

# Effect of Malocclusion on Cognitive Function and Academic Performance

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## Key points

- Malocclusion aesthetic appearance and functionality
- Aesthetic impact of malocclusion
- Relationship between malocclusion and cognitive function
- Mechanisms linking malocclusion and cognitive function

Malocclusion is a term used to describe the misalignment of teeth and/or jaws that can affect an individual's overall oral health, aesthetic appearance, and functionality. It is a common condition that affects a significant portion of the global population, with estimates ranging from 20% to 70% depending on the population studied. While the impact of malocclusion on oral health is well established, its effects on cognitive function and academic performance are not yet fully understood. This paper will explore the current literature on the relationship between malocclusion and cognitive function and academic performance.

### What is malocclusion?

Malocclusion is a condition that involves the alteration of the growth process of the upper jaw and the positioning of teeth, which can lead to various physical, psychological, and social consequences. The condition can affect an individual's smile, which is a critical aspect of their facial appearance and emotional expression. The aesthetic impact of malocclusion can cause adverse effects on a person's quality of life, social interactions, interpersonal relationships, and psychological well-being, leading to feelings of inferiority. Individuals with fewer dental and facial issues are perceived to be more socially competent and better adjusted intellectually and psychologically. This condition's negative impacts can be particularly significant for adolescents, as they may become targets of ridicule, name-calling, and harassment. Since children and adolescents spend a significant portion of their developmental years in educational environments, the presence of oral disorders such as malocclusion can potentially impact their academic performance and overall quality of life. In some cases, severe malocclusions may even lead to bullying. While there is evidence that other oral conditions, such as periodontal disease and tooth loss, can negatively affect school performance and oral health-related quality of life, further research is needed to understand the potential impact of malocclusion on these aspects of an individual's life.



**Figure 1;** crooked teeth  
(source: shutterstock.com)



**Figure 2;** bullying and crooked teeth  
(source: wcbrcases.com)

### Impact of malocclusion on cognitive function

Several studies have investigated the impact of malocclusion on cognitive function, with mixed results. A study in 2014 found that children with malocclusion had lower scores on tests of spatial memory and visual-motor integration than children without malocclusion.<sup>1</sup> Similarly, a study in 2016 found that individuals with severe malocclusion had lower scores on tests of verbal and nonverbal intelligence than individuals without malocclusion.<sup>2</sup> On the other hand, a study in 2012 found no significant differences in cognitive function between

### individuals with malocclusion and those without. 3

These conflicting results suggest that the relationship between malocclusion and cognitive function is complex and may depend on a variety of factors, including the severity and type of malocclusion, age of the individual, and other individual differences such as socioeconomic status.

#### Impact of malocclusion on academic performance

The impact of malocclusion on academic performance has also been investigated, with similarly mixed results. A study in 2017 found that children with malocclusion had lower grades in mathematics and language classes than children without malocclusion.<sup>1</sup> Similarly, another study in 2017 found that children with malocclusion had lower academic achievement scores than children without malocclusion.<sup>4</sup>

In contrast, a study in 2014 found no significant differences in academic performance between children with and without malocclusion.<sup>5</sup> Likewise, a study in 2016 found no significant differences in academic achievement between individuals with different types of malocclusion.<sup>6</sup>

Again, these mixed results suggest that the relationship between malocclusion and academic performance is complex and may depend on a variety of factors, including the severity and type of malocclusion, age of the individual, and other individual differences such as socioeconomic status.

#### Possible mechanisms linking malocclusion and cognitive function/academic performance

The mechanisms linking malocclusion and cognitive function/academic performance are not yet fully understood, but several hypotheses have been proposed. One hypothesis is that malocclusion may lead to decreased self-esteem and confidence, which can affect an individual's motivation to learn and perform academically.<sup>1</sup>

It has also been suggested that malocclusion may affect an individual's sleep quality, which can in turn affect cognitive function and academic performance.<sup>2</sup> Finally, it has been proposed that malocclusion may affect an individual's oral health, which can in turn affect overall health and well-being, including cognitive function and academic performance.<sup>3</sup>

According to a study, malocclusion was significantly associated with lower overall academic performance, especially in arts and physical education subjects. A previous study in India reported that students with severe malocclusion are more likely to exhibit poor academic performance, but the current study did not find a significant difference in academic performance depending on the need for malocclusion treatment. The inconsistency of these findings might be due to the severity of the condition, as the

previous study focused on the academic performance of adolescents with severe malocclusion. The current study evaluated the type of malocclusion and found that dental crowding was significantly associated with academic performance.

The link between malocclusion and low academic performance of children may be explained by social and biological pathways. Malocclusion is associated with the emotional well-being and self-esteem of school children. Poor oral condition can result in an impaired smile, leading to social exclusion and poor academic performance. It is often present in the anterior portion and can induce gingivitis, which was associated with overall, arts, and physical education performance.



**Figure 3;** malocclusion vs. normal occlusion  
(source: wazirorthodontics.com)

Malocclusion is also associated with headache and reduced trigeminal nerve stimulation, which may cause cognitive impairment. This, as a chronic stressor, might enhance the secretion of stress-activated neuronal responses in the hippocampus area, thereby suppressing learning and memory ability. Occlusal conditions can influence cerebral blood flow and motor function, which may affect fine motor skills required in arts and physical education subjects.



**Figure 4;** malocclusion (source:centralcoastorthodontics.com)

## Conclusion

It is crucial to assess the long-term impact of malocclusion on a patient's psychosocial health. Patients with severe malocclusions or dento-facial malformations may experience numerous dental health issues that can affect their well-being in various ways. Self-concept is a learned and organized response pattern that includes the patient's experiences, ability to achieve goals, and reactions of others. While the objective assessment of malocclusion severity is essential for orthodontists, a patient's self-perceived dental attractiveness, positive feelings towards the dento-facial region, or subjective perception of malocclusion (or disfigurement) are the primary factors contributing to self-concept in pre-adolescents and adolescents. The cosmetic implications of malocclusion are generally regarded as important for self-concept. It is crucial for dentists to understand if malocclusions impact dental health and/or psychological and social well-being. The reason being, without concrete evidence, it becomes difficult to provide patients with accurate information during the consent process. This highlights the significance of conducting research in this area to enable better communication and decision-making between dentists and their patients.

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