JMS Tongue Pressure Measurement Device (TPMD) and PECOPANDA - Main Related Studies

N0	Title	Citation	Device	Summary	Keywords	Year	Link
1	Standard values of maximum tongue pressure taken using newly developed disposable tongue pressure measurement device	Utanohara Y et al. Dysphagia. 2008 Sep;23(3): 286-90.	TPMD	853 healthy adults (408 males, 445 females, aged 20-79 years) were studied using JMS TPMD prototype to determine standard values of maximum tongue pressure in adults. Maximum tongue pressure measurements showed that males had higher values than females in the 20-49 age groups but no gender difference in the 50-79 age groups, with the seventies group showing significantly lower values than the twenties to fifties groups, demonstrating age-related tongue pressure decline and accelerated muscle strength reduction with aging in males.	Standard value Adult	2008	
2	Maximal voluntary tongue pressure is decreased in Japanese frail elderly persons.”	Tsuga K. et al. Gerodontology 2012	TPM-01	This study evaluated maximum voluntary tongue pressure (MVTP) in 129 Japanese frail elderly people receiving nursing care. Participants compressed a small balloon probe against the palate for 7 seconds, three times, at 1-minute intervals. MVTP was successfully recorded in 111 individuals, with a mean of 18 kPa and a wide range from 0 to 63 kPa. Eighteen participants could not follow the instructions, so their MVTP was not measured. Compared with published standard values from healthy dentate adults using the same device, frail elders showed clearly reduced MVTP, highlighting the importance of quantitative oral function assessment in nursing care settings.	MTP frail elderly	2012	
3	Tongue pressure in patients with tongue cancer resection and reconstruction	Hamahata et al. Auris Nasus Larynx 2014	TPM-01	This study evaluated tongue function after tongue cancer resection and reconstruction using a simple hand-held tongue pressure device in 30 patients six months postoperatively. Tongue defects were grouped from minimal to subtotal glossectomy, and tongue pressure was expressed as a percentage of normal values. Pressure decreased progressively with larger resections, from about 94% in minimal glossectomy to around 15–19% in more extensive surgeries. Tongue pressure showed strong correlations with articulatory test scores, food evaluation, and speech intelligibility (Pearson r ≈ 0.67–0.77). Tongue pressure measurement proved useful for objectively determining functional status in reconstructed tongues.	TP tongue cancer	2014	
4	Decreased tongue pressure is associated with sarcopenia and sarcopenic dysphagia in the elderly.	Maeda et al, Dysphagia, 2015	TPM-01	This study examined how tongue pressure relates to sarcopenia and its determinants in 104 very old inpatients (mean age 84 years) without stroke or neurodegenerative disease. Maximum tongue pressure was measured with a disposable balloon probe, alongside nutritional, anthropometric, and functional indices. Tongue pressure correlated positively with Barthel Index, nutritional status (MNA-SF, albumin), BMI, and arm muscle area. Regression analyses showed that sarcopenia, age, Barthel Index, and MNA-SF independently explained reduced tongue pressure. Sarcopenia and its causes were strongly associated with dysphagia, supporting the concept of “sarcopenic dysphagia” as dysphagia arising from systemic muscle loss and its etiologies.	sarcopenic dysphagia	2015	
5	Decreased tongue pressure is associated with sarcopenia and sarcopenic dysphagia in the elderly	Maeda K, Junji Akagi Dysphagia. 2015 Feb; 30(1):80-7.	TPMD	104 hospitalized elderly patients (mean age 84.1 years) were examined to investigate the relationship between tongue pressure and sarcopenia-related factors. The results showed that decreased maximum tongue pressure was independently associated with sarcopenia, reduced activities of daily living, poor nutritional status, and age, suggesting that sarcopenic dysphagia may be partially explained by the presence of sarcopenia and its causal factors.	Dysphagia Sarcopenia	2015	

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6	Prediction of Pneumonia in Acute Stroke Patients Using Tongue Pressure Measurements	Nakamori M et al. PLoS One. 2016 Nov 1;11(11): e0165837.	TPMD	220 acute stroke patients underwent tongue pressure measurement to investigate its predictive value for pneumonia onset. The results showed that tongue pressure below 21.6 kPa was a sensitive predictor of pneumonia onset (hazard ratio 7.95), with patients showing improved tongue pressure within 2 weeks having significantly lower pneumonia rates, suggesting tongue pressure is a useful indicator for predicting pneumonia in acute stroke patients.	Acute stroke Pneumonia	2016	
7	Maximum tongue pressure is associated with swallowing dysfunction in ALS patients.	Hiraoka A, Yoshikawa M, Nakamori M, et al., Dysphagia 2017	TPM-01	This study investigated whether maximum tongue pressure (MTP) can detect swallowing disorders in ALS. Twenty-five ALS patients underwent ALSFRS-R scoring, yogurt swallowing videofluorography, and MTP measurement with TPM-01. Patients with reduced tongue function or pharyngeal residue had significantly lower MTP. Prolonged bolus formation and oral and pharyngeal transit times were also associated with reduced MTP. A cut-off of 21 kPa corresponded to normal bulbar scores. The authors conclude that MTP is closely related to videofluorographic swallowing characteristics and may serve as a practical early diagnostic tool for swallowing dysfunction in ALS.	ALS	2017	
8	Maximum Tongue Pressure as a Measure of Post-Extubation Swallowing Ability	Ichibayashi R et al. Toho J Med 3 (3): 75-83, 2017	TPMD	36 patients who received mechanical ventilation with endotracheal intubation were studied to evaluate tongue pressure changes over one week after extubation and investigate differences between patients who later aspirated and those who did not. Post-extubation tongue pressure values were lower than normal in all patients but increased over time, though significantly lower in aspirating patients, suggesting tongue pressure is useful for assessing post-extubation swallowing ability, determining oral intake timing, and identifying aspiration risk.	Dysphagia Extubation Pneumonia	2017	
9	Analysis of factors related to tongue pressure during childhood	Takuya Asami et al. Dental, Oral and Craniofacial Research, 4(3): 1-7, 2017.	TPMD	209 children aged 3-6 years were investigated for changes in tongue pressure during childhood. Maximum tongue pressure increased significantly with age, with standard values of 11.8±7.7 kPa at age 3, 16.7±7.5 kPa at age 4, 22.1±9.5 kPa at age 5, and 25.4±8.2 kPa at age 6. Tongue pressure showed moderate correlations with grip strength and physical parameters, suggesting its relationship with generalized muscle strength and physical function.	Standard value Pediatric	2017	
10	Association of handgrip strength with various oral functions in 82- to 84-year-old community-dwelling Japanese	Mihara et al. Gerodontology, 2018	TPM-01	This study investigated links between general muscle strength and oral function in 809 Japanese adults aged 82–84 years. Participants underwent assessments of maximal occlusal force, masticatory performance, stimulated salivary flow, RSST score, tongue pressure, and mouth-opening distance, alongside handgrip strength measurement. Regression analyses, adjusted for dental status, dentures, periodontal condition, daily living abilities, and BMI, showed that lower handgrip strength was significantly associated with reduced occlusal force, poorer mastication, lower tongue pressure, worse RSST scores, and smaller mouth opening. The authors conclude that declining handgrip	handgrip strength oral functions elderly	2018	
11	Oral hypofunction in the older population: Position paper of the Japanese Society of Gerodontology in 2016	Minakuchi S et al. Gerodontology. 2018 Dec;35(4): 317-324.	TPMD	The Japanese Society of Gerodontology defined diagnostic criteria for "oral hypofunction" as the presence of 3 or more of 7 symptoms: oral uncleanness, oral dryness, decline in occlusal force, decline in tongue and lip motor function, decline in tongue pressure, decline in chewing function, and decline in swallowing function. Currently, diagnosis in Japan is conducted based on this guideline.	Elderly Oral hypofunction	2018	

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12	Relationship between characteristics of skeletal muscle and oral function in community-dwelling older women	Suzuki M, et al. Archives of Gerontology and Geriatrics, 2018	TPM-01	This cross-sectional study in 245 community-dwelling women ≥65 years examined links between sarcopenia stages and oral function. Participants were classified as normal, presarcopenia, dynapenia, or sarcopenia using skeletal muscle characteristics. Oral function was evaluated via maximum tongue pressure, oral diadochokinesis, and self-reported swallowing difficulties. Sarcopenia and dynapenia groups had significantly lower tongue pressure and diadochokinesis than normal participants, even after adjusting for age. Oral function declined in parallel with skeletal muscle deterioration across sarcopenia stages, suggesting shared pathophysiology. The authors recommend further research on swallowing-related muscle mass, strength, and performance at each sarcopenia stage.	skeletal muscle; oral function; TP; older women	2018	
13	Literature review on tongue pressure of healthy Japanese	Tabuchi K. et al. Sci J Pub Health, 2018	TPM-01	This literature review examined tongue pressure across the lifespan in healthy Japanese individuals. It searched Japanese and international databases for “tongue pressure,” yielding 349 papers, of which 12 included relevant healthy Japanese data. Tongue pressure in infants up to three months was 10–13 kPa, rising to 29–35 kPa in elementary school children and about 35 kPa in adolescents. Adult women in their twenties to sixties showed 33–40 kPa, while men in their twenties reached 45–55 kPa, 5–22 kPa higher than women. Men’s pressure declined from their forties, eventually matching or falling below women’s in old age.	tongue pressure; healthy adults; reference values	2018	
14	Sarcopenia and dysphagia: Position paper by four professional organizations	Fujishima et al., Geriatr Gerontol Int. 2019 Feb; 19(2):91-97.	TPMD	This is a position paper on sarcopenia and dysphagia jointly published by four Japanese societies including the Japanese Society of Dysphagia Rehabilitation. Sarcopenic dysphagia is defined as dysphagia caused by sarcopenia of the whole body and swallowing-related muscles, and it was shown that treatment requires both swallowing muscle resistance training and nutritional intervention. Additionally, a tongue pressure cutoff value of 20 kPa was described for the diagnosis of sarcopenia.	Dysphagia Sarcopenia	2019	
15	Effects of anterior tongue strengthening exercises on posterior tongue strength in healthy young adults	Yano J et al. Arch Oral Biol. 2019 Feb: 98:238-242.	TPMD	11 healthy participants were investigated for the effects of anterior tongue muscle strengthening exercises (pressing the tongue tip against the palate, performed 3 days/week for 8 weeks) on posterior tongue muscle strength. Anterior tongue exercises significantly improved maximum tongue pressure in both anterior and posterior tongue muscles, with effects sustained for 3 months after exercise completion. Additionally, the JMS TPMD, which has a bite block not present in IOPI and a slightly larger balloon, may have provided better exercise effects than IOPI.	Exercise anterior tongue muscles	2019	
16	Change in tongue pressure and the related factors after esophagectomy: a short-term, longitudinal study	Yokoi Aya et al. Esophagus. 2019 Jul;16(3): 300-308.	TPMD	59 patients (41 males, 18 females, aged 33-77 years) who underwent esophagectomy were studied to investigate the association between tongue pressure changes and postoperative dysphagia/pneumonia. Tongue pressure significantly decreased after esophagectomy, and this decrease was significantly associated with longer ICU stay, preoperative tongue pressure values, dysphagia (RSST<3), and pneumonia incidence.	Dysphagia Esophagectomy ICU	2019	

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17	Variability in tongue pressure among elderly and young healthy cohorts: A systematic review and meta-analysis	Arakawa et al. J Oral Rehab, Aug. 2020	TPMD IOPI	This systematic review and meta-analysis examined factors influencing tongue pressure (TP) in healthy people. It included 68 studies with 13 773 participants and compared TP by age, sex, and device. Adults under 60 had significantly higher TP than those 60 or older. Men showed higher TP than women overall, but this sex difference disappeared in people aged 60 and above. TP values were also higher when measured with the Iowa Oral Performance Instrument (IOPI) than with the	Comparison with IOPI value	2020	
18	Reliability and comparability of methods for assessing oral function: Chewing, tongue pressure and lip force	Arakawa I et al., J Oral Rehabil. 2020 Jul;47(7): 862-871.	TPMD IOPI	26 healthy adults (aged 27-93 years) participated in a study evaluating the reliability and comparability of different oral function measurement devices (maximum tongue pressure, chewing function, maximum lip force). Maximum tongue pressure measurements were compared between JMS TPMD and IOPI, and correlations were observed. Notably, JMS TPMD showed smaller standard deviation and fewer outliers compared to IOPI, suggesting that JMS TPMD may offer higher measurement accuracy than IOPI.	Comparison with IOPI value	2020	
19	Effects of Tongue-Strengthening Exercise on the Geniohyoid Muscle in Young Healthy Adults	Yano J et al. Dysphagia. 2020 Feb;35(1): 110-116.	TPMD	7 healthy young adults (3 men, 4 women, aged 21.0±1.3 years) underwent 8-week tongue muscle training (pressing the tongue tip against the hard palate 30 times × 3 sessions daily, 3 days/week) to investigate its effects on geniohyoid muscle hypertrophy. After training, maximum tongue pressure and geniohyoid muscle area at rest significantly increased, demonstrating that tongue-strengthening exercises are effective for improving not only tongue muscle but also geniohyoid muscle strength.	Exercise genioglossus	2020	
20	Improper sitting posture while eating adversely affects maximum tongue pressure	Yoshikawa M et al., J Dent Sci. (2021) 16, 467e473	TPMD	This study investigated how lower extremity positioning during eating influences tongue pressure in healthy adults and elderly individuals requiring care. Forty-three healthy participants and thirty-three elderly participants were assessed across four postures: good and poor positions in bed and in a reclining wheelchair. In both groups, optimal postures produced significantly higher tongue pressure than poor postures. In elderly participants, wheelchair positioning yielded the highest values overall. These findings suggest that whole-body posture, including lower limbs, plays a meaningful role in	swallowing eating posture tongue pressure lederly	2021	
21	Differences in the factors associated with tongue pressure between children with class I and Class II malocclusions	Fujita, Y. et al. BMC Pediatr (2021) 21:476	TPMD	This study examined how tongue pressure relates to masticatory performance and craniofacial features in children with mixed dentition and Class I versus Class II malocclusions (n=56). Children with Class II malocclusion showed significantly lower tongue pressure, hand grip strength, and occlusal force. In Class I cases, tongue pressure correlated positively with strength, occlusal force, masticatory performance, and mandibular position (SNB angle). In Class II cases, it correlated instead with growth-related factors such as height, weight, and incisor inclination. These findings indicate distinct functional and morphological associations depending on malocclusion type.	tongue pressure children malocclusions	2021	

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22	Effect of decreased tongue pressure on dysphagia and survival rate in elderly people requiring long-term care	Sakamoto et al. J Dent Sci. 2021 17(2):856-862	TPMD	This study evaluates the impact of tongue pressure on dysphagia and mortality from pneumonia in 60 frail older adults. The results show that reduced tongue pressure and a low BMI are major predictors of dysphagia. Furthermore, a tongue pressure below 20 kPa significantly increases the risk of death from pneumonia within one year (survival rate of 44.3% versus 100% above this threshold). In conclusion, tongue strength is a vital prognostic marker for the safe passage of food.	Tongue pressure, Dysphagia, Pneumonia, Mortality	2021	
23	Changes in tongue pressure and dysphagia at oral cancer patients by palatal augmentation prosthesis	Kuniyuki et al. Cancer Reports. 2022;5:e1516.	TPMD PAP	Background: The palatal augmentation prosthesis (PAP) is an intraoral prosthesis used in the treatment of dysphagia. Aim: The objective of the study is to examine the effect of PAP using tongue pressure and the Videofluoroscopic Dysphagia Scale (VDS) to understand the precise mechanism for improvement in swallowing function with PAP for oral cancer at retrospective survey. Methods and results: Fifteen patients were provided PAPs. Tongue pressure and VDS were evaluated with and without PAP. After intervention with PAP, tongue pressure significantly increased as compared to when without PAP ($p < .05$). The total mean VDS score with PAP was found to have significantly improved ($p < .05$). The mean VDS score of the oral phase also significantly improved with the PAP	PAP dysphagia, oral cancer, palatal augmentation prosthesis, swallowing, videofluoroscopic	2021	
24	A Novel Tongue Pressure Measurement Instrument with Wireless Mobile Application Control Function and Disposable Positioning Mouthpiece	Liu et al. Diagnostics 2021, 11, 489.	TPWA : TPMD	The study introduced a wireless, smartphone-controlled chair-side tongue pressure device with a disposable palate-shaped balloon mouthpiece and bite-positioning tube. It withstood 700-cycle fatigue testing while maintaining 12 kPa output stability. In 52 young and 40 elderly adults, maximum tongue pressure values closely matched a commercial device, showing no significant differences across instruments or repeated tests. Tongue pressure declined with age (≈41 kPa young vs 17 kPa elderly) and differed by sex, with higher values in young males but higher values in elderly females. The system was deemed reliable for clinical TP screening.	Comparison with TPWA	2021	
25	Effects of Tongue-Strengthening Self-Exercises in Healthy Older Adults: A Non-Randomized Controlled Trial	Yano J et al. Dysphagia. 2021 Oct;36(5):925-935.	TPMD PECOPANDA	27 healthy older adults (exercise group: 16 participants, 7 men, 9 women, median age 84.5 years; control group: 11 participants, 2 men, 9 women, median age 79.0 years) were studied to investigate the effects of tongue-strengthening self-exercises using JMS PECOPANDA at home on tongue strength. The exercise group performed tongue exercises (pressing the anterior tongue against the hard palate 30 times × 3 sessions daily, 5 days/week for 8 weeks), resulting in significant improvements in maximum tongue pressure and endurance of tongue pressure.	Exercise Elderly	2021	
26	Comparison of the Iowa Oral Performance Instrument and JMS tongue pressure measurement device	Yoshikawa M et al., J Dent Sci. 2021 Jan;16(1): 214-219.	TPMD	74 healthy young participants (34 males aged 23.2±2.0 years, 40 females aged 21.4±1.3 years) were studied to investigate the correlation between maximum tongue pressure measured by IOPI PRO and JMS TPMD. IOPI PRO values were slightly higher than JMS TPMD, but JMS TPMD was demonstrated to generate useful and valid tongue pressure values, with significant correlations shown overall and by gender ($P<0.05$) and conversion formulas established: males (IOPI PRO = JMS TPMD × 1.07 + 15.4) and females (IOPI PRO = JMS TPMD × 1.21 + 11.2).	Comparison with IOPI value	2021	

JMS Tongue Pressure Measurement Device (TPMD) and PECOPANDA - Main Related Studies

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27	Effects of Tongue-Strengthening Exercise on Tongue Strength and Effortful Swallowing Pressure in Young Healthy Adults: A Pilot Stud	Fukuoka T et al. J S H Res;• Vol. 65 • 1686–1696	TPMD	This study examined whether tongue-strengthening exercise (TSE) improves tongue strength and swallowing pressure in healthy young adults. Thirteen participants completed 8 weeks of isometric TSE, with measurements taken during training and after cessation. Maximum isometric tongue pressure (MITP) and effortful swallowing pressure both increased significantly after training. However, MITP declined during detraining, whereas swallowing pressure remained stable up to 8 weeks post-training. These findings suggest TSE effectively enhances tongue–palate pressure during swallowing, with more durable functional gains in swallowing pressure than in maximal strength, indicating potential clinical relevance for maintaining swallowing performance.	Exercises MTP healthy	2022	
28	Effect of tongue strength on clinical outcomes of patients: A systematic review	Nagano Ayano et al. Arch Gerontol Geriatr. 2022 Sep-Oct:102: 104749.		A systematic review was conducted to investigate the effects of decreased tongue strength on clinical outcomes, screening 3040 articles published from January 2000 to June 2021, with 7 articles (787 patients) finally selected. Cut-off values for decreased tongue strength ranged from 13.8-21.6 kPa, and patients with decreased tongue strength showed poorer swallowing function recovery, higher pneumonia incidence, and worse life expectancy, though tongue strength improved with exercise interventions and nutritional management.	Systematic review tongue strength Cut-off value	2022	
29	Relationships between maximum tongue pressure and second formant transition in speakers with different types of dysarthria	Tamura t et al. PLoS One. 2022 Mar 8;17(3): e0264995.	TPMD	63 dysarthria patients (median age 68 years) and 30 normal speakers (median age 22 years) were studied to investigate the relationship between maximum tongue pressure and second formant transition reflecting tongue movement speed during articulation. Dysarthria patients showed significantly lower maximum tongue pressure, speech intelligibility, oral diadochokinesis rate, and second formant slope than normal speakers, with significant correlation only between maximum tongue pressure and second formant slope ($r = 0.368$, $p = 0.003$).	Dysarthria	2022	
30	Population-based reference values for tongue pressure in Japanese older adults: A pooled analysis of over 5,000 participants	Iwasaki M et al. J Prosthodont Res. 2023;67(1):62-69. PMID 35944993.	TPMD	This pooled population-based analysis established age- and sex-specific reference values for maximum tongue pressure (TP) in community-dwelling Japanese adults aged ≥65 years. Four cohorts using the JMS tongue pressure device were combined, and means and deciles were calculated for 5-year age strata in men and women. Among 5,083 participants (2,150 men; 2,933 women; mean age 75.2 ± 6.5 years), TP declined progressively with age in both sexes. In men, mean TP decreased from 34.0 to 24.4 kPa, and in women from 31.5 to 26.4 kPa between 65–69 and ≥85 years. Regression analysis showed significant age-related decline and a sex–age interaction, indicating sex-specific trajectories of TP loss	TP reference values Old adults JP	2023	
31	Relationship between Occlusal Vertical Dimension and Tongue Pressure in Complete Denture Wearers	Kurata Y et al. Int J Oral-Med Sci 21（4）:183–190, 2023	TPMD	This study investigated whether tongue pressure can guide vertical dimension of occlusion (VDO) in complete denture fabrication. Ten edentulous patients wearing dentures were tested using incremental changes from the most comfortable position (MCP). Tongue pressure remained stable when VDO was reduced by 1–4 mm and when increased up to +5 mm. However, pressure declined significantly at +6 mm and +7 mm. These findings indicate that moderate increases or decreases around MCP do not impair tongue function, suggesting that setting VDO within approximately +5 mm of MCP is clinically acceptable generally.	tongue pressure vertical dimension	2023	

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32	Comparison of the Tongue-Palate Pressure Patterns According to the Tongue Pressure in Community-Dwelling Older Adults	Min-Ji J et al. J Dent Hyg Sci 2023; 23(4): 320-329	TPMD	This study quantified tongue–palate pressure patterns in Korean community-dwelling older adults to refine oral frailty assessment and guide interventions. Among 217 seniors ≥60 years attending a Wonju senior center, 205 completed 7-second cyclic tongue-palate pressure tests and were classified as normal (NTP) or abnormal (ATP) based on whether they ever reached a standard target pressure. Overall, 40.5% showed tongue weakness with ATP, where pressure curves were steep and irregular, versus smooth, sustained plateaus in NTP. Abnormal pressures averaged only 48.4%, 40.7%, 31.9%, and 22.6% of NTP values in those in their 60s, 70s, 80s, and ≥90s ($p<0.05$), underscoring age-related decline and the need for structured oral rehabilitation to support safe swallowing.	Tongue palate Pressure frailty	2023	
33	Relationships between Lip Seal Strength, Tongue Pressure, and Daytime Sleepiness in Japanese Workers: A Cross-Sectional Study	Minoura A. et al. Clin. Pract. 2023, 13, 753–762	TPMD	This cross-sectional study investigated associations between lip seal strength, tongue pressure, and daytime sleepiness in 496 Japanese workers using the Epworth Sleepiness Scale (ESS). Excessive sleepiness (ESS ≥11) was present in 8.5% of participants. Median lip seal strength was 13.5 N, and tongue pressure was 41.7 kPa. Higher ESS scores were significantly associated with lower lip seal strength after adjusting for age and BMI ($\beta = -0.043$), while tongue pressure showed no significant relationship. The findings suggest that maintaining adequate lip seal strength may help reduce daytime sleepiness, independent of age and BMI.	MTP, lip seal, daytime sleepiness	2023	
34	Effects of Tongue Right Positioner use on tongue pressure: a pilot study	Yanagida, R., Hara, K., Namiki, C. et al. Sci Rep **13**, 3289 (2023*)*	TPMD TRP	This interventional study assessed the effect of two months of nightly tongue repositioning palate (TRP) use on tongue function in eight dysphagic patients. Tongue pressure was the primary outcome, with lip and tongue movements, peak nasal inspiratory flow, and ultrasonographic changes as secondary outcomes. Participants wore the TRP at least eight hours nightly. Tongue pressure increased significantly from 23.0 ± 13.4 kPa to 31.5 ± 13.1 kPa, while secondary measures showed no significant change. Unlike conventional tongue exercises that demand active adherence, TRP use alone improved tongue pressure, suggesting TRP can substantially enhance tongue strength in dysphagia over two months.	TRP device used for dysphagia	2023	
35	Association Between Low Tongue Pressure and Physical Abnormalities in Adolescent and Young Adult Women: A Cross-Sectional Study	Fujita Y et al., Children (Basel). 2024 Dec 2;11(12): 1478.	TPMD	This study investigated factors linked to low tongue pressure in 92 females aged 10–20 years. Measurements included anthropometrics, grip strength, occlusal force, tongue pressure, and masticatory performance. Participants were categorized by BMI and Rohrer index. Low tongue pressure was defined as the lowest 20%. Tongue pressure correlated positively with grip strength ($r = 0.407$). Multivariate analysis showed higher odds of low tongue pressure in underweight (OR 7.45) and overweight/obese individuals (OR 18.38), while greater grip strength was protective (OR 0.864). Overall, low tongue pressure is associated with abnormal body weight and reduced muscular strength in young women, suggesting systemic physical factors influence oral function.	Adolescent women MTP masticatory Body weight	2024	

JMS Tongue Pressure Measurement Device (TPMD) and PECOPANDA - Main Related Studies

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36	Sleep status and oral function in patients with obstructive sleep apnea	Lee J. et al., Journal of oral and Sleep Medicine. Vol. 11, No.1 (2024): 3-10.	TPMD	29 patients with obstructive sleep apnea (OSA) and 29 healthy controls were studied to compare oral function using maximum tongue pressure measurement and sleep questionnaires. OSA patients showed significantly higher rates of mouth-opening during sleep and xerostomia upon awakening ($p=0.01$ and $p<0.001$, respectively) and lower maximum tongue pressure ($p=0.004$). Myofunctional therapy for OSA patients with reduced oral function may improve sleep respiratory function by strengthening tongue and upper airway muscles.	OSA MTP MFT	2024	
37	Prospective Observational Study for the Comparison of Screening Methods Including Tongue Pressure and Repetitive Saliva Swallowing With Detailed Videofluoroscopic Swallowing Study Findings in Patients With Acute Stroke	Nakamori M et al., J Am Heart Assoc. 2024 Feb 6;13(3):e032852.	TPMD	346 acute stroke patients (age 70.5±12.6 years) were studied to compare VFSS findings with modified Mann Assessment of Swallowing Ability, tongue pressure, and RSST. Modified Mann assessment correlated with all findings except aspiration, tongue pressure with oral and pharyngeal residue, and RSST with all except oral residue. ROC analysis showed the optimal cutoff value for abnormal VFSS findings was RSST≤2, suggesting that combining tests may improve swallowing evaluation accuracy.	Dysphagia Acute stroke	2024	
38	Association between tongue pressure, masticatory function, and salivary bacterial load in older adults requiring long-term care	Funahara T et al. J Dent Sciences, 2025 7 035	TPMD	This cross-sectional study in 80 long-term care residents (mean age 85.4 years) examined whether tongue pressure, occlusal force, and masticatory function relate to salivary bacterial load and to each other. Decreased tongue pressure was significantly associated with higher salivary bacterial counts, while reduced masticatory ability was the only significant predictor of lower tongue pressure. Having fewer than 20 teeth was linked to diminished occlusal force and masticatory function and tended to accompany reduced tongue pressure. The authors conclude that preserving natural, functional teeth and masticatory function is essential to maintain tongue pressure, control salivary bacteria, and potentially reduce aspiration pneumonia risk in frail older adults.	TP Masticatory bacterial load	2025	
39	Temporal relationship between malnutrition and oral function impairment in older adults with dysphagia	Furuya H et al. J Nutr Health Aging. 2025 Jul; 29(7):100577.	TPMD	177 older adults aged ≥65 years with dysphagia were studied to investigate the relationship between tongue pressure and malnutrition. The results showed that decreased tongue pressure increased the risk of malnutrition, while malnutrition did not affect tongue pressure decline. The findings suggest that tongue pressure decline may precede malnutrition, highlighting the importance of incorporating oral function assessment as part of malnutrition risk evaluation.	Dysphagia Malnutrition	2025	
40	The Clinical Impact of the Tongue Pressure Measurement and the Novel Preoperative Training Program With the Tongue Strength Training Device	Marui et al, 2025, Interdisciplinary Cardiovascular and Thoracic Surgery, 40(10).	TPMD PECOPANDA	In cardiovascular surgery, frailty increases the risk of postoperative dysphagia. This study evaluated the impact of preoperative tongue-strengthening training using the Pecopanda device. Among 108 patients (2022–2024), 42 received training and 66 did not. Low tongue pressure (<30 kPa) was found in 44.4% of patients. Tongue pressure change was +0.2 kPa in the training group versus −2.2 kPa in controls. Regression analyses suggested training improved postoperative pressure and reduced need for modified diets or tube feeding, with all trained patients discharged home.	Dysphagia surgery exercise	2025	

JMS Tongue Pressure Measurement Device (TPMD) and PECOPANDA - Main Related Studies

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41	Relationships between dysarthria, lesion location, and oral/swallowing function in patients with first-ever stroke	Nakamori M et al., Clin Neurol Neurosurg. 2025 Jul:254: 108928.	TPMD	82 acute stroke patients (mean age 67.6±11.5 years, 32 women, median NIHSS 1.5) were analyzed for the association between dysarthria and lesion locations, oral/swallowing functions. Dysarthria was identified in 16 patients (19.5%), with NIHSS (OR 1.289) and corona radiata lesions (OR 9.981) as significant risk factors, and decreased tongue pressure (cutoff value 28.4 kPa, AUC 0.688) was also associated with dysarthria.	Dysarthria Stroke	2025	
42	Strength Training Device	Oshima Y et al. 2025 Cureus 17(3): e80544.	TPMD PECOPANDA	A 67-year-old woman with severe dysphagia due to muscle-specific tyrosine kinase antibody-positive myasthenia gravis underwent swallowing rehabilitation for approximately 12 months alongside drug therapy. Through intensive and prolonged swallowing rehabilitation including regular swallowing assessments, progressive muscle strengthening exercises using PECOPANDA, and interferential current stimulation, the patient successfully achieved oral intake without recurrence of aspiration pneumonia.	Dysphagia Myasthenia gravis Exercise	2025	
43	the Novel Preoperative Training Program With the Tongue	Wang JM and Tai-Shan Tong World J Psychiatry. 2025 Aug 19;15(8): 106019.	TPMD	110 head and neck cancer patients undergoing radiochemotherapy were studied in a randomized controlled trial to evaluate the combined effects of tongue pressure resistance feedback training and empowerment education. After 6 weeks of intervention, the experimental group showed significant improvements in depressive symptoms and swallowing function, optimization of coping strategies, and enhanced quality of life compared to the control group ($P < 0.05$), demonstrating the effectiveness of this combined approach.	Dysphagia Depression Cancer Excersise	2025	
44	Reproducibility of Tongue Pressure Values in Adults With Down Syndrome	Yamaguchi H, et la. SCD vol 45 .1 2025 02	TPMD	Down syndrome patients often have tongue hypotonicity, making reliable tongue pressure testing challenging. This study assessed reproducibility of tongue pressure measurement (TPM) in 30 adults with Down syndrome who could complete three trials. Mean chronological age was 33 years, mean developmental age (DA) 3.8 years, and median maximal tongue pressure 17.6 kPa. Intraindividual variability was low (SD 2.0 kPa, CV 11.9), indicating acceptable reproducibility. Patients with DA ≥ 4 years showed significantly better speech presence and lower CV than those with DA < 4 years, and their TPM reproducibility was comparable to typical adults.	MTP Down syndrome	2025	
45	Relationship between Tongue Pressure and Nutritional Status in Patients Undergoing Maintenance Hemodialysis: A Single-center Cross-sectional Study	Yasushi Kosuge et al. Prog Rehabil Med. 2025 May 14:10:20250012.	TPMD	80 maintenance hemodialysis patients (median age 81.0 years) were studied to investigate the relationship between tongue pressure and nutritional status/sarcopenia components, revealing that 58.8% showed low tongue pressure (<30kPa). Multivariate analysis identified age, handgrip strength, and GNRI (geriatric nutritional risk index) as independent predictors of tongue pressure.	Dialysis Nutritional status Sarcopenia	2025	

JMS Tongue Pressure Measurement Device (TPMD) and PECOPANDA - Main Related Studies

N0	Title	Citation	Device	Summary	Keywords	Year	Link
46	Effectiveness of tongue rotation exercise in a patient with obstructive sleep apnea: a case report	Makihara E et al. Asian Pac J Dent 2026; 26.	TPMD	This case report describes a patient with obstructive sleep apnea (OSA) who could not receive oral appliance therapy because of temporomandibular disorders and was instructed to perform tongue rotation exercises. The patient's maximum tongue pressure, lip-seal strength, and subjective sleep quality improved post-intervention. Furthermore, apnea-hypopnea index and sleep architecture were improved after exercise compared with the baseline. These results suggest that tongue rotation exercises can improve not only oral function but also respiratory function during sleep and, thus, may be meaningful to introduce as an adjunctive therapy for OSA with impaired oral function or intolerance to conventional therapies.	Tongue Exercise OSA case study	2026	
47	Effects of oropharyngeal exercises / myofunctional therapy on orofacial function and corticomotor excitability in healthy individuals – implications for obstructive sleep apnea?	Mi D et al. Scientific report 2026 (under review)	TPMD	This cross-over study examined how oropharyngeal and myofunctional exercises affect tongue motor control in 22 healthy adults. Participants completed tongue training (TT), breathing training (BT), or no training (CT), with transcranial magnetic stimulation assessing motor-evoked potentials (MEPs). TT significantly increased tongue MEP amplitude and volume ($P < 0.001$), indicating enhanced cortical excitability, while BT and CT had no effect. No changes were observed in a control muscle or functional outcomes. These results suggest tongue-specific training induces rapid corticomotor plasticity without immediate performance gains, supporting its potential use in neurorehabilitation for sleep apnea and orofacial disorders.	OSA tongue pressure corticomotor plasticity	2026	