

# Introduction

#### Dentition

- Dentition is the arrangement & condition of the teeth.
- The teeth are one of the few immovable articulators which serve as place markers for lip and tongue position.
- The contact between the teeth, lips and tongue are necessary for normal speech production.

#### Articulation

- There are approximately 18 English sounds that require contact with the lips and teeth (bilabials, labiodentals, interdentals, and alveolars).
- Many speech sounds such as fricative and affricate consonants require the teeth to direct and shape oral airflow during speech production.
- The fricative, [s], is produced incorrectly more than any other speech sound when there is defective articulation (Subtelny, Mestre, & Subtelny, 1964).

#### Past Studies about Articulation and Dentition

- Problems that can arise in dentition include class II malocclusions (overjet), class III malocclusions (underbite), crossbite, crowding, spacing and missing teeth (Leavy, Cisneros, & Leblanc, 2016).
- Malocclusions affect a variety of frontal speech sounds such as [m], [p], [b], [f], and [s] (Leavy et al., 2016).
- The type of dental abnormality associated with incorrect [s] production appears to be the same across many languages (Laine, 1992).

#### The purpose of this literature review is to determine the effect of dentition on speech and articulatory characteristics.

# **Methods**

<u>Data Source</u>: Two databases (ASHA Wire and PubMed) were used to search articles published from 1961 to 2020.

Approach: Ten research articles were used and examined for this literary review.

<u>Variables</u>: Keywords used to search in the databases include "dentition and speech production," "tooth position," and "malocclusions" in order to find articles relating to how dentition affects speech production.

# The Effects of Dentition on Speech and **Articulatory Characteristics**

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### Malocclusions

- Movement of the tongue and lips are abnormal due to muscular adaptation needed in the presence of dental anomalies (Subtelny & Subtelny, 1962).
- Certain sound groups are more sensitive to malocclusions (Vallino & Thompson, 1993; Johnson & Sandy, 1999).
- All participants with class III malocclusions showed greater production efficiency with alveolar and palatal speech sounds (Lee & Kim, 2017).
- Speech sound errors are reliant on the individuals' ability to adapt and compensate to the distortion/defect (Johnson & Sandy, 1999).
- An older study concluded that there was no concrete evidence to support that the severity of the distortion affects the type and number of speech sound errors (Johnson & Sandy, 1999).
- A recent study suggests that the more severe the malocclusion, the more ulletlikely the individual is to have speech sound errors (Leavy et al., 2016)

### Missing Teeth

- Premature loss of teeth can affect fricatives because they alter direction of oral airflow (Kalia et al., 2018).
- Significant difference in misarticulation of fricative sounds ([f], [v], [s], [z], [ð],  $[\theta]$ ) between children with missing/abnormal upper incisors and children with normal dentition (Snow, 1961).
- Children with normal dentition misarticulated the same fricatives produced correctly by three-fourths of the children who had dental abnormalities (Snow, 1961).
- There are compensatory mechanisms which allow for correct speech for those who have missing maxillary incisors (Johnson & Sandy, 1999).

Table 1. The effect of dentition problem on speech sound production			
Speech Sounds	Correct Placement	Type of Dentition Problem	Distortion
/s/ & /z/	Tongue tip on alveolar ridge	Malocclusion	Interdental placement of tongue; tongue protrusion beyond mandibular teeth
		Open Bite	Tongue tip down; tongue protrusion
/ <b>f</b> / & / <b>v</b> /	Labiodental (maxillary teeth against lower lip)	Missing Teeth	Tongue protrusion
/th/	Interdental (tongue tip between maxillary and mandibular teeth)	Missing Teeth	Tongue tip up, behind absent maxillary teeth; tongue protrusion
/sh/ & /ch/	Tongue tip on hard or soft palate	Malocclusion	Tongue tip is distal from mandibular incisors
		Open Bite	Interdental tongue protrusion; tongue tip is distal from mandibular incisors

#### Table 4 Th - |- | T

(Leavy et al., 2016; Johnson & Sandy, 1999; Subtelny & Subtelny, 1962; Vallino & Tompson, 1993)



#### **Open Bite**

 Production of fricatives across most languages are misarticulated in individuals with open bite (Laine, 1992).



Figure 3. Photograph of anterior open bite

## Conclusion

- dentition.

# **Clinical Implications**

# **Future Research**

- bites.

# References

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• Abnormal dentition can result in speech errors.

 Children with normal and abnormal dentition present with different speech sound errors.

• Fricative sounds are most often affected by

• Severity of dentition problems may correlate with severity of the speech disorder.

 Compensatory strategies can be used to adapt articulators to correctly produce speech sounds.

• Individuals with abnormal dentition can be taught compensatory strategies to achieve normal speech.

Speech pathologists should assess dentition to identify the etiology of speech sound errors.

Dentists, orthodontists, and speech pathologists should collaborate to provide best treatment outcomes for individuals with abnormal dentition.

• Research is needed to understand the relationship between timing of tooth eruption and speech sound errors.

• Substantial research has been done of the effects of malocclusions on speech, but limited studies have explored the effect of missing teeth and open

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