Mouth breathing in preschool children

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PhD candidate @University of Liège, BE
**My experience**

**Education**

- **Erasmus** @University of Geneva, Switzerland
- **Master degree** @University of Liège, Belgium
- **PhD training program** with Guy’s & St Thomas’ NHS Foundation Trust Sleep Center, England

**Training**

- 30+ courses and conferences on MFT’s topic

**Work**

- **SLP specialized in OMT** @orthodontic practices
- specialized in paediatric dentofacial orthopaedics and sleep disordered breathing
- **PhD candidate** @University of Liège, Belgium

**Scientific**

- **Reviewer** for MFT in international journals
- **International lecturer**
- **International trainer** for OMT
- **Founding member** @BAOMT
- **Vice-president** @SFOP
Declaration

- The author of this presentation benefits from a grant from the National Fund for Scientific Research (F.N.R.S.) to carry out his doctoral thesis
- No financial compensation is received for this presentation
- No product or material is sold as part of this presentation
- The author is a founding member and co-president of the Belgian Association of Myofunctional Orofacial Therapy
- The author is vice-president of the French Society of Pediatric Orthodontics
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Functional role of nasal breathing

- Defense
- Air conditioning
- Olfaction
- NO production
- Balanced orofacial myofunctional development

Elad, Wolf, & Keck, 2008; Lundberg & Weitzberg, 1999; Limme, & Rozencweig, 2013
<table>
<thead>
<tr>
<th>Authors</th>
<th>Age range</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trawitzki and coll., 2005</td>
<td>3 to 6 yo</td>
<td>64%</td>
</tr>
<tr>
<td>Abreu, Rocha, &amp; Guerra, 2008b</td>
<td>2 to 16 yo (370 children)</td>
<td>55%</td>
</tr>
<tr>
<td>Lopes, Moura &amp; Lima, 2014</td>
<td>2,5 to 4 yo (252 children)</td>
<td>43.1%</td>
</tr>
<tr>
<td>Soares and coll., 2018</td>
<td>2 to 5 yo</td>
<td>1,39 %</td>
</tr>
<tr>
<td>Trawitzki and coll., 2005</td>
<td>3 to 6 yo</td>
<td>64%</td>
</tr>
<tr>
<td>Paolantonio and coll., 2019</td>
<td>3 to 6 yo</td>
<td>23%</td>
</tr>
</tbody>
</table>
Etiologies of MB in preschoolers

- allergic rhinitis +++
- functional MB
- hypertrophic adenoids
- hypertrophic tonsils

Abreu and coll., 2008; Junqueira and coll., 2010
Early etiologies of MB

« Breastfeeding for 24 months or more, as well as exclusive breastfeeding in the first 6 months, was associated with the development of nasal breathing»

(Limeira et coll., 2013)
Unexplored early etiologies of MB

- **REFLUX**
  Possible relationship with chronic sinusitis, chronic rhinitis, otitis media, enlarged tonsils and SDB
  ➔ All factors linked to MB!

- **POLLUTION**
  Relationship with upper airway infections and allergic symptoms

- **FOOD**
  Soft and processed food impedes orofacial growth

Consequences of MB in preschoolers

Polmonary function
(Veron an coll., 2016)

Upper airway infections
(Kukwa and coll., 2018)

Otitis media
(Van Bon, 1984)

Asthma
(Stensson and coll., 2010)

Poor oral health
(Ballikaya and coll. 2018)

Caries and gengivitis inflammation
(Nascimento Filho and coll., 2004)

Halitosis
(Motta and coll., 2011)
Orofacial Myofunctional Disorders

Future changes in upper airway

Low position of the tongue

Atypical swallowing

Troubles chewing

Small naso-pharyngeal airspace

Retraded mandible

Inclination of mandibular plane

(De Lemos, 2009; Ikenaga, 2013; Milanesi and coll., 2018)

(Juliano et al., 2009; Chung Leng Munoz & Beltri Orta, 2014; Zhao and coll., 2020)
Consequences of MB in preschoolers

Souki and coll., 2009; Paolantonio and coll., 2019; Dimberg and coll., 2013
Consequences of MB in preschoolers

Could mouth breathing lead to obstructive sleep apnea syndromes. A preliminary study
Raskin S, Limme M, Poirrier R
L’Orthodontie Francaise, 01 Jan 2000, 71(1):27-35

MOUTH BREATHING CHILDREN HAVE CEPHALOMETRIC PATTERNS SIMILAR TO THOSE OF ADULT PATIENTS WITH OBSTRUCTIVE SLEEP APNEA SYNDROME
Maria Ligia Juliano^1, Marco Antonio Cardoso Machado^2, Luciane Bizari Coin de Carvalho^3, Lucila Bizari Fernandes do Prado^4, Gilmar Fernandes do Prado^5

Izu, and coll., 2010

Lee, Guilleminault, Chiu, & Sullivan, 2015; Kukwa and coll., 2018
This shows the importance of studying MB in preschool children to intercept current alterations and prevent future aggravations.

- Longitudinal study
- Aim: to determine if the myofunctional development is linked or not to the speech development
- Parent questionnaires + clinical observations + clinical assessment
**POPULATION**

- **n = 64 children (47% girls; 53% boys)**
- **Recruitment = kindergartens schools**
- **SES (mode) = good**
- **Age = 3 years old (33 to 39 months)**

**Exclusion =** no cranio-facial anomalies, no asthma, no pulmonary, neurological, cardiac or genetic pathology; no orthodontic treatment; no SLP treatment

**Inclusion =** French speaking
How to dissociate MB from NB?

- SLP examination
  - Visual observations
  - Assessment

- ENT examination for obstructions

- Parent questionnaires
### Table 3 - Main clinical manifestations in mouth-breathing children's patient histories

<table>
<thead>
<tr>
<th>Variables</th>
<th>p*</th>
<th>OR</th>
<th>Confidence interval of OR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snores</td>
<td>0.001</td>
<td>45.3</td>
<td>23.4-87.8</td>
</tr>
<tr>
<td>Sleeps with mouth open</td>
<td>0.001</td>
<td>40.2</td>
<td>22.1-73.7</td>
</tr>
<tr>
<td>Drools on pillow</td>
<td>0.001</td>
<td>32.7</td>
<td>15.1-69.9</td>
</tr>
<tr>
<td>Blocked nose daily</td>
<td>0.001</td>
<td>78.4</td>
<td>10.7-72.4</td>
</tr>
<tr>
<td>Itchy nose</td>
<td>0.001</td>
<td>8.9</td>
<td>5.5-14.4</td>
</tr>
</tbody>
</table>
Does your child keep his/her mouth open throughout the day?
- Never
- Rarely
- Often
- Most of the time
Does the child keep his/her mouth open during the video?

- Never
- Rarely
- Often
- Most of the time
Does the child keep his/her mouth open during the video?
- Never
- Rarely
- Often
- Most of the time

Descriptive statistics with 2 criteria of Abreu (2008)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Fréquence</th>
<th>Pourcentage</th>
<th>Pourcentage valide</th>
<th>Pourcentage cumulé</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validé</td>
<td>RN</td>
<td>37</td>
<td>57,8</td>
<td>57,8</td>
</tr>
<tr>
<td>Validé</td>
<td>RB</td>
<td>27</td>
<td>42,2</td>
<td>100,0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>64</td>
<td>100,0</td>
<td>100,0</td>
</tr>
</tbody>
</table>
MOUTH BREATHING IN OUR SAMPLE: SECOND METHOD

ITEM RESPONSE THEORY

“For the diagnosis of mouth breathing, the Item Response Theory (IRT) was used, which from the set of responses allowed the estimation of the parameters of items and individuals on a measurement scale. Item Response Theory takes into account the item in particular, without highlighting the total scores; therefore, the conclusions do not depend only on the test or questionnaire, but of each item that composes it. This gives us a better analysis of the questions “

Soares and coll., 2018, p.3
MOUTH BREATHING IN OUR SAMPLE: FIRST METHOD

Statistical treatment

LATENT CLASS ANALYSES

LCA is a statistical model in which each individuals can be classified into exclusive categories (latent classes), based on their pattern of answers. It allows to create groups of individuals based on their characteristics even when there is no gold standard diagnosis.

Test of model fit (Chi-Square test p=0.974)
MOUTH BREATHING IN OUR SAMPLE: FIRST METHOD

Statistical treatment

RESULT OF LATENT CLASS ANALYSES

<table>
<thead>
<tr>
<th>Latent class 1 (n)</th>
<th>Latent class 2 (n)</th>
<th>Latent class 3 (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>6</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.874</td>
<td>0.00</td>
<td>0.126</td>
</tr>
<tr>
<td>2</td>
<td>0.000</td>
<td>0.00</td>
<td>0.000</td>
</tr>
<tr>
<td>3</td>
<td>0.000</td>
<td>0.00</td>
<td>1.000</td>
</tr>
</tbody>
</table>

“sleep with mouth open”
“sleep with mouth closed”
“Other symptoms”

Entropy (score = 0.89)
### Descriptive statistics with latent class

<table>
<thead>
<tr>
<th>RB_IRT_LATENT_3groupes</th>
<th>Fréquence</th>
<th>Pourcentage</th>
<th>Pourcentage valide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valide</td>
<td>RN</td>
<td>30</td>
<td>46,9</td>
</tr>
<tr>
<td></td>
<td>RB possible</td>
<td>6</td>
<td>9,4</td>
</tr>
<tr>
<td></td>
<td>RB</td>
<td>28</td>
<td>43,8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>64</td>
<td>100,0</td>
</tr>
</tbody>
</table>
→ NO correlation between Abreu questionnaire & “does your child has his/her mouth open during the day” (p<0,05)
According to parents
Does your child keep his/her mouth open throughout the day?

According to experts
Does the child keep his/her mouth open during the video?

→ No agreement between experts and parents
(Cohen’s Kappa of SLP vs parent 0.118; p>0.05)
Are experts overestimating?

- Observation time was too short
- Open lips posture might not be representative enough of MB in preschoolers
- Does the quantity of time count? Or severity of MB?

Are parents underestimating?

- 54% of children in our sample are still bottle fed
- 65% of children in our sample are still using a pacifier
May clinical test help to diagnose MB in preschoolers?

→ 48.4% are unable to maintain water more than a few seconds (spontaneous swallowing) during retention test.
May clinical test help to diagnose MB in preschoolers?

→ 12.5% unable to test the tape test
→ Within the sample that did the test:

<table>
<thead>
<tr>
<th>Tableau croisé RB_ABREU_2CRITERES * T1_tape_labial</th>
<th>T1_tape_labial</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>réussite</td>
<td>échec</td>
</tr>
<tr>
<td>RB_ABREU_2CRITERES</td>
<td>Effectif</td>
<td></td>
</tr>
<tr>
<td>RN</td>
<td>25</td>
<td>3</td>
</tr>
<tr>
<td>% dans T1_tape_labial</td>
<td>54,3%</td>
<td>50,0%</td>
</tr>
<tr>
<td>RB</td>
<td>Effectif</td>
<td></td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>3</td>
</tr>
<tr>
<td>% dans T1_tape_labial</td>
<td>45,7%</td>
<td>50,0%</td>
</tr>
<tr>
<td>Total</td>
<td>Effectif</td>
<td></td>
</tr>
<tr>
<td></td>
<td>46</td>
<td>6</td>
</tr>
<tr>
<td>% dans T1_tape_labial</td>
<td>100,0%</td>
<td>100,0%</td>
</tr>
</tbody>
</table>

Zaghi and coll., 2020
May clinical test help to diagnose MB in preschoolers?

- Easy to perform
- halo of the steam in cm² (Melo and coll., 2013)
1) There is a need for validated, sensitive and specific diagnosis tool in preschoolers

2) Good news, this is going to be a longitudinal study ✔

3) Awake and Sleep MB should be dissociated

4) Parents might underestimate awake MB (while experts could overestimate). Based on expert’s opinion, the prevalence of awake MB could potentially be higher than sleep MB

5) Abreu questionnaire (2008) seems currently the more reliable assessment for sleep MB
Orophacial Myofunctional Therapy
With a specialised SLP

- PREVENTION
- INFORM AND GUIDE PARENTS
Orofacial Myofunctional Therapy
With a specialised SLP

From birth...

✓ Promote breastfeeding → !! Tongue-tie (Ferrés-Amat and coll., 2017)
✓ Follow BEFORE and AFTER releasing of tongue tie (Zaghi et coll., 2019)
✓ Stop pacifier and CHEW
✓ Therapy for pediatric feeding and swallowing disorders (Gosa et coll., 2017)
From preschool...

- **Somatosensoriality** (Limme & Nicolai, 1991)
- Nasal breathing (sleep and awake)
- Proper chewing with masticatory muscles
- Position of the tongue through active and passive proprioception

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**The impact of speech therapy on asthma and allergic rhinitis control in mouth breathing children and adolescents**

O impacto do tratamento fonoaudiológico no controle da asma e da rinite alérgica em crianças e adolescentes respiradores orais

Silvia M. A. Campanha¹, Maria J. F. Fontes¹, Paulo A. M. Camargos³, Lincoln M. S. Freire (in memoriam)¹

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**Systematic review of the effectiveness of breathing retraining in asthma management**


Burgess an coll.
MERCI POUR VOTRE ATTENTION
morganewarnier@hotmail.com


