cluster. However, insertion can occur only if the preceding vowel is high because height and backness are mirrored by the inserted glide (Uffmann, 2007, p. 463).

2.2 Vowel epenthesis

Vowel epenthesis is used by L2 learners to break up consonant clusters that are too difficult to produce. It is usually employed when a consonant cluster of the L2 language is

[8] The term hiatus describes two separate vowel sounds occurring in two adjacent syllables without intervening consonant.

not allowed in the native language of the learner (Shoji, 2014, p. 1). Typically, the word of the L2 language undergoes an epenthetic process that adjusts the word to fit the syllable structure of the L1 language (Hall, 2011, p. 1576). L2 learners perceive these clusters as illegal in their language and thus correct them with vowel epenthesis in two ways (Yun, 2016, p. 16):

1) by inserting a vowel between the consonant of the cluster. The CC cluster becomes CVC. This process is called **internal epenthesis** as the epenthesis occurs inside the cluster.
2) by inserting a vowel at the borders. In this case, the CC cluster can become VCC, CCV, or VCCV. This process is called **external epenthesis** as the vowel is inserted outside the cluster.

According to Yun (2016), the sonority hierarchy and markedness of the consonant clusters play an important role in the place of an epenthesis. For instance, a cluster in which the sonority rises, such as the /pl/ cluster, is likely to undergo internal epenthesis, forming a new syllable /pəl/ to avoid creating a marked structure. On the other hand, a cluster in which sonority falls or is consistent, such as cluster /lb/, is likely to undergo external epenthesis, resulting in /əlb/. This is because external epenthesis does not create a sonority rise across the syllable boundary (Yun, 2016, p. 17).

When employing vowel epenthesis to break up more complex consonant clusters, there are typically multiple viable positions where the vowel could be inserted to make its production easier. Based on the syllable structure of a L1 language the possibilities for inserting vowels in L2 words differ. For instance, the CCC cluster in a language that allows CC clusters can be broken up by inserting the epenthetic vowel either after the first or after the second consonant. Resulting in two feasible structures CVCC or CCVC, which is dependent on the L1 language as it influences the L2 production. However, if the language does not allow clusters as is the case in Korean or Japanese, the vowel would be inserted after, or before each consonant (Itô, 1989, p. 241).

The nature of an inserted vowel can be established in two ways. Firstly, as a relatively fixed quality of an epenthetic vowel, which can undergo allophonic variations according to the language phonology. Alternatively, it can be a quality that is influenced by a specific

context. (Hall, 2011, p. 1579). According to Itô (1989), there exist languages in which the inserted epenthetic vowel takes the same quality as a vowel nearby in the same word.

2.3 Epenthesis in the production of English by Japanese learners

As it was previously stated, consonant clusters are not widely accepted in Japanese, and as a result, most English consonant clusters are misperceived with an illusory vowel by Japanese L2 learners. Furthermore, the production of words containing clusters follows the Japanese syllable structure (Yun, 2016, p. 17). When faced with difficulties, Japanese resort to vowel insertion in the majority of contexts, which would otherwise be forbidden by the phonotactics of the language (Kubozono, 2015, p. 525; Uffmann, 2006, p. 214).

Kubozono (2015) suggests that the epenthetic vowel inserted into the production of an English word by Japanese speakers is to some degree predictable (see Figure 6 below). In Japanese, only five vowels are available for epenthesis /ɑ/, /i/, /ɯ/, /e/ and /o/ from which only four sounds /ɑ/, /i/, /ɯ/, and /o/ are used as an epenthetic vowel. First, it is important to note that although the /ɑ/ sound is used as an epenthetic vowel, it appears to be used only in specific words from Dutch and German. For example, in words containing the phoneme /x/ in pronunciation, such as *Bach* /bɑx/, the /x/ sound is transformed into the geminated /h/ sound /bɑh̄h/ (because Japanese does not have the /x/ sound and /h/ is its closest sounding counterpart that is used in Japanese). The /ɑ/ sound is then added as an epenthetic vowel after /h/, forming a word production /bɑh̄hɑ/, which consists of two syllables /bɑh/ and /hɑ/ (Kubozono, 2015, p. 225). /o/ sound is commonly inserted after dental stops /t/ and /d/. These can be observed either as a final element in the word or as a part of a consonant cluster. An example of this epenthetic vowel can be seen in the word *bed* which is commonly pronounced by Japanese speakers of English as /bed̄do/. Thirdly, the epenthetic /i/ is restricted to occur after palato alveolar affricates /tʃ/ and /dʒ/. This limitation arises because /i/ is a palatal vowel and therefore shares perceptual and articulatory similarities with both /tʃ/ and /dʒ/ (Yazawa, 2015, p. 1). Examples of these vowels can be seen in words like *bridge* /bɯɾidʑi/[9]or *peach* /piːtɕi/[10]. Finally, the vowel /ɯ/ is considered to be the default epenthetic vowel in Japanese and is therefore inserted in

[9] /dʑ/ is an IPA symbol for voiced palato-alveolar affricate used in Japanese

[10] /tɕ/ is an IPA symbol for voiceless palato-alveolar affricate used in Japanese

almost all other instances. This is because /ɯ/ is not only the shortest vowel, but it is also the weakest and most prone vowel for devoicing. These characteristics make inserting the /ɯ/ vowel sound into complex syllable structures the best candidate as inserting /ɯ/ barely changes the pronunciation of the word, so it retains the resemblance to the original word (Kubozono, 2015, p.528). However, in Japanese an important phonotactic rule restricts /ɯ/ to take position after plosives /t, d/. This limitation exists due to the Japanese affrication assimilatory rules that change /t/ and /d/ into /tsɯ/ and /dzɯ/ if they are followed by /ɯ/. Thus, the transformation would not preserve the original-like pronunciation. The epenthetic tendencies in Japanese contain one exception which is the consonant /k/. This consonant can be followed by either epenthetic /i/ or /ɯ/. /i/ tends to occur when /k/ is preceded by a front vowel as in the word *cake* /keːki/, other words usually retain the backness of the /k/ phoneme and /ɯ/ is inserted as an epenthetic vowel (Kubozono, 2015, p. 529). Despite these trends in pronunciation some ambiguities are not yet fully explored. One of them is why the palato-alveolar fricative /ʃ/ is followed by /ɯ/ instead of /i/. Kubozuno (2015) explains a possibility that it may be caused due to /ʃ/ having u-like quality due to the production with some lip rounding.

Figure 6

Nature of epenthesis in the speech of Japanese speakers of English.

Coda consonant in the English word	Nature of Epenthetic vowel
/t, d/	/o/
/tʃ, dʒ, **k**/	/i/
/p, b, **k**, g, f, v, θ, ð, s, z, ʃ, m, n, ŋ, l, r/	/ɯ/

Note: (Kubozono, 2015, p. 515)

2.4 Epenthesis in the production of English by Arabic learners

Epenthesis is used as a method to break up consonant clusters in every Arabic dialect. Based on the research of Alezetes (2007), the only possible vowel used to break up consonant clusters in Arabic speakers of English is /i/. The place of the inserted vowel,

however, is highly dependent on the dialect. (Ayyad, 2011, p.113). For instance, three consonant clusters are broken up by Iraqi Arabic speakers by inserting /i/ after the first consonant of the consonant cluster, whereas Egyptian Arabic speakers put /i/ in front of the cluster and after the second consonant of the cluster. Hence, in the case of Egyptian speakers the word with the syllabic structure CCCV is broken up to VCCV.CV but in the case of Iraqi speakers the structure would be broken up to CV.CVC. This means that both dialects deal with the same consonant clusters differently. One example of the Arabic production of English is the word *street* produced by Egyptian speakers /istirit/, while Iraqi speakers would produce the word /sitrit/ (Pirogova, 2017, p. 27). Itô (1986) suggests the reason for the different places for epenthesis is based on the grammar of the particular language to create the most harmonious syllable structure. For Arabic languages, the difference arises based on the direction the syllable is mapped. For Egyptians, the mapping goes from left to right and for Iraqi it is from right to left creating significant differences in the epenthesis of these dialects (Itô, 1986, p. 241).

2.5 Epenthesis in the production of English by Korean learners

Epenthesis in Korean English exhibits differences in the insertion of the vowel based on the context, with tendencies to insert the shortest vowel or vowel very close to it. In Korean the shortest vowel is /ɨ/, which is also an epenthetic vowel that ensures the closest pronunciation to the original word. Although the place of the epenthesis varies, some solid patterns can be observed. Firstly, the inserted vowel is more frequent after tense vowels rather than after lax vowels. Secondly, the epenthetic vowel is mainly inserted in the coda position or between words (Shin, 2014, p.18). This phenomenon arises from Koreans perceiving certain CVC syllables as CVCV, due to syllable structure that allows only /p, t, k, m, n, ŋ, l/ in the coda position. As a result, words ending with /m, n, l, r, ŋ / are adapted without the insertion of an epenthetic vowel but others are not (Kim, 2008, p. 211).

2.6 Comparison of epenthesis

It is possible to see different patterns in epenthesis. Typically, the language has a vowel that is short and relatively unmarked, which makes it the perfect candidate for insertion. By that, the speakers of the language are able to produce an output whose pronunciation is close to the original word of the foreign language. Some languages use fixed-quality

epenthetic vowels meaning that when epenthesis occurs only one specific vowel is always inserted. Arabic is an example of such a language where /i/ is the only epenthetic vowel. In the same manner, languages like Japanese and Korean use mainly one vowel. That is /ɯ/ for Japanese and /ɨ/ for Korean. The only exception is when a consonant has a similar way of articulation, in which case the similar articulated vowel is chosen.

Practical part

The aim of the practical part is to scrutinize the nature and scope of epenthesis in Japanese English. As it was stated in the theoretical part, the significant differences between English and Japanese syllable structures are very likely to be mitigated by the addition of extra sounds in consonant clusters, especially at the elementary level. Therefore, the following research questions were formulated and a perceptual analysis of Japanese L2 learners' production of consonant clusters was conducted in order to answer them:

RQ1: To what extent does epenthesis occur in Japanese English?

RQ2: What is the nature of epenthetic sounds in Japanese English?

Initially, the methodology employed in the research is explained, including the procedures for acquiring the data and their analysis. This is followed by the presentation of the research findings, which are followed by a discussion that deals with a few interesting questions that surfaced during the analysis.

3 Method

Japanese L2 speakers of English from the Japanese community residing in the Czech Republic and Japan were reached out via social networking apps and email. Some of the respondents, particularly friends, were asked to participate in person. Two recruitment phases were initiated, in which the research information was spread further through these communities, friends, and acquaintances. The first phase took place in October 2023. During this phase, acquaintances and friends were contacted to participate in the research and to share it with their English-speaking friends. The second phase was initiated in January 2024, when Japanese communities were contacted and asked for assistance with participant recruitment. All participants were provided with a PDF document which included detailed instructions along with the testing material. They were asked to get familiar with the text and eventually record themselves reading the sentences aloud in a quiet room. This recording was to be made using their mobile phone and sent via email. The email was required to be accompanied with answers to questions that were included in the instruction material. The questionnaire was designed to gain insight into the

respondents' personal and educational backgrounds. This included information such as their gender, age, self-reported language proficiency, and exposure to native English. Both the questionnaire and testing material can be seen in Appendix 1. All recordings underwent a double-check to ensure that their quality was appropriate before the analysis. One recording file had to be eliminated from the analysis due to sub-optimal quality and inaudible content.

3.1 Respondents

A total of twenty-one respondents submitted their recordings, from whom five were males and sixteen were females. From the twenty-one recordings, twelve were sent from Japan, seven participants recorded their entries in the Czech Republic, and two recordings were made in the United Kingdom by respondents currently studying for their master's degree. Participants self-reported their proficiency levels based on the Common European Framework of Reference for Languages, ranging from A1 to C1. The age of speakers ranged from 18 to 33 years, with the majority being in their early 20s. All participants had undergone a mandatory 6-year-long English school course in Japan, and most of them continued their English studies further. Moreover, 70% of the participants went to study abroad where they had daily exposure to native English. In contrast, the remaining 30% of the respondents had either limited or no native English exposure at the time of collecting the data.

3.2 Testing material

To identify the use of epenthesis by Japanese speakers of English, a suitable text containing a variety of challenging consonant clusters needed to be designed. The created text contains 72 different consonant clusters which the Japanese speakers were expected to mispronounce. Among these consonant clusters, there are 29 onset CC clusters and 31 coda CC clusters. Additionally, the text features six CCC clusters in both the onset and coda positions and a single instance of a CCCC coda cluster. These clusters are strategically divided into 17 sentences. The sentences can be seen in the Appendix 1. However, a total of 91 clusters are present because some clusters occur two or three times throughout the text. More specifically, five onset CC clusters occur twice in the text and

three CC clusters occur three times. There are three instances of coda CC clusters occurring three times and two CCC clusters in both the onset and coda occur twice.

3.3 Data analysis

One recording was eliminated from the analysis, and two recordings contained an incorrectly produced word that was not present in the sentences. In this case, it was decided to exclude only this word from the analysis. The remaining recordings were analysed using an Excel spreadsheet, that contained all consonant clusters employed in the sentences, including those that occurred across syllable boundaries. Then, a perceptual analysis was carried out by the author of the thesis, with the results carefully documented in the spreadsheet. To guarantee the accuracy of the analysis, the recordings were listened to twice and in unclear cases three times with great attention to detail. The identified production of target clusters was entered into the table using a binary system: (0) indicating a correctly pronounced cluster and (1) for the cluster where epenthesis occurred. When a case of epenthesis was identified, its realisation was written down. In certain cases where the production of a cluster was difficult to understand, the recordings were listened to and discussed with a second assessor, a Czech undergraduate student of English. If the ambiguity persisted, the cluster was then excluded from the final percentage calculation. This was done to enhance the reliability of the study. It is important to note that certain consonant clusters appeared multiple times within the test sentences. In order to maintain consistency of the results these repetitions were accounted for in the final analysis. Most of the calculations were made on a percentage basis to account for the multiple occurrences of clusters. In the calculations that were made differently, the multiple occurrences of the cluster were counted as a single occurrence, and the average occurrence of epenthesis was calculated.

4 Results

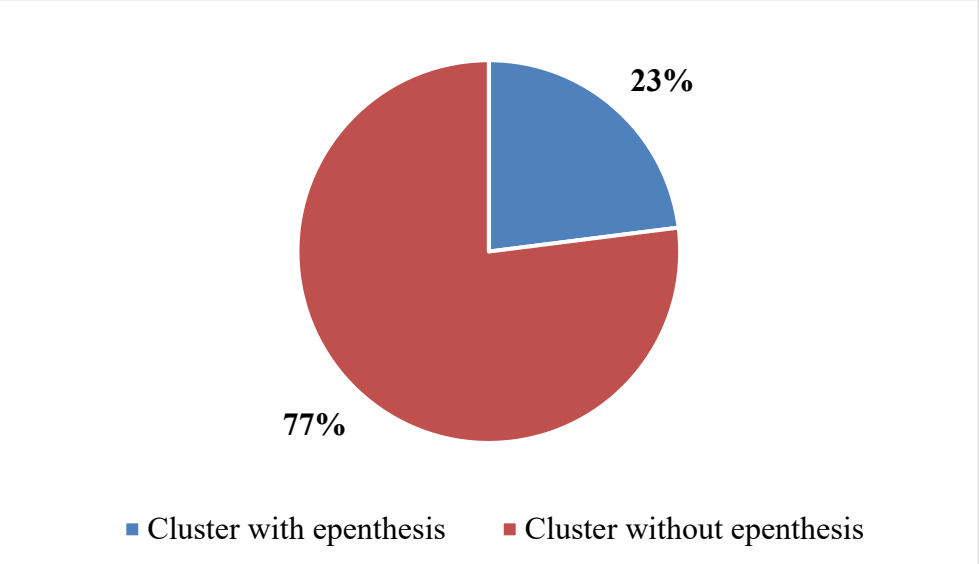
This section provides the findings of the study on epenthesis in Japanese English in the following order. Firstly, the overall results are presented, including all consonant clusters. Secondly, the analysis examines how the occurrence of epenthesis is impacted by English proficiency level. Lastly, the nature of epenthesis and the pronunciation of the most problematic clusters are described.

4.1 Frequency of epenthesis

Initially, the results from the entire corpus, which includes all consonant clusters in the onset and coda positions, are presented. The corpus is composed of a total of 91 clusters, 48 in the onset and 43 in the coda. All 20 participants considered, there existed 1820 potential instances for epenthesis to occur, 960 in the onset and 860 in the coda. Out of the 1820 anticipated occurrences, the participants made collectively 316 errors in the onset and 85 in the coda, resulting in 401 epenthetic mistakes in total. This represents less than a fourth of all possible occurrences (See Figure 7).

Figure 7

Epenthetic frequency in consonant clusters.



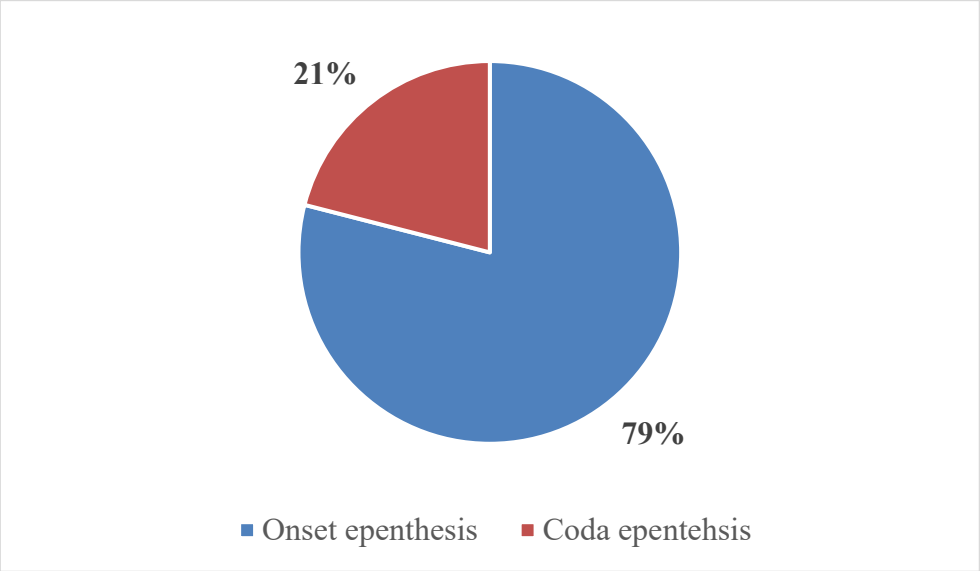
This was a rather unexpected finding because the structure of the Japanese syllabic system would suggest a higher occurrence of epenthesis. This might point to the significant impact

of English proficiency and exposure to the language on the perception and articulation of consonant clusters. Although the English proficiency varied among participants, the occurrence of epenthesis was, for the most part, observed within similar consonant clusters.

Looking further at the data, a significant difference was observed when comparing the frequency of the vowel insertions in the onset and coda. Epenthesis occurred in the onset in 33% of all possible instances, whereas in the coda position, a vowel was inserted in only 9% of all cases. A comparison of these results revealed that 79% of the epenthesis that occurred was present in the onset, and only 21% in the coda (See Figure 8).

Figure 8

Differences between onset and coda epenthesis.

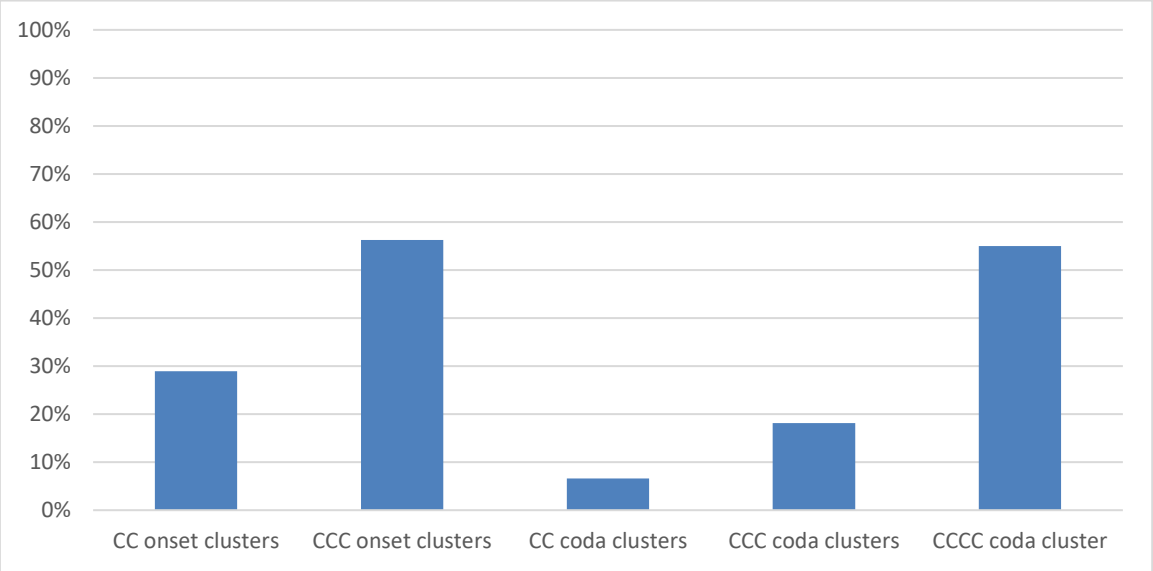


The finding portrayed in Figure 8 implies that Japanese learners of English may encounter fewer difficulties with onset clusters compared to coda clusters. The ratio of onset clusters over coda clusters was discovered to be approximately 4:1, indicating that epenthesis was four times more common in onset than in coda. Although the clusters in the initial positions were present throughout the sentences by six more occurrences, the substantial difference in frequency suggests that the overall outcome would likely remain consistent even if the ratio of occurrences in onset and coda was equal.

Further examination of the initial and final consonant clusters revealed a correlation between the complexity of the cluster and the frequency of epenthesis. The more complex the consonant cluster was, the bigger the challenge it caused for Japanese speakers of English, resulting in a higher frequency of mispronunciations in the three and four clusters. This trend is illustrated below in Figure 9, which shows that vowel insertion occurred predominantly in these more complex clusters.

Figure 9

Frequency of epenthesis in onset and coda consonant clusters.

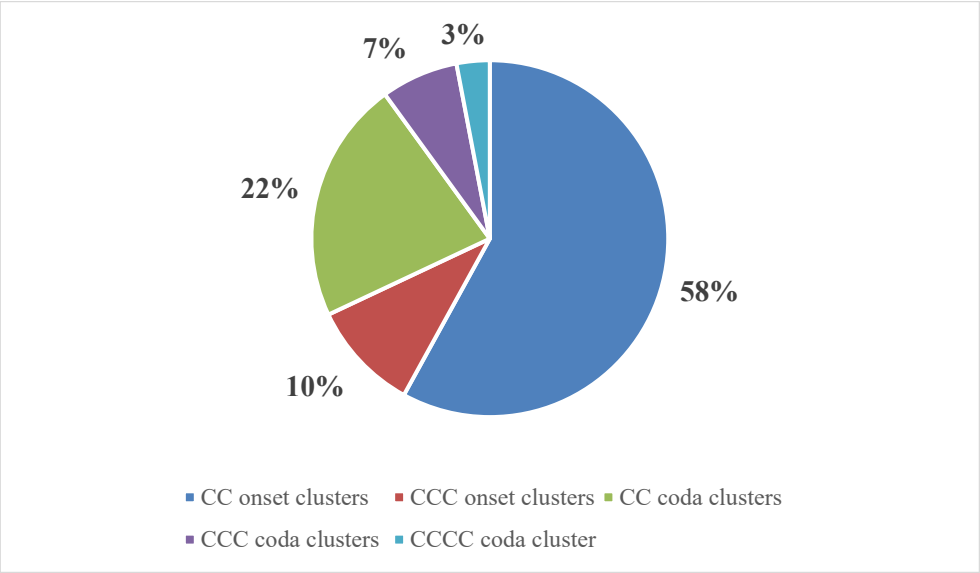


The epenthesis occurred in the maximum coda cluster in half of the cases, specifically 11 of all participants produced it. In all instances, the phoneme /i/ was inserted between the pre-final and final consonant, resulting in the production of the word *texts* as either /tekists/ or /tekist/. However, it should be noted that the cluster was represented only once within the testing sentences. This frequency may have varied if such clusters were to appear multiple times.

Further exploration of all epentetised clusters demonstrated that epenthesis was predominantly present in the two onset clusters. This is illustrated in Figure 10, which shows the percentages of all mispronounced clusters.

Figure 10

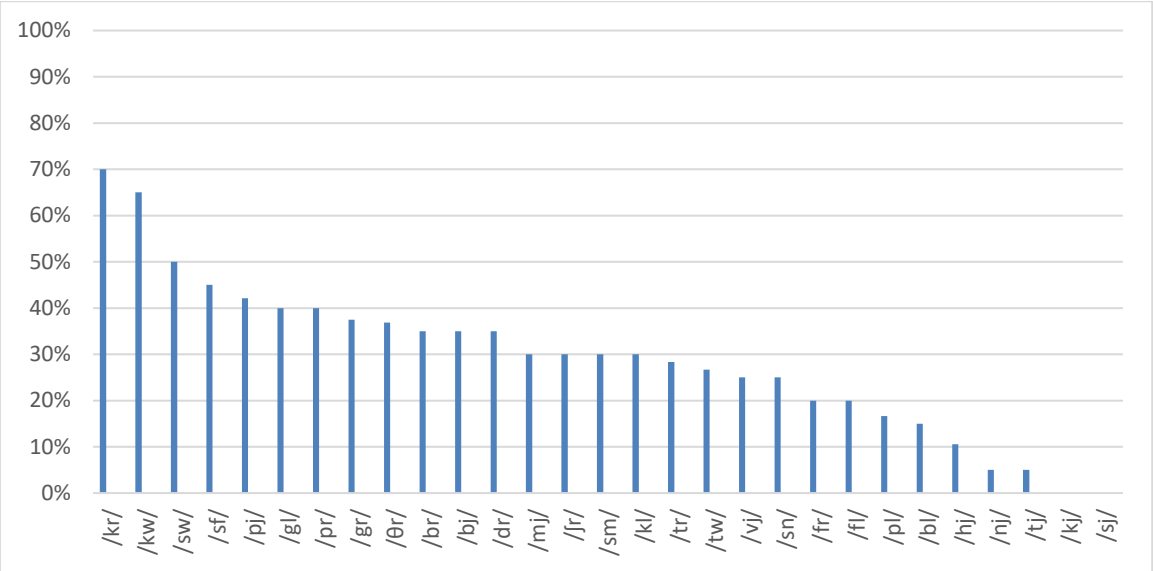
Ranking of epenthesis in onset and coda consonant clusters.



Looking at the specific combinations of consonants in the onset we can see that epenthesis was present most frequently in /kr/ and /kw/ clusters, followed by /sw/ and /sf/ clusters. It seems that the cluster with a pre-initial velar plosive, /k/ in particular, is the most difficult, in other words, Japanese participants produced the most extra sounds in them. The clusters in which epenthesis occurred the most are illustrated in Figure 11-14 below.

Figure 11

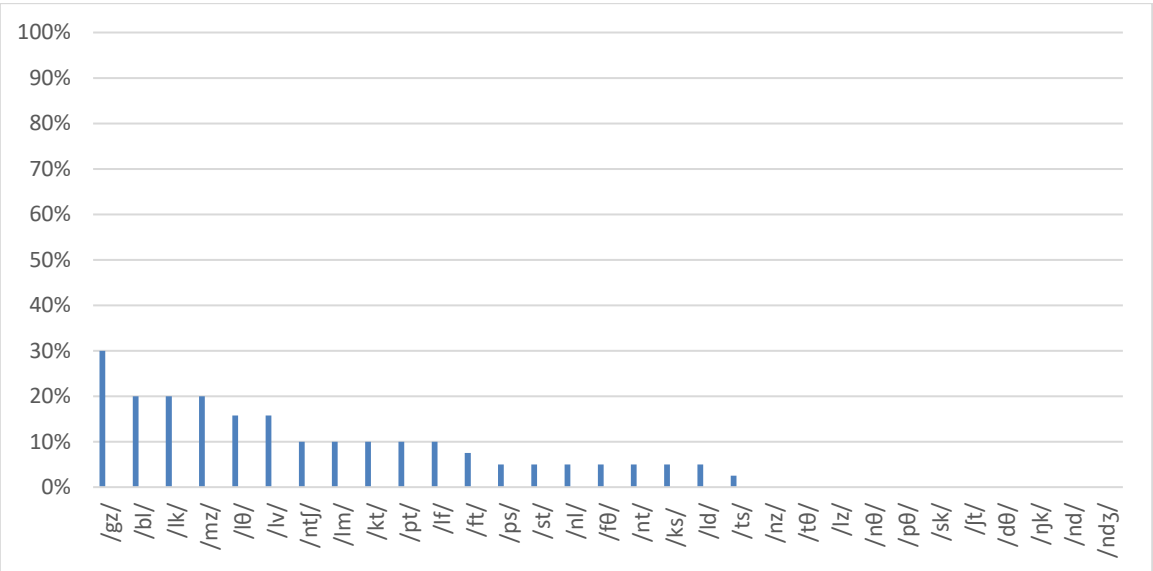
Frequency of epenthesis in CC onset clusters.



Surprisingly, the epenthesis was hardly present in some consonant clusters containing a palatal approximant /j/ in the initial position, such as /sj/, /kj/, /tj/, /nj/, /hj/. In clusters containing the post-alveolar approximant /r/ and the labio-velar approximant /w/ in the initial position, the epenthesis appeared quite consistently.

Figure 12

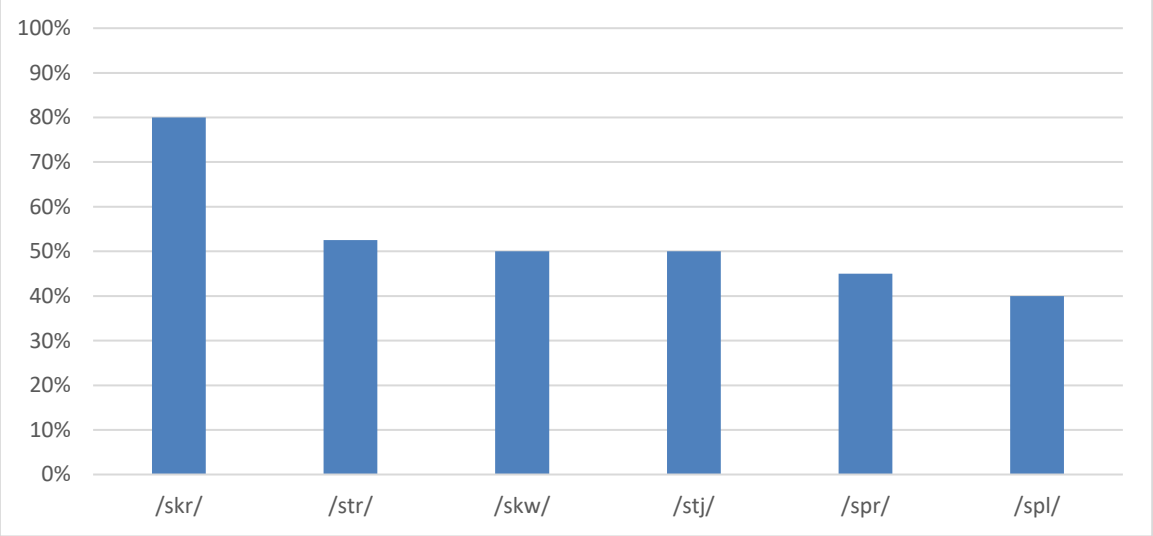
Frequency of epenthesis in CC coda clusters.



All two consonant clusters in the coda were epenthetised in less than 50%. Notably, clusters such as /ndʒ/, /nd/, /lz/, /nθ/, /nz/, /tθ/, /pθ/, /dθ/, /ŋk/, /sk/, and /ʃt/ were produced correctly in every recorded instance.

Figure 13

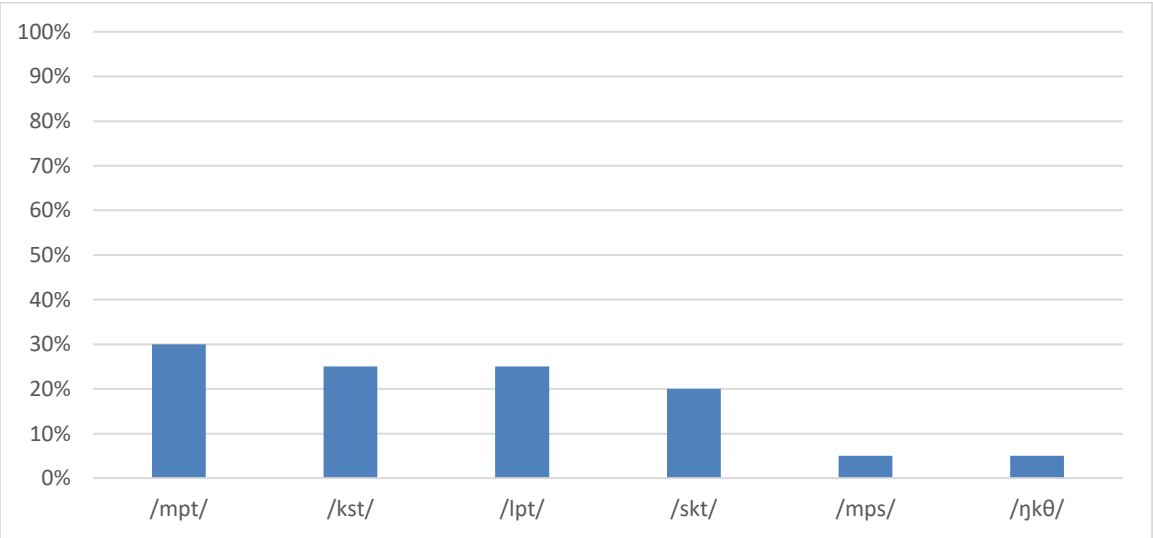
Frequency of epenthesis in CCC onset clusters.



The consonant cluster /skr/ exhibited the highest frequency of vowel insertion, with 80% of occurrences. Clusters that followed are /str/, /skw/ and /stj/ where epenthesis was observed in 50% of cases.

Figure 14

Frequency of epenthesis in CCC coda clusters.



Three consonant coda clusters were correctly produced in most of the instances. From all these clusters the most epenthetised was /mpt/, followed by clusters /kst/, /lpt/ and /skt/ with slightly lower epenthetic frequency. The only four consonant combinations /ksts/ were produced with an epenthetic vowel in 55%.

It is also interesting that the majority of onset three clusters beginning with the /s/ sound were pronounced with one epenthetic sound instead of two in most contexts. Specifically, the word *screw* was pronounced as [skɯrɯ] rather than [sɯkɯrɯ] in 70% of instances. At the elementary level, the Japanese syllable structure would typically prompt the segmentation of complicated clusters into consonant-vowel syllables. However, the results prove that the learners were partially able to produce the complex clusters. This phenomenon might be caused by the /s/ sound being less sonorous and therefore easier to produce for Japanese speakers. A similar phenomenon of splitting the cluster with one instead of two epenthetic vowels was observed in the clusters /skw/, /skr/, /str/, /spr/, /stj/, and /spl/.

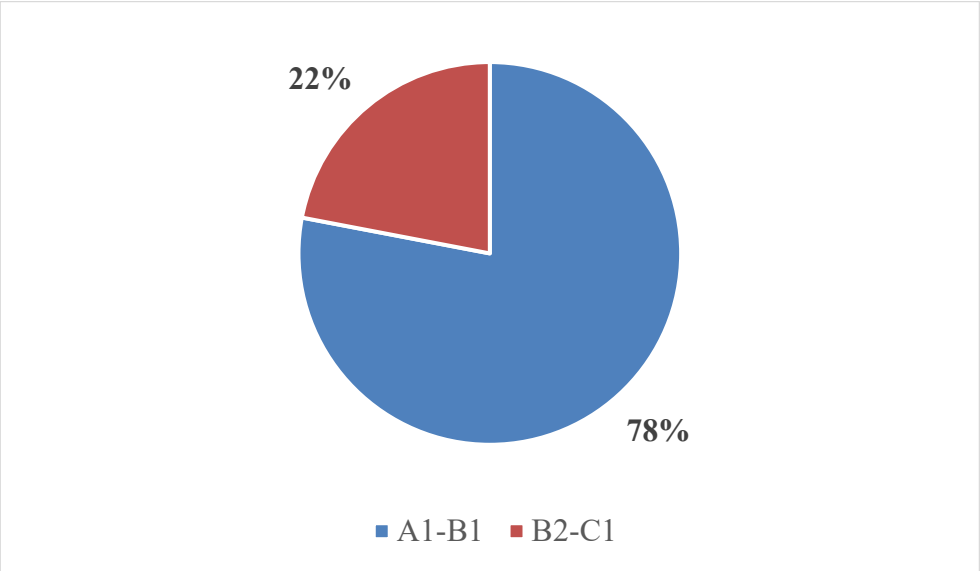
Some of the two-consonant onset clusters, such as /sj/, were produced correctly in every instance. Other clusters like /sn/ and /sm/ exhibited correct pronunciation with a very high success rate as well. The only exceptions to those mentioned above were clusters /sf/ and /sw/. In this case, the higher rate of mispronunciation might have been caused by the selection of more challenging C1, and B2 vocabulary, such as *sphere* or *sweat*.

The results also revealed inconsistencies in the placement of vowel insertion in multiple complex consonant clusters. Inconsistent patterns were observed in the three-onset consonant clusters /skw/, /skr/, /str/, /stj/, and in the three-coda consonant cluster /mpt/. The /skw/ cluster was produced either as a [skɯw] or [sɯkɯw], the /str/ cluster was produced as [stɯr] or [sɯtor], and the /stj/ was produced as [stʃɯj], [stɯj] or [sɯtɯj]. The coda cluster /mpt/ was produced as [mpit], [mɯpɯt] or [mpɯt].

Due to variations in the English level of participants, two groups were formed to investigate whether their achieved English level was a significant factor in the frequency of epenthesis. The first group consisted of eight speakers ranging from A1 to B1 levels, and the second group included twelve speakers ranging from B2 to C1 levels (See Figure 15).

Figure 15

The occurrence of epenthesis in the two groups according to the language level.



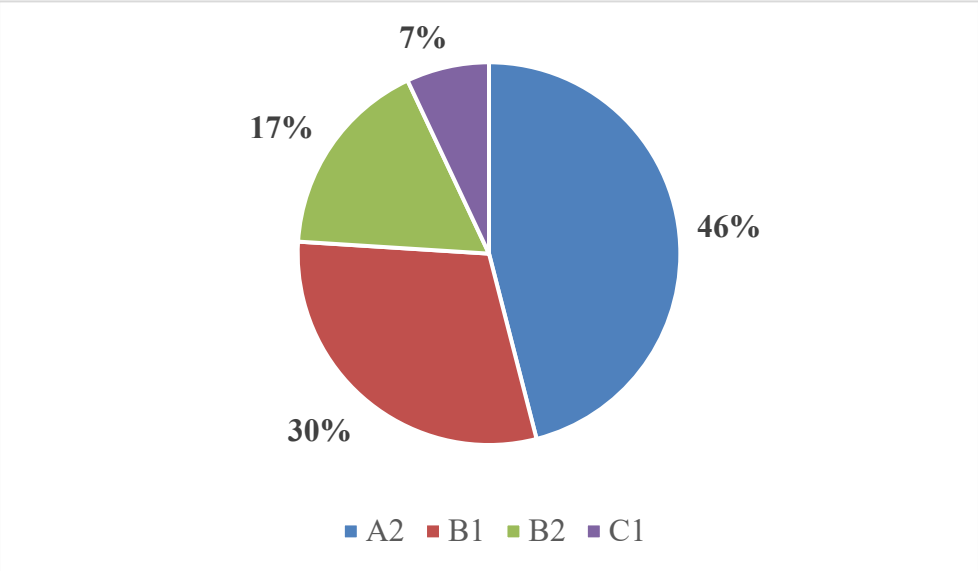
Unsurprisingly, the results indicate that lower-level students produced three times more epenthetic sounds than higher-level respondents. Notably, there was a prominent presence of deletion in the four consonant cluster /ksts/, which was produced as /ks:/ by a third of the high-level learners. Other clusters presented challenges for A1-B1 level students but were not problematic for higher-level groups. These clusters include /gl/, /mj/, /pj/, /pr/, /sf/, /sw/, /tw/, /skw/, and /str/. After further examination of the results, it was observed that the lowest-level students, that is level A1 and level A2, made some unique epenthetic mistakes. These mistakes were present in the coda cluster /gz/ and in onset clusters /dr/, /fl/, /gl/, /gr/, /pl/, / ʃr/, /spl/, /spr/. This is most likely due to the absence of the /l/ sound in Japanese phonetics and the fact that the /r/ sound, which is predominantly produced as the alveolar tap /ɾ/, has in Japanese seven allophones, one of which is the lateral approximant /l/. (Whitman, 2022, pp. 1-2). Consequently, the production of clusters /gl/ and /gr/ by the lower-lever learners was almost identical, as was the case with /spl/ and /spr/. The previous statistics in Figure 11 above, revealed that the onset clusters containing /r/ in the initial position were more frequently produced with an epenthetic vowel. This might explain this tendency of A1-A2 students to epenthetise clusters containing /l/ in the initial position.

These different findings regarding the level of subjects raised several questions which led to an even more detailed analysis across the participants. More detailed variation can be

seen in Figure 16 below, which provides a breakdown of each proficiency level with a percentage of epenthesis observed in both onset and coda positions within the dataset.

Figure 16

The occurrence of epenthesis based on the levels of participants.



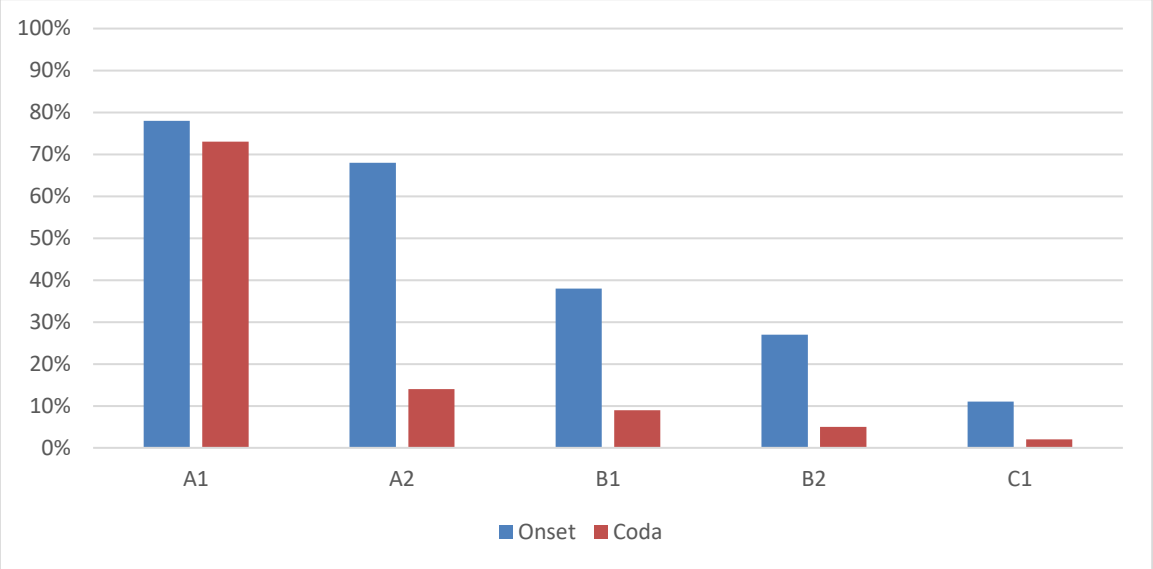
These results clearly demonstrate a correlation between the use of vowel insertion and the level of English proficiency. Furthermore, the improvement in the correct production of words is faster at lower proficiency levels and slows down as proficiency levels increase. This indicates that Japanese students of English can achieve significant progress from the beginner level. It is therefore possible to improve a significant portion of clusters at an early stage, while other clusters may persist problematic even at the C1 level.

Another discovery was the considerable disparity in the utilization of epenthesis between the A1 and C1 level speakers. The A1 speaker made 38 epenthetic mistakes in the onset and 34 mistakes in the coda, displaying a relatively equal distribution of errors between the onset and coda. Conversely, the C1 speakers made on average 5 epenthetic vowels in the onset and 1 in the coda. This prompted a closer look into variations across each category.

The final examination involved comparing the frequency of errors within English proficiency categories. This allowed us to observe the improvement and changes in onset and coda epenthesis, as depicted in Figure 17.

Figure 17

The frequency of epenthesis observed across different levels of English proficiency.



The chart reveals a trend where Japanese speakers with lower English proficiency are prone to exhibit a higher tendency to make epenthetic errors in both onset and coda positions. The higher the level of English the lower the epenthesis is. Furthermore, the data suggest a slower improvement in the correct production of onset epenthesis than in the coda.

4.2 Nature of epenthesis

It cannot be forgotten that the vowel inserted during epenthesis does not always have the same quality. In the theoretical part, a detailed explanation for each vowel in the process of epenthesis of Japanese learners of English has been provided. In this section, the quality of epenthesis and its frequency observed in the data set are presented.

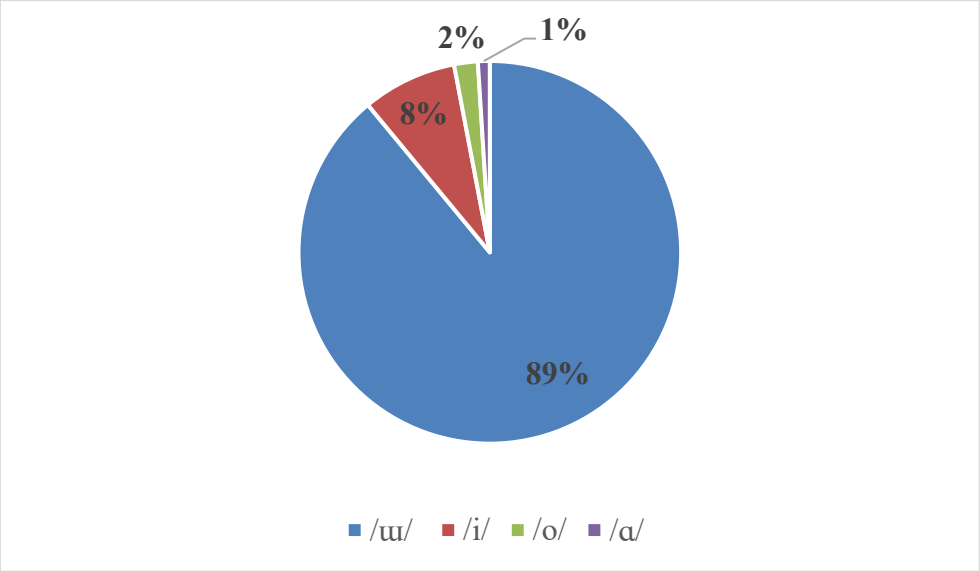
In this research, all the vowels observed that were utilised when producing consonant clusters were /ɑ/, /i/, /ɯ/ and /o/. From these four vowel sounds, the /ɯ/ vowel was used in 89% of all epenthetic instances, followed by /i/ with 8% of usage, /o/ 2%, and /ɑ/ 1%. For the summarised results see Figure 18 below.

However, each inserted vowel had a different preceding consonant that it was associated with. The /ɑ/ vowel was inserted only when the preceding consonant was a voiceless palatal-alveolar fricative /ʃ/. The /i/ usually followed the voiceless velar plosive /k/, but

there were also cases where the voiceless bilabial plosive /p/ and the voiceless alveolar fricative /s/ were prior to the /i/ sound. Lastly, the vowel /o/ occurred mainly after the voiceless alveolar fricative /s/, and after the voiced alveolar plosive /d/. In all other instances, the /ɯ/ vowel was used.

Figure 18

Nature of epenthetic vowels.



Although the preference for /ɯ/ was predominant, in some specific cases, the insertion of vowels was inconsistent, and it resulted in the usage of more than one vowel. In this study, the identified consonant clusters in which the irregularity occurred, and which were pronounced differently among speakers were /skt/, /pt/, /dr/, /sf/, /sn/, /ʃr/, and /mpt/. For example, the cluster /skt/ was produced as [skit] in 75% of instances and [skɯt] in 25%. Similarly, the /pt/ cluster was articulated as [pɯt] or [pit] each occurring with equal frequency. For the pronunciation of /dr/, the variations included [dɯr] at 71% and [dor] making up the remaining 29%. The cluster /sf/ was produced as [sof] in 78% of cases and [sif] in 12%. Likewise, the pronunciation of the /sn/ cluster was [sɯn] in 80% and [sor] in 20%. The /ʃr/ cluster was pronounced as [ʃɯr] in 67% and [ʃɑr] in 33%. Finally, the /mpt/ cluster exhibited the biggest variety, with production as [mpit] in 63% of possible cases, [mɯpɯt] in 36%, and [mpɯt] in just 1%. The vowel variability might originate from the

fact that the three-consonant clusters contain three potential positions for vowel insertion instead of the two positions available in two-consonant clusters.

Another interesting observation was found in the comparison of an A1-level speaker with others. A very common mistake was observed in the pronunciation of outside the boundary consonant combination /gj/, which occurred in the word /ɑːg.juː/. This cluster exhibited /ɯ/ vowel insertion in 55% of instances. Another instance in which the epenthesis occurred outside the boundaries was with A1 level respondent, for instance, the word *outbreak* was produced by A1 level speaker as [ɑɯtobɯreikɯ] and *prompted* as [pɯromɯpɯteto]. Additionally, words ending in a consonant were broken up by inserting vowels behind the last consonant, which was not present at all among the other nineteen speakers as all other participants avoided putting a vowel after the last consonant of a word. The phenomenon of the last consonant being followed by a vowel was expected in most speakers given that the Japanese syllable allows just the /n/ English consonant as a word-ending element.

The last phenomenon which occurred in the recordings was a deletion. The word *texts* were mostly pronounced as [tekist] when the epenthesis occurred, however, one-fourth of advanced students omitted the last two consonants producing the word with deletion creating the output [teks]. The deletion also occurred in the word *next* which 20% of participants produced as [neks], omitting the last consonant.

5 Discussion

This chapter discusses the tendencies identified in this research in relation to the previously conducted studies on epenthesis. The findings of this study are then compared to the facts from the theoretical part.

The results of Yazawa's group's research show that the epenthesis of Japanese speakers of English significantly declines as their English proficiency increases (Yazawa, 2015, p. 4). This trend was also observed in this study, in which the articulation of coda clusters with epenthesis was to a great extent identified in the A1 and A2 speakers, but not as much noticeable as in the B1 and the higher-level speakers. Despite the unequal groups that divided Japanese speakers according to their English level represented a notable limitation, the influence of the speakers' proficiency appeared to be present. However, these heterogeneous groups turned out to be a significant weakness of this research, as the results were affected by both a larger group of high-level learners and one A1 speaker.

The analysis demonstrated a low exhibition of epenthesis in the coda clusters. The studies by Kubozono (2015) and Masako (2012) address the issue of consonant and vowel devoicing by Japanese speakers might explain this phenomenon. Based on these studies, the reasoning for the correct production of consonant combinations /ndʒ/, /nd/, /lz/, /nθ/, /nz/, /tθ/, /pθ/, /dθ/, /ŋk/, /sk/, and /ʃt/ might involve this devoicing phenomenon that exists in Japanese. The devoicing occurs when a vowel is between two voiceless consonants or when a vowel after a consonant is in the final position. However, this cannot fully explain the correct production of clusters like /ndʒ/, /nd/, /lz/, /nθ/, /nz/, and /ŋk/, which contain at least one voiced sound. The correct production of these combinations might be due to the Japanese syllable structure, in which *n* is the only consonant that can stand alone, and the devoicing of an epenthetic vowel sound that occurs in a final position after a consonant. The only anomaly remains the combination /lz/. Nevertheless, further research into the coda clusters and their production by Japanese learners of English is needed.

The findings of this research on the nature of epenthesis deviate from the initial expectations. According to the predictions of Kubozono (2015), the only epenthetic sounds that should appear are /i/, /ɯ/ and /o/. The study identified the presence of an additional epenthetic vowel /ɑ/, which appeared two times after the voiceless palatal-alveolar

fricative /ʃ/. After /ʃ/ sound consonant /ɯ/ was expected instead, as it shares some articulatory properties. What is interesting, however, is that it appeared in the word shrine which given the cultural significance of shrines in Japan, does not seem to be an unknown word.

Conclusion

The main goal of this bachelor thesis was to investigate the occurrence and characteristics of epenthesis in the speech of Japanese L2 learners of English. In this respect, topical research was carried out.

Epenthesis is a phenomenon that is observed mainly in the speech of non-native learners, and it varies across languages with some exhibiting this phenomenon more prominently than others. The syllable structure of the native and target languages significantly influences the occurrence of this phenomenon as it is closely connected to the language's structure. The different language syllable structures of English and Japanese suggest that the epenthesis should be commonly present in complex consonant clusters.

The primary aim of this study was to investigate the extent to which epenthesis occurs in Japanese English. The perceptual analysis of the data corpus revealed that epenthesis occurred in approximately 25% of cases. Further analysis demonstrated that epenthesis is consistently present among every Japanese speaker, regardless of their English proficiency level. Likewise, the study found that the extent of epenthesis does significantly differ in the onset and coda positions, with a higher frequency of the epenthesis in the onset.

The secondary aim of this study was to explore the characteristics of epenthetic sounds in Japanese English. The sample of participants exhibited a tendency to mostly insert the vowel /ɯ/ in 89% of all instances of epenthetic sounds. However, the nature of epenthetic vowels was broader, as other vowels used in recorded consonant clusters, included /i/ in 8%, /o/ in 2%, and /ɑ/ in 1%.

The study encountered challenges and limitations along the way, more specifically, uneven distribution of proficiency levels among participants. While there were six C1-level respondents the A1 proficiency level was present only once, which might have influenced the findings. This unequal distribution could have also caused the frequency of epenthesis in the speech of L2 Japanese speakers to be lower as C1 levels could significantly lower the statistical occurrence of this phenomenon. Due to the limited sample of participants, the dataset was not as rich as desired, which impacted the statistical significance of the results. Nevertheless, the data provide valuable insight into the tendencies of Japanese L2

speakers of English. For more statistically significant data, further research needs to be done.

Teaching implications

From a pedagogical perspective, teachers should be aware of the challenges that Japanese L2 speakers face and consider integrating exercises that focus on consonant clusters. This approach could enhance learners' pronunciation skills and reduce their use of epenthesis. Learners at lower levels could benefit from exercises that help Japanese speakers pronounce single consonants without attaching vowels to them, as it is a common pattern acquired from Japanese syllables. The incorporation of words with complex clusters and emphasizing the correct pronunciation could also be a helpful drill. Furthermore, as we have seen in the study, consonant clusters in onsets seem to be more problematic than clusters in codas. Teachers could take advantage of this by challenging the students to correctly pronounce mainly the onset clusters, as it is a harder task for Japanese learners. Additionally, the phenomenon of deletion was observed in the pronunciation of words such as *texts* and *next* suggesting that this phenomenon might also occur in the coda even among more advanced students and should be corrected.

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List of appendices

Appendix 1

INFO:

Hi, I am Marek, a student at Charles University in Prague. I'm working on my bachelor-thesis in English linguistics, and I would greatly appreciate your help with recordings and some additional information. All data will be used anonymously and only for the purpose of my thesis.

Please include the following information: gender, age, estimated English proficiency level, length of studying English and specify your exposure to native English (e.g.,watching films, talking to natives) with the recordings.

Once you've finished, please send me the information with the recordings on my email: maxamarek123@icloud.com with the subject „thesis_recording“.

INSTRUCTIONS FOR THE RECORDING

Before you start recording, make sure to find a quiet place without background noise. Take a moment to read the text silently once or twice to get familiar with it. While recording you will read the text only once. Please try to speak clearly, and do not rush. If you accidentally mispronounce a word, please repeat the word or the entire sentence.

Thank you very much for your kind assistance. Your efforts are greatly appreciated!

SENTENCES

1. Put three glasses of milk on the new square-shaped orange table.
2. My friend eats scrambled eggs for brunch.
3. He quickly put the music texts into the box and helped me with moving out.
4. The salmonella outbreak prompted travellers to avoid street meals for the next month.
5. Planes fly twenty kilometres above the ground.
6. It's misty but you can catch a glimpse of the beautiful view from this shrine.
7. You can tell the actual depth, width and length of the pure crystal.
8. That cute girl has such a pretty smile.
9. He jumped twice, did a plank for a minute and left the gym.
10. Hold this screw and twist it until it comes loose.
11. This huge pile of snow covered the gas tube.
12. Some people argue that Earth is not a sphere.
13. She asked me if I knew the name of the film where the golf player tries to get wealthy by solving puzzles.
14. In the spring I had to wear a mask to take the lift to the fifth floor.
15. Students splashed water on their clean dresses and suits.
16. Only blood, sweat and tears will grant you strength.
17. Teacher didn’t instruct me to run 5 laps around the track.