



## Closest Speaking Space in Relation to Different Occlusions an in vivo Clinical Study

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### ABSTRACT:

**Background:** Speech is helpful in the determination of several clinical parameters such as occlusal vertical dimension (OVD), tooth position, and anterior guidance.

**Purpose:** this study was conducted to evaluate the closest speaking space with vertical overlap of anterior teeth in relation to dental and skeletal occlusions.

**Material and methods:** The vinyl polysiloxane interocclusal registration material was placed over the occlusal surfaces posterior teeth. The participants were instructed to close their lips, swallow, and repeat sibilant/s/ and word sixty six 10 times and then not close or move their mandible for 30 seconds the while the material was polymerizing. The interocclusal records were removed from the mouth after polymerization and identified as the left or right side. The thinnest point between the maxillary and mandibular teeth was recorded in millimeters as the CSS. The dental occlusion of all the participants was classified using Angles dental classification and the skeletal occlusion was classified using Steiner's analysis. The differences in CSS values within each classification were analysed statistically and the correlation between the CSS and the vertical overlap was analysed statistically with the Pearson Correlation tests ( $P < .05$ ).

**Results:** The differences in CSS in relation to Angles dental Class II div II and class III are statistically significant with p-value  $< 0.05$  only. No significant correlation exists between CSS and vertical overlap.

**Conclusion:** The CSS can be used to determine the occlusal vertical dimension for prosthetic restoration regardless of dental and skeletal relation.

**Key Words:** Overbite, nasion, sibilant

### I. INTRODUCTION:

The CSS is the minimum distance between the teeth that occurs during the pronunciation of words containing sibilant sounds,

particularly those in combination with the vowels /e/ and /i/. The speech is helpful in determining the vertical dimension, anterior guidance and tooth position. The factors that help in developing clear speech are anterior teeth display, cuspal height, occlusal vertical dimension, vertical and horizontal overlap of anterior teeth.

The factors that affect the magnitude of closest speaking space are cuspal height, occlusal vertical dimension, vertical and horizontal overlap of anterior teeth and skeletal variation.

**Aims and objectives:** this study was conducted to evaluate the closest speaking space with vertical overlap of anterior teeth in relation to dental and skeletal occlusions.

**Materials and methods:** The sample consisted of 70 participants with age range of 18-30 years who visited the department of prosthodontics, Government Dental College and hospital Srinagar.

**Inclusion criteria:**

1. Age: 18-30 years
2. Intact and normal dentition

**Exclusion criteria:**

1. temporomandibular dysfunction,
2. speech defects,
3. an anterior open occlusal relationship,
4. tongue thrusting, lisping, and
5. the presence of intact first and second premolars in occlusion

### Closest Speaking Space Recording

The participants seated in a dental chair were fully explained the recording procedures. Before recordings, participants were asked to repeat the sibilant /s/ and word sixty six. The participants were asked to repeat the word /s/ at a normal conversational rate and volume before recording closest speaking space, CSS.

Participants were informed to sit in an upright position with their heads unsupported. Approximately 1.5 cm of vinyl polysiloxane interocclusal registration material was placed bilaterally on the occlusal surfaces of mandibular premolar and molar teeth. The record material was not placed on the anterior teeth, so as not to



interfere with the /s/ sound and to determine that the participant's pronunciation was accurate. The participants were instructed to close their lips, swallow, and repeat sibilant/s/ and word sixty six 10 times and then not close or move their mandible for 30 seconds the while the material was polymerizing. The interocclusal records were removed from the mouth after polymerization and identified as the left or right side.

The CSS records were removed from the mouth and a digital gauge was used to measure the minimum thickness of the records at premolar region.

Dental and skeletal classification:

The dental stone casts of all the participants were made and used to determine the Angle's class of occlusion. The Steiner's analysis was done on the cephalograms of all the participants to determine the skeletal class of occlusion.

The cephalograms were traced with 4H pencil for following points

- i. Point A: subspinale
- ii. Nasion N: nasion
- iii. Point B: Supramentale

Then, these points were joined for measuring the angle ANB. This was used to determine the skeletal class of occlusion

1. Class I skeletal occlusion when  $0 < ANB < 5$  degrees
2. Class I skeletal occlusion when  $ANB > 5$  degrees
3. Class I skeletal occlusion when  $ANB < 0$  degrees

The overbite was measured as the vertical overlap from the labio-incisal edge of the right maxillary central incisor with the greatest possible overlap to the labio-incisal edge of the corresponding mandibular right central incisor and was expressed as a percentage (%). The differences

in CSS values within each classification were statistically analyzed, and the correlation between the CSS and the vertical overlap was statistically analyzed with the Pearson's Correlation tests ( $P < .05$ ).

## II. RESULTS:

The mean and SD of the CSS were  $2.25 \pm 1.27$  mm for the 70 right interocclusal records and  $2.17 \pm 1.26$  mm for the 70 left interocclusal records. The difference between the 2 sides was not statistically significant ( $P = .635$ ). The overall mean and SD of the CSS (range 0.24 to 5.724 mm) was  $2.27 \pm 1.27$  mm. The difference in the CSS between males and females was not significant ( $P = .647$ ). The mean and sd of CSS in Angles dental Class I, Angles dental Class II div I, Angles dental Class I div II and Angles dental Class III are  $2.74 \pm 0.76$  mm,  $2.21 \pm 1.32$  mm,  $2.7 \pm 1.26$  mm and  $1.57 \pm 0.97$  respectively. The mean and sd of vertical overlap % in Angles dental Class I, Angles dental Class II div I, Angles dental Class I div II and Angles dental Class III are  $20.2 \pm 12.07$ ,  $40.7 \pm 27.40$  and  $14.4 \pm 20.07$  respectively.

The mean and sd of CSS in Steiner's skeletal class I, Steiner's skeletal class II and Steiner's skeletal class III are  $2.14 \pm 0.46$ ,  $2.56 \pm 1.26$  and  $1.89 \pm 0.97$  respectively.

The mean and sd of overbite % in Steiner's skeletal class I, Steiner's skeletal class II and Steiner's skeletal class III are  $22.24 \pm 18.07$ ,  $47.8 \pm 30.04$  and  $13.4 \pm 21.07$  respectively.

The correlation between the CSS and the amount of vertical overlap was not statistically significant ( $r = .210$ ,  $P = .321$ ). The differences in CSS in relation to skeletal Class I, II, and III occlusions were not statistically significant ( $P = .521$ ).

The differences in CSS in relation to Angles dental Class II div II and class III are statistically significant with p-value  $< 0.05$ .

Table no. 1 Means and SD of CSS and vertical in relation to angles dental classification

Angles dental classification				
	Class I	Class II div I	Class II div II	Class III
CSS	$2.74 \pm 0.76$	$2.21 \pm 1.32$	$2.7 \pm 1.26$	$1.57 \pm 0.97$
Vertical overlap %	$20.2 \pm 12.07$	$40.7 \pm 27.40$	$47.8 \pm 34.04$	$14.4 \pm 20.07$

Table no. 2. Means and SD of CSS and vertical in relation to skeletal classification

Table no. 2. Means and SD of CSS and vertical in relation to skeletal classification			
	Class I	Class II	Class III
CSS	$2.14 \pm 0.46$	$2.56 \pm 1.26$	$1.89 \pm 0.97$
Vertical overlap %	$22.24 \pm 18.07$	$47.8 \pm 30.04$	$13.4 \pm 21.07$



### III. DISCUSSION:

This clinical study was aimed to test the amount of CSS with respect to the differences in dental and skeletal orthodontic classifications.

Rizzatti et al recommended the use of vinyl polysiloxane interocclusal registration material over the kinesiographic method to determine the CSS because it is simple, less expensive and easily available. It was seen that participants were able to pronounce the sibilant/s/ and word sixty six with vinyl polysiloxane interocclusal registration material over the posterior teeth.

The CSS does not change with gender, skeletal classifications, Angles dental class I and Angles dental class II div I occlusions significantly. The decrease in mean CSS from Angles dental class II div II to class III is accompanied with decrease in vertical overlap. However, a correlation that can suggest a cause and effect relationship between the CSS and vertical overlap was not found in the present study.

### IV. CONCLUSION:

Within the limitations of this clinical study, the mean closest speaking space values range from 1 to 3 mm and can be used in the clinical determination of the occlusal vertical dimension of prosthetic restorations, regardless of dental and skeletal classified occlusions. There was no correlation found between the amount of vertical overlap and closest speaking space.

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