

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Japanese Dental Science Review

journal homepage: www.elsevier.com/locate/jdsr



Review Article

Mastication as a tool to prevent cognitive dysfunctions[☆]

Gayathri Krishnamoorthy, Aparna I. Narayana*, Dhanasekar Balkrishanan

Department of Prosthodontics and Crown & Bridge, Manipal College of Dental Sciences, Manipal University, Manipal, 576104 India

Received 18 May 2017; received in revised form 14 May 2018; accepted 22 June 2018

KEYWORDS

Mastication;
Brain functions;
Stress;
Occlusion;
Occlusal disharmony

Summary Mastication as we all know has always been related to its primary function of digestion, but little do we know that it produces an enhancing effect on general health, especially the cognitive performance related aspects of memory. Recent studies have shown its association with activation of various brain regions, however little is known about its effects on neuronal activity in these specified regions. According to the enormous evidences collected so far, mastication has proved to be effective in conducting huge amount of sensory information to the brain, and maintaining learning and memory functions of hippocampus. Therefore it is essential that we maintain normal occlusion and preserve the masticatory function as long as possible to prevent the attenuation of hippocampus, caused by occlusal disharmony and reduced mastication. We provide an overview on how mastication activates various cortical areas of the brain and how an increase in the cerebral blood oxygen level of hippocampus and prefrontal cortex (PFC) accentuates the learning and memory process. We also justify why maintaining and establishing a normal occlusion is important from neurological point of view.

© 2018 The Authors. Published by Elsevier Ltd on behalf of The Japanese Association for Dental Science. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Contents

1. Introduction 00
2. Search methodology and evaluative criteria 00

[☆] Scientific field of dental science: Prosthodontics and Occlusion.

* Corresponding author.

E-mail address: prostho.manipal@gmail.com (A.I. Narayana).

<https://doi.org/10.1016/j.jdsr.2018.06.001>

1882-7616/© 2018 The Authors. Published by Elsevier Ltd on behalf of The Japanese Association for Dental Science. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Please cite this article in press as: Krishnamoorthy G, et al. Mastication as a tool to prevent cognitive dysfunctions. Japanese Dental Science Review (2018), <https://doi.org/10.1016/j.jdsr.2018.06.001>

3. Pathways that convey masticatory information to hippocampus 00
 3.1. Neuronal pathway 00
 3.2. Humoral pathway 00
 4. Effects of mastication on cognitive functions and human working memory 00
 5. Effects of mastication on stress 00
 6. Effects of occlusal disharmony 00
 7. Conclusion 00
 Conflict of interest 00
 Role of funding source 00
 References 00

1. Introduction

The process which involves crushing and grinding of food by teeth in order to increase the surface area for effective breakdown of food by enzymes is termed as mastication. Though mastication is a semi autonomic activity, the motor program governing it is a central nervous system (CNS) function which involves neural networks in brainstem and several regions of the brain that controls and creates the complex masticatory patterns. After the confirmation of a positive association between mastication and cognitive functions through many animal and human experimental studies, oral health disorders have attracted further attention on its association with cognitive deficits [1,2].

Hollingworth [3] in 1939 demonstrated the relationship between mastication and cognitive functions through electroencephalography and stated that there is an increase in performance of cognitive function during mastication. In 2002, Wilkinson et al. [4] carried out an experimental study between chewing and non-chewing groups, and found an increase in episodic, spatial and numeric working memory in chewing group when compared with that of the non-chewing control group. Numerous such studies have been carried out which associate the reduced number of residual teeth and decreased use of dentures to cognitive deficits [5,6]. This review provides a critical analysis and a comprehensive evaluation on how mastication induces neuronal activities in various regions of the brain [7,8] thereby increasing the cerebral blood oxygen level of hippocampus and prefrontal cortex (PFC) which accentuates the learning and memory process, it also provides an insight into masticatory disharmony and its association with cognitive deficits (Fig. 1).

2. Search methodology and evaluative criteria

Scopus, PubMed, ScienceDirect, Clinical Key and Google Scholar were used as search engines. The search term ‘‘Mastication’’ was used along with ‘‘stress’’, ‘‘cognition’’, ‘‘working memory’’, and ‘‘occlusal disharmony’’ separately. Articles published from the year 1939 to 2015 were reviewed and cross references were checked for further useful research. In addition to these, only standardized results of cognitive valuation were considered. Self-evaluation measures or any other form of questionnaires were excluded from this review.

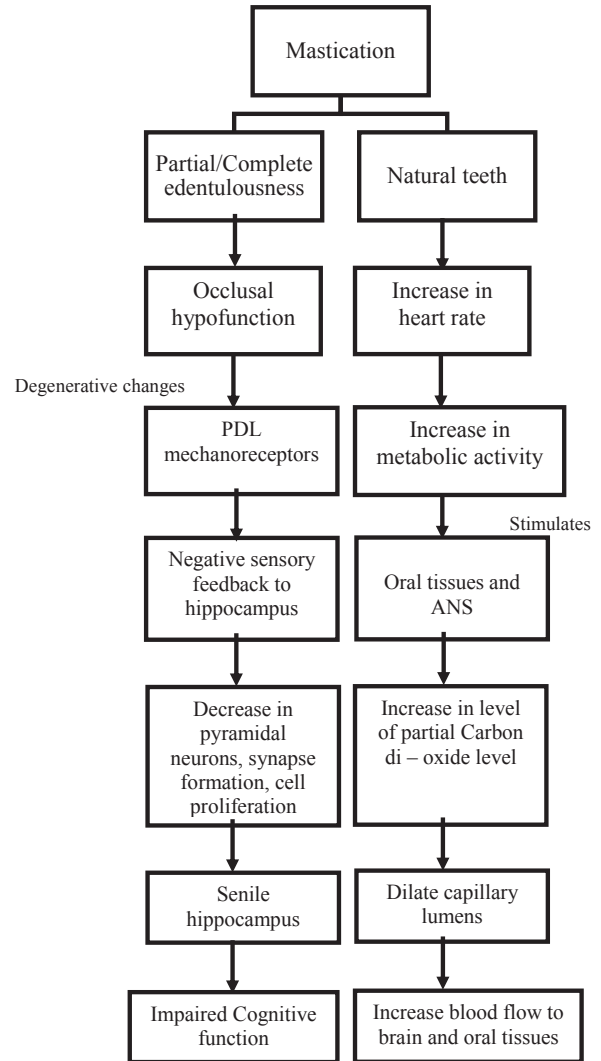


Figure 1 Relation between mastication and cognitive functions; PDL — periodontal ligament, ANS— Autonomic Nervous System.

3. Pathways that convey masticatory information to hippocampus

Hippocampus is a central nervous system region which is vital for learning, maintaining spatial memory, formation and retrieval of episodic memories in human [9]. Litera-

Download English Version:

<https://daneshyari.com/en/article/11014729>

Download Persian Version:

<https://daneshyari.com/article/11014729>

[Daneshyari.com](https://daneshyari.com)