# Effectiveness of an adapted Interdisciplinary Orofacial Examination Protocol for Children and Adolescents for the Early Identification of Speech Disorders in Paediatric Orthodontic Patients

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## Abstract

**Aim** Orofacial Myofunctional Disorders (OMDs) affect oral functions and influence craniofacial development, contributing to skeletal and dental malocclusions. The collaboration between orthodontists and speech-language pathologists (SLPs) is crucial for early diagnosis and comprehensive treatment. This study aims to evaluate the diagnostic competence of orthodontic residents in identifying OMDs, and to determine whether the application of a standardised interdisciplinary orofacial assessment protocol enhances diagnostic accuracy and interprofessional consistency.
**Study design** Single-group pre-post study with external validation.
**Methods** Twenty-nine postgraduate orthodontic residents (PORs) at the University of Pavia were asked to conduct the first visit of one patient each to assign a Diagnostic Score (DS) from 1 to 10, where 1 indicated no need for intervention and 10 indicated an absolute necessity for orofacial myofunctional therapy (T0). Subsequently, an adapted version of the Interdisciplinary Orofacial Examination Protocol for Children and Adolescents (aIOEPCA) was used to improve the diagnostic ability of PORs. aIOEPCA comprised 15 clinical items, including assessment of sagittal, vertical, and transverse malocclusion patterns, lip competence, tongue mobility, breathing, swallowing, and speech articulation—each scored to quantify the severity of dysfunction. A second evaluation of the DS was conducted after the use of the protocol (T1), to assess improvements in PORs diagnostic ability. An expert SLP independently evaluated the same patients using the interdisciplinary protocol and DS were compared.
**Results** Statistically significant differences ($p < 0.05$) were observed between the PORs and the SLP evaluations across several functional parameters. Regarding DS, a significant difference was found between PORs T0 and SLP ($p < 0.05$), while after the use of the protocol the score improved, and PORs T1 vs SLP resulted not significant ($p > 0.05$). The use of the aIOEPCA improved diagnostic consistency, highlighting its potential as a standardised interdisciplinary diagnostic tool.
**Statistics** Statistical analyses included the Wilcoxon test for the variables of the aIOEPCA, except for the final score assessed with the Friedman test followed by Dunn's post hoc test. Significance threshold was set at $p < 0.05$.
**Conclusions** The findings highlight a deficiency in the ability of orthodontic residents to identify functional impairments requiring orofacial myofunctional therapy. Implementing interdisciplinary assessment tools could help to mitigate this deficit and foster more cohesive diagnostic pathways. Structured interprofessional education should be considered an imperative part of orthodontic education.

KEYWORDS Speech disorders, speech-language pathology, orofacial myofunctional therapy, interdisciplinary communication, orthodontics, early diagnosis.

## Introduction

OMDs are characterised by dysfunctions in the coordination and strength of the orofacial muscles, affecting essential functions such as swallowing, breathing, speech, and mastication [Mason, 2005; D'Onofrio, 2019]. These dysfunctions are particularly relevant in paediatric patients, where they may contribute to the development or exacerbation of dentoskeletal malocclusions and adversely impact long-term orthodontic outcomes [Garretto, 2001; Sfondrini et al., 2023].

The complexity of OMDs stems from their multifactorial aetiology [Koskimies et al., 2015; Marchesan et al., 2012; Saccomanno et al., 2012]. Factors such as airway obstruction, prolonged oral habits (e.g., thumb sucking, pacifier use), muscular imbalances, and neurological conditions can all contribute to myofunctional dysfunctions [Takahashi et al., 1995; Gelb et al., 2021]. If left untreated, these conditions can lead to malocclusions such as open bites, deep bites,

and crossbites, which, in turn, may require more complex orthodontic interventions [Sadoun et al., 2024; Inchingolo et al., 2024; Saccomanno et al., 2014]. Early identification and intervention are critical to preventing long-term complications, particularly in growing patients whose skeletal structures are still developing [Li et al., 2024; Saccomanno et al., 2012; Ma et al., 2024].

Despite their high prevalence, the detection of OMDs in routine orthodontic practice remains inconsistent, often due to insufficient interdisciplinary training and lack of standardised assessment tools [Akbeyaz et al., 2024]. The need for early and accurate identification of orofacial dysfunctions underscores the importance of structured screening protocols that facilitate interprofessional collaboration, particularly between orthodontists and speech-language pathologists (SLPs) [Boyd et al., 2021; Camacho et al., 2023; Picinato-Pirola 2023]. An effective diagnostic framework that integrates both specialties is necessary to ensure a comprehensive approach to patient care. A growing body of literature emphasises the importance of early identification and management of OMDs through integrated approaches involving orthodontists and SLPs [Rabelo et al 2015; Correa et al., 2020; Trulsson et al., 2020]. However, barriers such as inconsistent referral patterns, lack of standardised protocols, and deficits in interdisciplinary training persist. In response to this clinical need, Grandi et al. introduce the Interdisciplinary Orofacial Examination Protocol for Children and Adolescents (IOEPCA) [Grandi et al., 2012], a structured diagnostic tool aimed at facilitating comprehensive and collaborative evaluation of the stomatognathic system. The original protocol encompasses 13 core items, each designed to systematically assess morphological and functional aspects of orofacial development. In the present study, an adapted version of the IOEPCA protocol [Grandi et al., 2012] was employed (aIOEPCA).

While maintaining the foundational structure and core items of the original tool, minor modifications were implemented to align the instrument more closely with the clinical and educational context of a postgraduate orthodontic training program. These modifications included refinements in item scoring criteria and minor adjustments in wording and operational definitions to enhance clarity and usability for orthodontic residents. The incorporation of such a protocol into orthodontic practice holds significant clinical value. It serves not only to improve diagnostic sensitivity for OMDs—conditions that may otherwise go unnoticed—but also to support the timely referral of SLP, thereby fostering a genuinely interdisciplinary model of care [Zhang et al., 2022; Debucean et al., 2023]. Moreover, its structured format offers an effective pedagogical tool for educating orthodontic residents in the recognition of functional disturbances beyond traditional occlusal parameters. The primary objective of this study is to assess the extent to which the use of this adapted Interdisciplinary Protocol improves orthodontic residents' ability to diagnose OMDs and determine whether this tool can enhance diagnostic accuracy and interdisciplinary communication.

## Materials and Methods

### Study design, setting, participants

This was a single-group pre-post study with external validation approved by the Unit Internal Review Board (approval number: 2024-0320) and registered on clinicaltrials.gov (NCT06887660). This study involved 29 Postgraduate Orthodontic Residents (POR) from the University of Pavia. Participants evaluated paediatric patients at their first visit at the Unit of Orthodontics and Paediatric Dentistry, Section of Dentistry, Department of Clinical, Surgical, Diagnostic and Pediatric Sciences, University of Pavia, Pavia, Italy.

The inclusion criteria for the enrolment were:

- Patients aged between 6 and 18 years at their first orthodontic visit
- Patients with no previous orthopaedic/orthodontic treatment.
- Patients with parental or guardian consent for participation in the study.

The exclusion criteria were:

- Patients who had undergone previous orthodontic treatment.
- Patients with a history of speech therapy intervention.
- Patients with craniofacial malformations or syndromic conditions affecting oral and facial structures.

### Variables

After the sign of the informed consent by parents/legal guardians, patients underwent the first visit. Each POR visited only one patient for this protocol. A detailed anamnesis was conducted to collect information regarding medical history, oral habits, respiratory function, and speech development. Each patient involved in the study underwent an initial evaluation by one POR, which conducted an independent assessment of the patient without using the protocol. Based on the POR's clinical judgment, the necessity of speech therapy consultation was assigned on a scale from 1 to 10, where 1 indicated no need for intervention and 10 indicated an absolute necessity. This outcome was named Diagnostic Score (DS). Then, an adapted version of the Italian translation of Grandi's protocol [2012], the aIOEPCA, was used for the diagnosis of OMDs; it was expanded with additional questions aimed at assessing swallowing function and speech articulation in greater detail, to better capture the complexity of OMDs and to align the protocol with interdisciplinary diagnostic needs. The final version of the protocol consists of 15 items covering key functional and structural aspects. Each variable assessed within the protocol was assigned a score to allow for a quantitative comparison between the POR and the SLP. Variables such as breathing, lip posture, swallowing, and speech articulation were graded on a scale from 0 to 2 or 0 to 5, depending on the level of severity, with higher scores indicating more severe dysfunctions. The items are here presented in Figure 1.

Subsequently, after the administration of the protocol, the PORs re-rated the DS.

At last, an experienced SLP independently evaluated each patient using the same protocol and provided a rating on the necessity of orofacial myofunctional therapy.

### Statistical methods

Data were statistically analysed with R software (R version 3.1.3, R Development Core Team, R Foundation for Statistical Computing, Wien, Austria). Descriptive statistics were calculated, including mean, standard deviation, minimum, median, maximum. The Wilcoxon test was applied to assess inter-group differences. The final score was evaluated with Friedman test followed by Dunn's post hoc multiple comparison tests. The significance threshold for all the tests was set at $p < 0.05$.

1. **Facial profile: it assesses the sagittal contour of the facial profile.** Scores (from 0=best to 2=worst condition):
- 0: Normal profile
- 1: Mildly convex or concave profile
- 2: Severely convex or concave profile

2. **Breathing: it evaluates habitual breathing modality.** Scores (from 0=best to 2=worst condition):
- 0: Predominantly nasal breathing
- 1: Mixed oral-nasal breathing
- 2: Predominantly oral breathing

3. **Nasal airway patency: it assesses the structural integrity and patency of the nasal valves during forced inspiration.** Scores (from 0=best to 5=worst condition):
- 0: Bilateral nasal dilation
- 1: No collapse, no dilation
- 2: Unilateral partial collapse
- 3A: Bilateral partial collapse
- 3B: Total unilateral collapse
- 4: Total collapse in one naris and partial in the other
- 5: Bilateral total collapse

4. **Lip posture at rest: it evaluates passive closure of the lips.** Scores (from 0=best to 2=worst condition):
- 0: Lip seal achieved effortlessly
- 1: Lip seal achieved with visible effort
- 2: Incomplete lip seal

5. **Vertical malocclusion: it assesses the vertical relationship of the anterior dentition.** Scores (from 0=best to 2=worst condition):
- 0: Normal vertical overlap (physiological overbite)
- 1: Mild open/deep bite
- 2: Severe open/deep bite

6. **Sagittal malocclusion: it classifies the anteroposterior molar relationship.** Scores (from 0=best to 2=worst condition):
- 0: Class I molar relationship
- 1: Mild Class II or Class III
- 2: Severe Class II or Class III

7. **Transversal malocclusion: it assesses the presence of transverse dental discrepancies.** Scores (from 0=best to 2=worst condition):
- 0: Normal transverse relationship
- 1: Edge-to-edge (head-to-head) transverse contact
- 2: Complete posterior crossbite

8. **Overbite: it quantifies vertical overlap of incisors.** Scores (from 0=best to 2=worst condition):
- 0: Normal (2-2.5 mm)
- 1: Mildly increased or reduced
- 2: Severely increased or negative (anterior open bite)

9. **Overjet: it measures horizontal projection of the maxillary incisors over the mandibular incisors.** Scores (from 0=best to 2=worst condition):
- 0: Normal (2-2.5 mm)
- 1: Mildly increased or decreased
- 2: Severely increased (protrusion) or negative (anterior crossbite)

10. **Dental alignment: it evaluates spacing or crowding in the dental arches.** Scores (from 0=best to 2=worst condition):
- 0: Well-aligned dentition
- 1: Mild crowding or spacing
- 2: Severe crowding or spacing

11. **Tonsillar hypertrophy: it grades tonsil size using a visual inspection of oropharyngeal encroachment.** Scores (from 0=best to 5=worst condition):
- 0: Post-tonsillectomy
- 1: Not visible
- 2: <25% of oropharyngeal space
- 3: 25–50%
- 4: 50–75%
- 5: >75%

12. **Tongue mobility (Lingual Frenulum Assessment): it assesses the range of motion of the tongue, particularly its ability to contact the palate.** Scores (from 0=best to 5=worst condition):
- 0: Frenulectomy
- 1: Complete palatal tongue contact
- 2: Near-palatal tongue contact
- 3: Tongue equidistant between upper and lower incisors
- 4: Tongue contacts only mandibular incisors
- 5: Tongue cannot extend past lower incisors

13. **Perioral muscle effort during swallowing: it assesses visible muscular compensation during swallowing.** Scores (from 0=best to 2=worst condition):
- 0: No observable effort
- 1: Mild perioral strain
- 2: Marked perioral strain (e.g., chin dimpling)

14. **Lingual movement during swallowing: it evaluates tongue posture and movement while swallowing a small amount of water.** Scores (from 0=best to 2=worst condition):
- 0: Physiological swallowing pattern
- 1: Anterior tongue thrust
- 2: Tongue interposition between dental arches

15. **Speech articulation: it assesses articulatory precision through repetition of target phonemes and words.** Scores (from 0=best to 2=worst condition):
- 0: Normal articulation
- 1: Mild distortions or substitutions
- 2: Omission of one or more target sounds

FIG. 1 Selection Criteria.

## Results

The study started in March and ended in June 2025. All the 29 PORs were able to perform one assessment. Table 1 shows the comparison of the DS assigned by PR at T0 and after the use of the adapted Interdisciplinary Orofacial Examination Protocol at T1, and the DS assigned by the SLP as a reference standard. Mean PR T0 was significantly lower in respect to ST score ($p < 0.05$). After the use of the protocol, PR T1 increased but with no significant difference ($p > 0.05$). However, the statistical comparison between PG T1 and ST score did not show a significant difference ($p > 0.05$) (Table 1).

| | Mean | SD | Min | Median | Max | Significance* |
|---|---|---|---|---|---|---|
| POR T0 | 5.76 | 3.11 | 1.00 | 7.00 | 10.00 | A |
| POR T1 | 6.59 | 2.54 | 1.00 | 7.00 | 10.00 | A, B |
| SLP | 7.34 | 2.06 | 1.00 | 8.00 | 10.00 | B |

*: means with the same letter/s do not show significant differences ($p > 0.05$).

TABLE 1 Values of the Diagnostic Score (DS) before (T0) and after (T1) the administration of the adapted Interdisciplinary Orofacial Examination Protocol for Children and Adolescents by Postgraduate Orthodontic Residents (POR) and Speech-Language Pathologist (SLP)

Table 2 presents a comparative analysis of the comparison between the scores assigned by Postgraduate Residents and the SLP while using the Adapted Interdisciplinary Orofacial Examination Protocol for Children and Adolescents. It revealed that SLP scored significantly higher than orthodontic postgraduates in assessing breathing, nasal airway patency, lip posture at rest, and tongue mobility. Conversely, orthodontic postgraduates assigned higher scores for sagittal malocclusion and overjet. No significant differences ($p > 0.05$) were observed in parameters such as vertical malocclusion, overbite, dental alignment, and speech articulation.

Table 3 shows the linear regression models conducted for

| | Group | Mean | SD | Min | Mdn | Max | P value |
|---|---|---|---|---|---|---|---|
| Facial profile | POR T1 | 0.83 | 0.47 | 0.00 | 1.00 | 2.00 | >0.999 |
| | SLP | 0.86 | 0.52 | 0.00 | 1.00 | 2.00 | |
| Breathing | POR T1 | 0.41 | 0.57 | 0.00 | 0.00 | 2.00 | 0.006* |
| | SLP | 0.86 | 0.64 | 0.00 | 1.00 | 2.00 | |
| Nasal airway patency | POR T1 | 0.66 | 0.81 | 0.00 | 1.00 | 3.00 | 0.007* |
| | SLP | 0.86 | 1.04 | 0.00 | 1.00 | 3.00 | |
| Lip posture at rest | POR T1 | 0.26 | 0.53 | 0.00 | 0.00 | 2.00 | 0.001* |
| | SLP | 0.86 | 0.90 | 0.00 | 1.00 | 2.00 | |
| Vertical malocclusion | POR T1 | 0.69 | 0.66 | 0.00 | 1.00 | 2.00 | 0.589 |
| | SLP | 0.86 | 0.68 | 0.00 | 1.00 | 2.00 | |
| Sagittal malocclusion | POR T1 | 1.00 | 0.89 | 0.00 | 1.00 | 3.00 | 0.039* |
| | SLP | 0.86 | 0.64 | 0.00 | 1.00 | 2.00 | |
| Transversal malocclusion | POR T1 | 0.72 | 0.80 | 0.00 | 1.00 | 2.00 | 0.180 |
| | SLP | 0.86 | 0.67 | 0.00 | 1.00 | 2.00 | |
| Overbite | POR T1 | 1.10 | 0.62 | 0.00 | 1.00 | 2.00 | 0.234 |
| | SLP | 0.86 | 0.59 | 0.00 | 1.00 | 2.00 | |
| Overjet | POR T1 | 1.24 | 0.79 | 0.00 | 1.00 | 2.00 | 0.039* |
| | SLP | 0.86 | 0.82 | 0.00 | 1.00 | 2.00 | |
| Dental alignment | POR T1 | 1.07 | 0.65 | 0.00 | 1.00 | 2.00 | >0.999 |
| | SLP | 0.86 | 0.50 | 0.00 | 1.00 | 2.00 | |
| Tonsillar hypertrophy | POR T1 | 1.69 | 0.76 | 1.00 | 2.00 | 3.00 | 0.144 |
| | SLP | 0.86 | 0.63 | 1.00 | 1.00 | 3.00 | |
| Tongue mobility | POR T1 | 1.21 | 0.56 | 0.00 | 1.00 | 3.00 | <0.001* |
| | SLP | 0.86 | 0.91 | 1.00 | 2.00 | 4.00 | |
| Perioral muscle effort during swallowing | POR T1 | 0.90 | 0.67 | 0.00 | 1.00 | 2.00 | 0.681 |
| | SLP | 0.86 | 0.60 | 0.00 | 1.00 | 2.00 | |
| Lingual movement during swallowing | POR T1 | 0.79 | 0.73 | 0.00 | 1.00 | 2.00 | 0.143 |
| | SLP | 0.86 | 0.63 | 0.00 | 1.00 | 2.00 | |
| Speech articulation | POR T1 | 0.62 | 0.68 | 0.00 | 1.00 | 2.00 | >0.999 |
| | SLP | 0.86 | 0.73 | 0.00 | 0.00 | 2.00 | |

TABLE 2 Values of the adapted Interdisciplinary Orofacial Examination Protocol for Children and Adolescents assigned by Postgraduate Orthodontic Residents (POR) and Speech-Language Pathologist (SLP)

this study. It revealed a set of statistically significant associations between selected functional and structural variables. Notably, "lip posture" demonstrated a strong predictive relationship with "breathing" ($R^2 = 0.35$, $p < 0.0001$), suggesting that alterations in lip competence at rest are closely linked to dysfunctional breathing, particularly oral or mixed patterns. Additionally, "lip posture" was also significantly associated with "nostril patency" ($R^2 = 0.13$, $p = 0.005$), indicating that patients with incompetent lips may be more prone to presenting with reduced nasal airflow. Other significant, but weaker, associations were observed between:

- "Transverse malocclusion" and "nostril patency" ($R^2 = 0.08$, $p = 0.037$): it suggests that patients presenting with posterior crossbites or narrow maxillary arches might also show limitations in nasal airflow.
- "Tonsillar hypertrophy" and "nostril patency" ($R^2 = 0.08$, $p = 0.032$): it suggests a systemic airway compromise: enlarged tonsils may contribute to obstructed nasal breathing.
- "Speech articulation" and "nostril patency" ($R^2 = 0.14$, $p = 0.004$): it suggests that children with reduced nasal airflow may also experience speech articulation difficulties.
- "Swallowing with muscular effort" and "speech articulation" with "Diagnostic Score" ($R^2 = 0.14$, $p = 0.004$): represent a functional red flag within the protocol and a predictor of more complex myofunctional issues.

## Discussion

Early and timely intervention in orthodontics is crucial for the management of malocclusions in growing patients. Early intervention during the deciduous or mixed dentition stage reduces the severity of malocclusion and avoids the need for more invasive orthodontic treatments in the future. This approach enables skeletal and dentoalveolar defects to be corrected using orthopaedic/orthodontic appliances [Koaban et al., 2024]. In this context, OMDs and their orthodontic implications range from paediatric to adult contexts; however, it is quite rare to find adequate literature on this subject given the difficulty of investigating these kinds of problems [Washington et al., 2021]. More so, it is even more difficult to find correlations between orthodontics and myofunctional disorders. An attempt was done by a previous study that evaluated the presence of speech sound disorders in patients with functional disorders of the masticatory system, correlating persistent tongue thrust with errors in bilabial alveolar, postalveolar and pre-palatal sounds, and finding that oral breathing was five times more frequently in children with speech sound disorders than in children without speech sound disorders [Deshkar et al., 2024; Grudziąż-Sękowska et al.,

| Independent variables | Dependent variables | | | |
|---|---|---|---|---|
| | Breathing | Nostrils | Swallowing | Diagnostic Score |
| Lip | 0.35 (<0.0001*) | 0.13 (0.005*) | ns | ns |
| Transverse malocclusion | ns | 0.08 (0.037*) | ns | ns |
| Tonsils | ns | 0.08 (0.032*) | ns | ns |
| Speech | ns | 0.14 (0.004*) | ns | 0.12 (0.008*) |
| Swallowing with effort | ns | ns | ns | 0.14 (0.004*) |
| *: < 0.05; ns, not significant. | | | | |

TABLE 3 $R^2$ and p value (in brackets) for the linear regressions performed for the study.

2018]. Another systematic review [Thijs et al., 2022] found that articulation disorders and non-physiological swallowing could coexist with anterior open bite. However, available evidence comprises low-quality studies with high risk of bias and observational study designs [Grudziąż-Sękowska et al., 2018; Thijs et al., 2022]. Regarding treatment, evidence is limited as well for the same reasons, but it is noteworthy to further investigate in this way as Orofacial Myofunctional Therapy seems to be a valid aid before, during and after orthodontic treatment [Homem et al., 2014]. The importance of early diagnosis and timely treatment is essential not only in preventing an abnormal growth of the jaws, but also in case of dysgnathic growth, to maintain the outcomes obtained by maxillofacial surgery and avoid relapse [Gallerano et al., 2012].

Therefore, given the multifactorial nature of OMDs and their overlapping morphological and functional manifestations, a standardised and validated diagnostic framework is essential not only for accurate detection but also for fostering interprofessional synergy, in particular in orthodontics [Shah et al., 2021; Stefani et al., 2025].

The results of the present study demonstrate statistically significant differences between the evaluations of PORs and SLP in key functional domains, particularly breathing, nasal valve function, lip competence, and tongue mobility. These findings reaffirm the hypothesis that PORs, while proficient in skeletal and dental diagnosis (e.g., sagittal relationships, overjet), tend to underrecognise or undervalue OMDs, especially those not strictly within the orthodontic field. Notably, the application of the aIOEPCA demonstrated a tendency to reduce these discrepancies. This finding highlights the protocol's potential as a didactic and clinical support tool to enhance interdisciplinary diagnostic sensitivity.

Grandi's original protocol [2012] was conceived to bridge the gap between speech-language and orthodontic disciplines by offering a shared lexicon and structured diagnostic framework for evaluating the stomatognathic system. In alignment with Grandi's objectives, our results support the protocol's relevance in fostering improved clinical awareness and interprofessional dialogue, particularly among residents.

Complementarily, de Felício et al. [2010] introduced an expanded protocol of orofacial myofunctional evaluation, which incorporates both anatomical and functional domains with scoring metrics. Their validation study emphasised the need for comprehensive assessment instruments in paediatric populations and demonstrated the high intra- and inter-examiner reliability of scored tools. Our findings echo their conclusions by showing that a protocol-driven assessment – even when applied by non-expert raters – can enhance diagnostic coherence and identify dysfunctions otherwise overlooked in routine practice.

The findings of the present study are further supported by Scarponi et al. [2018], who validated the Italian version of the Orofacial Myofunctional Evaluation with Scores (I-OMES). Their study emphasised the importance of validated, standardised tools in reliably assessing orofacial function and highlighted the clinical challenge posed by the subjective interpretation of signs without structured criteria. Similar to the present study, they confirmed that consistency in evaluation improves significantly when a protocolised approach is implemented, reinforcing the notion that objective, scored protocols yield greater inter-rater reliability and diagnostic precision.

Furthermore, the relevance of interdisciplinary screening procedures is highlighted by the recent pilot study by Hennig et al. [2023], which presented a newly developed orthodontic-logopaedic screening method for myofunctional disorders. Their findings aimed at identifying a gap in orthodontists' ability to assess functional impairments, especially in the absence of formal training or structured instruments. Both studies advocate for the integration of interdisciplinary screening into standard orthodontic workflows and suggest that collaborative protocols can act as clinical equalisers, aligning the diagnostic output of different professional groups.

The issue of limited awareness and training in myofunctional disorders among dental professionals is further elaborated by Van der Straeten et al. [2024]. In a national survey of Belgian orthodontists and general dentists, the authors reported that nearly half of the respondents perceived their knowledge of OMDs as insufficient or absent. Only a minority (13%) regularly referred patients to speech-language pathologists. This perceived lack of expertise mirrors the performance of the trainees in our cohort, who, prior to protocol exposure, demonstrated significant underestimation of dysfunction severity in key domains. Van der Straeten et al. [2024] called for a systematic integration of interprofessional education (IPE) into both undergraduate and postgraduate curricula—a recommendation that our findings strongly support.

Taken together, these studies underscore a consistent theme across the literature: that interprofessional collaboration in the management of OMDs remains underutilised, and that the implementation of validated, standardised assessment tools plays a critical role in bridging the diagnostic divide between disciplines.

This highlights the importance of repeated training, longitudinal application, and structured interdisciplinary case discussions to ensure that theoretical knowledge is fully integrated into clinical reasoning. Future research should explore the implementation of targeted training modules aimed at enhancing orthodontists' proficiency in evaluating orofacial functions.

While several protocols—such as OMES, OMES-E and IOEPCA [Grandi et al., 2012; de Felício et al., 2010; Scarponi et al., 2018]—have demonstrated reliability and validity within their respective scopes, their simultaneous coexistence without clear clinical consensus can lead to variability in diagnostic thresholds, referral criteria, and therapeutic timelines. This fragmentation may hinder interdisciplinary communication and compromise the timeliness of functional interventions, particularly in paediatric populations where developmental plasticity offers a critical therapeutic window.

Therefore, future research must prioritise the development and cross-disciplinary validation of a unified orofacial assessment protocol. Such a tool should balance clinical comprehensiveness with practical applicability, ensuring it is detailed enough to detect nuanced dysfunctions while remaining accessible to practitioners from different backgrounds. Moreover, its integration into educational programs for orthodontists, speech-language pathologists, paediatricians, and otolaryngologists would promote a shared diagnostic culture rooted in objective, reproducible criteria. A universally endorsed protocol would not only enable more consistent patient identification and early interception of orofacial disorders but also support longitudinal data collection, multicentre research, and the establishment of evidence-based referral pathways. In turn, this would contribute to a more cohesive model of care, optimising treatment outcomes, minimising the risk of relapse in

orthodontic therapy, and enhancing the quality of life for paediatric patients with orofacial dysfunctions.

## Conclusion

The aIOEPCA resulted effective in reducing diagnostic differences between PORs and SLP. Integrating such protocols into orthodontic training could improve early detection and management of OMDs, leading to better long-term orthodontic stability. Future studies should explore its implementation in broader populations to establish national guidelines for interdisciplinary training.

### Abbreviations

**aIOEPCA:** adapted version of the Interdisciplinary Orofacial Examination Protocol for Children and Adolescents
**DS:** Diagnostic Score
**OMDs:** Orofacial Myofunctional Disorders
**PORs:** Postgraduate Orthodontic Residents
**SLP:** speech-language pathologist.

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