Table 1. Summary of characteristics of included articles
(Critical appraisal tool- AMSTAR) https://amstar.ca/Amstar_Checklist.php

Author, year, and country	Number of articles included	Type of treatment and description	^RDI	#AHI	% SaO2	Snoring Index	Epwort's sleepiness scale (ESS)	Upper airway dimensions	Hyoid and other measurements	Main Results	AMSTAR
Bartolucci et al. 2021 Italy	50	Mono-bloc and Duo-block mandibular advancement devices and its effects on AHI and SaO_2		82% of the Mono-block therapy and 54% of the duo-block demonstrated success rate improving AHI	10% of the Mono-block therapy and 3% of the duo-block demonstrated success rate improving O_2S					Mono-block devices showed a higher effectiveness when compared to due-block devices, however with a very low quality of evidence, according to the authors.	High quality
Anusuya et al. 2019 India	8	Changes in pharyngeal airway dimensions following functional appliance therapy in skeletal Class II malocclusion in growing patients.						Average change in **nasopharynx**, between control and treatment groups (mm): CG: 91.85±159.25 TG: 133.12±133.35 (insignificant change) **Oropharynx:** CG: 168.54±325.71 TG: 414.21±394.51 (prominent effect) **Hypopharynx**: CG: 0.54±1.56. TG: 1.01±1.89	Changes in hyoid bone (mm): 1.81±2.50 Both removable and fixed functional appliances produced a significant increase in the hyoid bone distance. Changes were more prominent in the horizontal than vertical direction.	Functional appliance treatment has a significant effect on the improvement of the oropharyngeal airway, but minimum effect on the nasopharynx. Removable functional appliances (ie. Twin blocks) produced the better improvement in the upper airway dimension such as the oropharynx and hypopharynx than fixed appliances.	High quality

Sakamoto et al. 2019 Japan	3	Crossover and parallel trials, which compare results for OSA patients using MAD with 50% and 75% protrusion.	Mean difference between 50% and 75% protrusion Respiratory rate 1.89 95% CI [0.36, 9.92]	Mean difference between 50% and 75% protrusion: 0.38 95%CI [-0.89, 1.65]		Mean difference between 50% and 75% protrusion: 0.09 95% CI [0.05, 0.13]	Mean difference between 50% and 75% protrusion: 1.07 95% CI [-0.09, 2.24]			In mild to moderate OSA cases, 50% protrusion might be effective, whereas for severe cases, >70% may be more effective.	Low quality
Marina et al. 2019 India	6	Research question was if two types of MADs (custom made vs. pre-fabricated) affect the AHI, ESS, and SaO_2		Average without appliance: 27.34±5.08 Average with type A appliance: 7.08±2.27 Average with type B appliance: 8.93±2.72	Average without appliance: 10.88±4.97 Average with type A appliance: 6.24±2.94 Average with type B appliance: 5.28±3.09		Average without appliance: 9.54±6.33 Average with type A appliance: 6.59±4.50 Average with type B appliance: 7.03±5.0			Both the custom-made and prefabricated MADs reduced the severity of symptoms of OSA. MADs can reduce AHI when evaluated objectively, and can reduce ESS when evaluated subjectively.	Low quality
Xiang et al. 2017 China	7	Change in pharyngeal airway after treatment with a functional appliance. Types used were: Forsus, Twin block, Activator with/without headgear.						Superior Pharyngeal Space: 1.73mm/yr [1.13, 2.32] Middle Pharyngeal Space: 1.68mm/ yr [1.13, 2.23] Inferior Pharyngeal Space: 1.21mm/ yr [0.48, 1.95]	Appliances can force mandibular advancement with an annual increase in SNB angle by 1.79°/yr S-PNS: 0.83° [-0.19, 1.86] SN-GoGN: 1.19mm/yr [0.50, 1.89] (significant difference found in the mandibular plane angle)	"The oropharynx dimensions were most affected by the functional appliances compared to the nasopharynx and hypopharynx. Early treatment with functional appliances has positive effects on the upper airway, especially on oropharyngeal dimensions. The forward repositioning of the mandible and adaptive changes to the soft palate, increasing airway dimensions, help decrease the airway resistance."	Low quality

Bartolucci et al. 2016 Italy	13	AHI changes relative to mandibular advancement amounts		Improvement in AHI was seen in mandibular advancements of 25% to 89% of the maximum protrusion						Advancement amounts higher than 50% do not significantly influence the success rate of AHI (AHI improvement is not proportionate with mandibular advancement increase).	High quality
Serra-Torres et al. 2016 Spain	22	MADs used included: Klearway, Twin-block, Herbst, custom-made duo-block, custom-made mono-block.		AHI % reduction: 21% to 80%. 16 out of 22 studies reported at least 50% reduction in the AHI	Average oxygen saturation, from initial to post-treatment (%): 86.08±6.04 to 90.8±3.91		Average ESS, from initial to post-treatment: 9.99±4.72 to 6.84±3.5	5 out of 22 studies measured velopharynx dimensions and found an increase in it		"MAD increase the area of the airway and bring the soft palate, tongue, and hyoid bone forward activating the masseter and submental muscles, preventing closure."	High quality
Alsufyani et al. 2013 Canada	2 *	"Dimensional changes in the upper airway after appliance therapy in subjects with mild to moderate OSA. Twin-block and Herbst were used in the included studies						One study showed the total airway volume increased by 1.1±0.2 cm3 with twin-block. The other study showed an increase in the oropharynx to be 2.8±4.4 cm3 after the use of Herbst.		Although there was an increase in the airway volume, the studies had a low quality of evidence according to the authors of this systematic review	Moderate quality
Ahrens et al. 2011 China	14	Oral appliance design and its effect on OSA symptoms treatment outcomes		MAD therapy improves polysomnographic indices						"All MADs proved successful in improving AHI/RDI and comparison with inactive appliances suggests that mandibular advancement is crucial in terms of establishing efficacy."	Low quality

Ahrens et al. 2010 China	14	Subjective evaluation of MAD compared with either inactive appliances or MAD with different designs.					"Subjects and sleep partners both recorded that MADs significantly reduced snoring frequency, choking, cessation of breathing, the number of arousals, daytime sleepiness frequency of morning headache daytime aggressive reaction, and decreased libido."			"There is no MAD design that most effectively influences subjectively perceived treatment efficacy. Efficacy depends on materials and methods used for fabrication, type of MAD (monoblock or Twinblock), and the degree of sagittal and vertical protrusion."	Low quality
Lim et al. 2006 UK	17	Out of the 17 articles, 6 trials compared OA with a control OA, which consisted of devices that did not protrude the mandible.		There was a significant effect in favor of active treatment (-10.78 events/hr; 95%CI -15.53 to -6.03	Minimum arterial oxygen saturation For cross over studies, there was no significant effect in favor of active appliances (1.79% with 95% confidence interval [-0.29, 3.87])		Active appliance: 8.53±10.91 Control appliance: 37.47±5.87 Mean difference with 95% confidence interval: -2.09 [-3.80, -0.37]			OA improves subjective sleepiness and indices of sleep-disordered breathing over an inactive control. Additionally, OA leads to improvement in the AHI compared to the baseline. Blood pressure: active oral appliance therapy led to lower blood pressure compared to the control appliances	High Quality

Hoekema et al. 2004 Netherlands	16	Evaluation of the efficacy and safety of OA while treating OSA		Improvement of AHI and SaO_2 was seen among the included studies.	Improvement of AHI and SaO_2 was seen among the included studies.					"Oral appliances are effective in the treatment of OSA, although a placebo effect should be considered. (…)Although definite conclusions are not possible, efficacy of OA treatment appears to be related to the degree of mandibular advancement. Moreover, appliance design, like the amount of bite opening or the means of mandibular fixation, may affect subjective parameters of success."	High Quality

*Alsufyani et al 2013 evaluated in their Systematic Review changes in the upper airway after MAD or surgery, since surgery was not the focus of this Umbrella Review, we reported only the results based on MAD;^RDI= Respiratory disturbance index; #AHI= Apnea/Hypopnea Index; % SaO2= Oxygen saturation