**Phenotype-Predicting Model for Response to OSA Treatment with Mandibular Advancement Devices**

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Obstructive sleep apnea (OSA) is a prevalent condition characterized by repetitive episodes of upper airway obstruction during sleep, often resulting in fragmented sleep and associated comorbidities such as cardiovascular and metabolic disorders. Mandibular advancement devices (MADs) have been shown to be eDective in treating mild to moderate OSA, yet patient response to this treatment is highly variable. This variability underscores the need for a phenotype-predicting model that can stratify patients according to their likelihood of benefiting from MAD therapy.

This review focuses on recent advancements in phenotype-predicting models for MAD response in OSA treatment, particularly those utilizing craniofacial, physiological, and polysomnographic data. Key phenotypic traits include anatomical factors (such as craniofacial structure, airway collapsibility, and tongue positioning), non-anatomical factors (such as arousal threshold and ventilatory control stability), and patient-specific characteristics like age, gender, and body mass index. Predictive models integrating these variables have demonstrated the potential to enhance treatment outcomes by allowing clinicians to identify "responders" versus "non-responders" before treatment initiation.
Recent studies highlight the importance of computational modeling and machine learning algorithms to improve the predictive accuracy of MAD eDectiveness. These models analyze extensive data sets, including cephalometric measurements, sleep study metrics, and even genetic markers, to provide a personalized treatment approach. Early results show that

phenotype-based prediction models could improve therapeutic decision-making, reducing trial-and-error periods and leading to more eDicient, tailored care.

In conclusion, as MADs continue to be a non-invasive, eDective alternative to continuous positive airway pressure for some OSA patients, the development of accurate phenotype-predicting models could revolutionize patient selection and
treatment success. Further research, especially in larger and more diverse patient cohorts, is needed to refine these models and fully integrate them into clinical practice.

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