



MARINA SEVERI LEME

MALOCCLUSION, OROFACIAL DYSFUNCTION, DELETERIOUS
ORAL HABITS AND ANXIETY SYMPTOMS ASSESSMENT IN
CHILDREN AND ADOLESCENTS

AVALIAÇÃO DE MALOCLUSÃO, DISFUNÇÃO OROFACIAL,
HÁBITOS ORAIS DELETÉRIOS E SINTOMAS DE ANSIEDADE
EM CRIANÇAS E ADOLESCENTES

Piracicaba
2014



Universidade Estadual de Campinas
Faculdade de Odontologia de Piracicaba

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ORAIS DELETÉRIOS E SINTOMAS DE ANSIEDADE EM CRIANÇAS E
ADOLESCENTES

Thesis presented to the Piracicaba School of Dentistry of the
University of Campinas in partial fulfillment of the requirements
for the degree of Doctor in Dentistry, in Pediatric Dentistry area.

Tese apresentada à Faculdade de Odontologia de Piracicaba da
Universidade Estadual de Campinas como parte dos requisitos
exigidos para a obtenção do Título de Doutora em Odontologia, na
Área de Odontopediatria.

Orientadora: Prof^ª Dr^ª Maria Beatriz Duarte Gavião

Este exemplar corresponde à versão final da
tese defendida pela aluna Marina Severi
Leme e orientada pela Prof^ª Dr^ª Maria
Beatriz Duarte Gavião.

Assinatura do orientador

Piracicaba
2014

Ficha catalográfica
Universidade Estadual de Campinas
Biblioteca da Faculdade de Odontologia de Piracicaba
Marilene Girello - CRB 8/6159

L542m Leme, Marina Severi, 1986-
Malocclusion, orofacial dysfunction, deleterious oral habits and anxiety
symptoms assessment in children and adolescents / Marina Severi Leme. –
Piracicaba, SP : [s.n.], 2014.

Orientador: Maria Beatriz Duarte Gavião.
Tese (doutorado) – Universidade Estadual de Campinas, Faculdade de
Odontologia de Piracicaba.

1. Avaliação da deficiência. 2. Má oclusão. 3. Hábitos. 4. Ansiedade. I.
Gavião, Maria Beatriz Duarte, 1955-. II. Universidade Estadual de Campinas.
Faculdade de Odontologia de Piracicaba. III. Título.

Informações para Biblioteca Digital

Título em outro idioma: Avaliação de maloclusão, disfunção orofacial, hábitos orais deletérios e sintomas de ansiedade em crianças e adolescentes

Palavras-chave em inglês:

Disability evaluation

Malocclusion

Habits

Anxiety

Área de concentração: Odontopediatria

Titulação: Doutora em Odontologia

Banca examinadora:

Maria Beatriz Duarte Gavião [Orientador]

Marcelo José Strazzeri Bönecker

Thais Marchini de Oliveira Valarelli

Antonio Bento Alves de Moraes

Maria Beatriz Borges de Araujo Magnani

Data de defesa: 25-08-2014

Programa de Pós-Graduação: Odontologia



UNIVERSIDADE ESTADUAL DE CAMPINAS
Faculdade de Odontologia de Piracicaba



A Comissão Julgadora dos trabalhos de Defesa de Tese de Doutorado, em sessão pública realizada em 25 de Agosto de 2014, considerou a candidata MARINA SEVERI LEME aprovada.

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ABSTRACT

The objectives of this thesis were determine the prevalence of orofacial dysfunction and malocclusion, establish the interrelation between orofacial dysfunction and malocclusion and determine the relationship between DOH and symptoms of anxiety. This thesis was divided in two chapters. **Chapter 1:** The development of malocclusion is the result of interactions of genetically and environmental factors. The orofacial function is considered an environmental factor. In this way, the present study aimed to determine the prevalence of orofacial dysfunction and malocclusions and to establish the interrelation between orofacial dysfunction and malocclusion in children and adolescents aged 4 to 14 year-old. Sample was constituted by 1561 subjects divided in four groups: Primary dentition (PRD), Intermediate mixed dentition (IMD), Late mixed dentition (LMD) and Permanent dentition (PD). The orofacial dysfunction was assessed using the Nordic orofacial test-screening (NOT-S) and malocclusion was assessed using the criteria of Grabowski et al., 2007, by this the sample was subdivided in malocclusion and no malocclusion groups. Statistical analysis constituted of descriptive analysis, chi-squared partition and independence tests, and Mann-Whitney and Kruskal-Wallis tests. Rates from malocclusion prevalence was 64.9% in PRD, 83.2% in IMD, 80.4% in LMD and 90.7% in PD, being increased overjet the most common malocclusion found. The frequency for orofacial dysfunction observed was 86.6% in PRD, 88.1% in IMD, 91.3% in LMD and 89.6% in PD, being the presence of deleterious oral habits the most frequent one. Malocclusion groups of bilateral class II (in PRD), frontal open bite (in PRD and PD), unilateral class III and unilateral and bilateral posterior crossbite (in PD) presented significant more orofacial dysfunction compared to no malocclusion group. As conclusion, the prevalence of malocclusion and orofacial dysfunction in assessed sample were high and it was detected a positive interrelation between higher impacts on orofacial dysfunction and the presence of malocclusion. **Chapter 2:** Deleterious oral habits (DOH) are orofacial dysfunction whit anxiety as a possible etiological factor. In this way, this chapter objective to evaluate the relationship between DOH and symptoms of anxiety in children and adolescents aged from 7 to 14 year-old. Subjects (n=1174) were divided in 3 groups:

Intermediate mixed dentition (IMD), Late mixed dentition (LMD) and Permanent dentition (PD). The assessment of DOH was done using the domain III (Habits) of the NOT-S and anxious symptoms were assessed using the Multidimensional Anxiety Scale for Children (MASC). Data were analysed descriptively and with Chi-squared, Mann-Whitney and Kruskal-Wallis tests. The prevalence of DOH was 69.5 % in IMD, 78.9% in LMD and 77.1% in PD. The most frequent one in the assessed groups was nail biting. MASC scores were higher in females in LMD and PD. Habit groups presented more symptoms of anxiety when compared to Habit free group in IMD, LMD and PD. As conclusion children and adolescents with DOH presented significant more symptoms of anxiety.

Key-words: Disability evaluation. Orofacial dysfunction. Malocclusion. Habits. Anxiety.

RESUMO

Os objetivos desta tese foram determinar a prevalência de disfunção orofacial e maloclusão, estabelecer a interrelação entre disfunção orofacial e maloclusão e determinar a relação entre hábitos orais deletérios e sintomas de ansiedade. Essa tese foi dividida em dois capítulos. **Capítulo 1:** O desenvolvimento da maloclusão é o resultado de interações entre fatores genéticos e ambientais, e a função orofacial é considerada um fator ambiental. Dessa forma, o presente estudo objetivou determinar a prevalência de disfunção orofacial e maloclusão, e estabelecer a interrelação entre disfunção orofacial e maloclusão em crianças e adolescentes de 4 a 14 anos de idade. A amostra consistiu de 1561 sujeitos divididos em quatro grupos: Dentição decídua (DD), Dentição mista 1º período transitório (DM1), Dentição mista 2º período transitório (DM2) e Dentição permanente (DP). A disfunção orofacial foi avaliada usando o Nordic Orofacial Test – Screening (NOT-S) e a maloclusão foi avaliada utilizando critérios sugeridos por Grabowski et al. 2007, e, a partir disso a amostra foi subdividida em grupos sem maloclusão e com os tipos de maloclusão. A análise estatística consistiu de análise descritiva dos dados, e aplicação dos testes Qui-quadrado, Mann-Whitney e Kruskal-Wallis. A prevalência da maloclusão encontrada foi de 64.9% na DD, 83.2% na DM1, 80.4% na DM2 e 90.7% na DP, sendo a sobressaliência aumentada a maloclusão mais frequente. A frequência de disfunção orofacial encontrada foi de 86.6% na DD, 88.1% na DM1, 91.3% na DM2 e 89.6% na DP, sendo a presença de hábitos a disfunção mais frequente. Os grupos de maloclusão Classe II bilateral (no grupo DD), mordida aberta anterior (nos grupos DD e DP), classe III unilateral, mordida cruzada posterior unilateral e bilateral (no grupo DD e DP) apresentaram mais disfunção orofacial quando comparados ao grupo sem maloclusão. Como conclusão, a prevalência de maloclusão e disfunção orofacial na população avaliada é alta, e verificou-se uma relação positiva entre maiores impactos de disfunção orofacial e presença de maloclusão. **Capítulo 2:** Os hábitos orais deletérios (HOD) são disfunção orofacial cujo possível fator etiológico é a ansiedade. Dessa forma, o objetivo deste capítulo foi avaliar a relação entre HOD e sintomas de ansiedade em crianças e adolescentes de 7 a 14 anos. A amostra (n=1174) foi dividida em 3 grupos : Dentição mista 1º período transitório (DM1), Dentição mista 2º

período transitório (DM2) e Dentição permanente (DP). A avaliação dos HOD foi realizada usando-se o domínio III (hábitos) do NOT-S e os sintomas de ansiedade foram avaliados utilizando o Multidimensional Anxiety Scale for Children (MASC). A prevalência de HOD encontrada foi de 69.5% na DM1, 78.9% na DM2, 77.1 na DP. O HOD mais frequente foi a onicofagia. Os escores do MASC foram maiores em meninas nos grupos DM2 e DP. Os grupos de hábito apresentaram mais sintomas de ansiedade quando comparados ao grupo sem hábito nos grupos DM1, DM2 e DP. Conclui-se que crianças e adolescentes com HOD apresentaram, significativamente, mais sintomas de ansiedade.

Palavras-chave: Avaliação da deficiência. Disfunção orofacial. Má oclusão. Hábitos. Ansiedade.

Sumário

DEDICATÓRIA	xiii
AGRADECIMENTOS	xv
Introdução	1
Capítulos	4
CAPÍTULO 1	5
Prevalence of and relationship between malocclusion and orofacial dysfunction in children and adolescents – an epidemiological study.....	5
CAPÍTULO 2	33
Relationship between anxiety symptoms and deleterious oral habits in children and adolescents.....	33
Discussão	55
Conclusões Gerais	57
Referências *	58
APÊNDICE 1	63
APÊNDICE 2	66
ANEXO 1	72
Anexo 2 – FICHA DE AVALIAÇÃO DE MALOCLUSÃO.....	73
Anexo 3 - “MASC” - Escala Multidimensional de Ansiedade para Crianças.....	74

DEDICATÓRIA

Dedico este trabalho aos meus pais, Gustavo Batista Leme e Rafaela Munhoz Severi Leme, pelo apoio incondicional, incentivo incansável, amor, carinho, dedicação e esforço.

AGRADECIMENTOS

A Deus, por conceder todas as oportunidades que me levaram a este caminho e por ter me dado forças para persistir.

Aos meus pais, Gustavo Batista Leme e Rafaela Munhoz Severi Leme, por serem meus modelos de vida profissional e pessoal e por sempre me apoiarem, incentivarem e ajudarem. Sem o sacrifício de vocês nada disso seria possível.

À Universidade Estadual de Campinas, na pessoa do seu Magnífico Reitor Prof. Dr. José Tadeu Jorge; à Faculdade de Odontologia de Piracicaba, na pessoa do seu diretor Prof. Dr. Jacks Jorge Junior, da Coordenadora Geral da Pós-Graduação da FOP – UNICAMP Profa. Dra. Cínthia Pereira Machado Tabchoury e da Coordenadora do programa de Pós-Graduação em Odontologia da FOP-UNICAMP Profa. Dra. Juliana Trindade Clemente Napimoga, pela oportunidade de um crescimento científico e profissional nesta conceituada instituição.

Ao Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPQ), por me conceder a bolsa de doutorado.

Aos diretores e pais/responsáveis, que autorizaram a participação das crianças e adolescentes neste trabalho.

Às crianças e adolescentes, que aceitaram participar deste trabalho e que cooperaram com a realização dos exames clínicos necessários.

À Prof^a. Dr^a. Maria Beatriz Duarte Gavião, minha orientadora, agradeço pela oportunidade, confiança e dedicação.

Às Prof^{as} Dr^{as} da área de Odontopediatria Regina Maria Puppini Rontani, Marinês Nobre dos Santos Uchôa e Fernanda Miori Pascon. Agradeço toda seriedade e competência, que contribuíram muito para o meu crescimento pessoal e profissional.

À Prof^a Dr^a Maria Beatriz Borges de Araújo Magnani por me iniciar neste caminho de pesquisa científica, por todo carinho e amizade.

Aos prof. Drs. da área de Ortodontia Vânia Célia Vieira de Siqueira e João Sarmiento Pereira Neto. Agradeço os ensinamentos e o companheirismo.

Às minhas amigas de turma: Éfani Banzi, Larissa Pacheco e Marcela Oliveira, por vivenciarem comigo grande parte dos momentos desta etapa.

Aos amigos: Livia Paggoto Rodrigues, Fabiana Furtado Freitas, Ana Beatriz Marangoni Montes, Maria Carolina Salomé Marquezin, Alessandra Shizue Iwamoto, Bruna Raquel Zancopé, Luciana Tiemi Inagaki, Luiz Filipe Barbosa Martins, Micaela Cardoso, Thayse Rodrigues de Souza, Vanessa Benetello Dainezi pelos ótimos e divertidíssimos momentos.

À Tais de Souza Barbosa que contribuiu com este trabalho, meu sincero agradecimento.

Introdução

A função orofacial é o resultado de atividades complexas integradas ao Sistema Nervoso Central e ao Sistema Neuromuscular (Lund, 1991). Inclui ações vitais ao organismo (como respiração, mastigação e deglutição) e postura muscular (postura de lábios e língua) (Sthal et al., 2007 e Grabowski et al., 2007), que são base para a interação social em termos de fala, comunicação emocional, expressão facial e aparência (Bakke et al., 2007).

Dessa forma, a alteração da função orofacial, e consequente disfunção orofacial, também chamada de desordem miofuncional orofacial, pode ser severamente debilitante, uma vez que é definida como qualquer padrão envolvendo a musculatura oral e/ou orofacial que interfira com o crescimento e desenvolvimento normais, ou função das estruturas; ou chame atenção por si mesmo (American Speech-Language-Hearing Association), podendo provocar impactos negativos na saúde oral e geral (Bakke et al., 2007; Ferreira et al., 2009).

Esta disfunção pode ocorrer em qualquer idade (Felício et al., 2012) e é uma característica comum em deformidades orofaciais, respiração bucal, desordens temporomandibular, muitas doenças genéticas e congênitas e ainda, anormalidades anatômicas como fendas palatinas. Entretanto, ela pode ocorrer também como consequência de doenças adquiridas (acidente vascular cerebral, traumatismo craniano) e degenerativas (doença de Parkinson, esclerose múltipla) e trauma (Bakke et al., 2007), e inclui ainda a presença de hábitos orais deletérios (Sthal et al., 2007).

Entretanto, a avaliação da função orofacial não se restringe somente a pacientes com doenças debilitantes. Essa avaliação deve ser realizada como parte do exame clínico inicial para o tratamento odontológico. Isso porque o desenvolvimento da maloclusão deve ser considerado como o resultado de interações entre fatores genéticos e fatores ambientais, incluindo a função orofacial (Ovsenik, 2009), sendo que, o genótipo determina quando e em que proporção a influência externa produz efeito. Sugere-se na literatura que 35-50% das maloclusões são causadas por fatores ambientais (Grabowski et al, 2007). Assim, acredita-se que a função orofacial deva ser avaliada antes do tratamento odontológico e principalmente do tratamento ortodôntico, seja ele, preventivo, interceptativo ou corretivo.

Como a função orofacial pode ser considerada um fator etiológico ao desenvolvimento da maloclusão, e os hábitos orais deletérios são a disfunção orofacial mais frequentemente encontrada (Leme et al., 2012) é imprescindível a avaliação desta disfunção orofacial. Hábito pode ser definido como um automatismo, um estímulo aprendido, que com a prática, pode se tornar inconsciente e ser incorporado à personalidade. Hábitos orais são definidos como padrões de contração muscular aprendidos (Moyers, 1991). São considerados normais, quando contribuem para o estabelecimento da oclusão e crescimento facial normais e deletérios quando se tornam potenciais fatores etiológicos para a maloclusão e crescimento facial alterado. Os hábitos orais podem ser divididos em hábitos de sucção não nutritivos (sucção de chupeta e de dedo), hábitos de morder (morder objetos, lábios, bochechas, bruxismo, e unhas) e hábitos funcionais (respiração bucal, deglutição atípica e interposição de língua) (Bosnjak, 2002).

Uma grande margem de frequências de hábitos orais deletérios são reportadas na literatura, de 9.9 a 34.1% em estudos internacionais (Shetty e Munshi, 1998; Onyeaso e Isiekwe, 2008; Quashie-Williams et al., 2010) e de 70 a 83.1% em pesquisas brasileiras (Leite-Cavalcanti et al., 2007; Hebling et al., 2008; Leme et al., 2013). Como os hábitos orais deletérios são considerados disfunção orofacial, podem interferir nas funções do sistema estomatognático (Felício et al., 2003) e ainda são considerados fatores etiológicos da maloclusão (Sthal et al., 2007). Os efeitos negativos dos hábitos dependem da frequência, intensidade e duração, assim como dos padrões individuais genéticos de crescimento (Hebling et al., 2008).

Duas teorias do comportamento são usadas para explicar a etiologia dos hábitos orais, especialmente os de sucção não nutritivos: a psicanalítica, proposta por Freud, e a do aprendizado (Jonhson e Larson, 1993). As duas teorias acreditam que condições normais do desenvolvimento promovem o início dos hábitos de sucção não nutritivos. A teoria do aprendizado suporta que os hábitos são respostas adaptativas enquanto que para a teoria psicoanalítica, os hábitos de sucção são estímulos prazerosos dos lábios e boca. (Jonhson e Larson, 1993; Bayardo et al., 1996; Vandas et al., 2001). Espera-se que por volta dos 3 anos de idade a maioria das crianças tenha eliminado esses hábitos (Jonhson e Larson, 1993; Fukuta et al., 1996). Para as crianças que persistem com o hábito a partir desta idade, a teoria do aprendizado acredita que é apenas um hábito aprendido, entretanto a teoria

psicoanalítica acredita que isso seria um indício de distúrbio psicológico, causado pela inabilidade de lidar com os estresses da vida (Jonhson e Larson, 1993). De acordo com a teoria psicoanalítica, um possível fator etiológico dos hábitos orais deletérios é a ansiedade.

A ansiedade pode ser definida como uma antecipação de possível dano ou infortúnio, acompanhada de um sentimento de disforia (desconfortável) e/ou sintomas somáticos de tensão. Ela é um sinal de alerta para um perigo eminente e permite que a pessoa tome as medidas necessárias para confrontar a ameaça. Por isso, a ansiedade é considerada normal e, até um sentimento e estado emocional desejável para lidar com as situações corriqueiras. Quando ela excede a capacidade adaptativa de uma pessoa, a ansiedade pode se tornar patológica com sintomas físicos, psicológicos e comportamentais. Dessa forma, as desordens de ansiedade são caracterizadas pela presença de tensão, medo e preocupação excessivos (Guideline Working Group for the Treatment of Patients with Anxiety Disorders in Primary Care, 2008).

A ansiedade constitui o tipo mais comum de desordens psiquiátricas na infância (Mazzone et al., 2007). A prevalência nacional varia de 4.6 a 5.8% em crianças e adolescentes, respectivamente (Fleitlich-Bilyk e Goodman, 2004) e de 2.4 a 13% em estudos internacionais (Spence, 1998; Costello et al., 2003). Crianças e adolescentes caracterizam-se por ter um curso crônico desta desordem e consequências debilitantes, esses fatos evidenciam a importância do diagnóstico e intervenção precoces. Com esse objetivo e, para diferenciar a ansiedade dos medos que ocorrem como parte do processo normal de desenvolvimento, instrumentos para avaliação da ansiedade neste grupo etário específico foram desenvolvidos e estão disponíveis para uso.

Os objetivos deste trabalho foram determinar: a prevalência da disfunção orofacial e da maloclusão, a relação existente entre disfunção orofacial e maloclusão e a relação entre sintomas de ansiedade e hábitos orais deletérios.

Dessa forma, as hipóteses desta tese foram:

1. Existe relação positiva entre disfunção orofacial e maloclusão;
2. Crianças e adolescente com HOD apresentam mais sintomas de ansiedade do que sujeitos sem HOD.

Capítulos

Esta tese está baseada na Deliberação CCPG-Nº 228/2013 que regulamenta o formato alternativo para teses de Mestrado e Doutorado e permite a inserção de artigos científicos de autoria ou co-autoria do candidato. Por se tratar de pesquisa envolvendo seres humanos, o projeto de pesquisa deste trabalho foi submetido à apreciação do Comitê de Ética em Pesquisa da Faculdade de Odontologia de Piracicaba, tendo sido aprovado (Anexo 1). Sendo assim, esta tese é composta de dois artigos, conforme descrito abaixo:

CAPÍTULO 1

“Prevalence of and relationship between malocclusion and orofacial dysfunction in children and adolescents – an epidemiological study”; Leme MS, Barbosa TS, Gavião MBD

CAPÍTULO 2

“Relationship between anxiety symptoms and deleterious oral habits in children and adolescents”; Leme MS, Barbosa TS, Gavião MBD

CAPÍTULO 1

Prevalence of and relationship between malocclusion and orofacial dysfunction in children and adolescents - an epidemiological study

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Artigo submetido ao periódico American Journal of Orthodontics and Dentofacial Orthopedics.

Abstract

Introduction: this study aimed to determine the prevalence of and relationship between orofacial dysfunction and malocclusions. **Methods:** 1561 (aged 4-14 years) subjects were divided in four groups: Primary dentition (PRD, n=387), Intermediate mixed dentition (IMD, n=387), Late mixed dentition (LMD, n=402) and Permanent dentition (PD, n=385). The orofacial dysfunction was assessed using the Nordic orofacial test-screening (NOT-S) and malocclusion was assessed using the criteria of Grabowski et al. (2007) and Dental Aesthetic Index (DAI), by this the sample was subdivided in malocclusion and no malocclusion groups. Statistical analysis constituted of descriptive analysis, chi-squared partition and independence tests, and Mann-Whitney and Kruskal-Wallis tests. **Results:** malocclusion prevalence was 64.9% in PRD, 83.2% in IMD, 80.4% in LMD and 90.7% in PD, being increased overjet the most common malocclusion found. Orofacial dysfunction prevalence was 86.6% in PRD, 88.1% in IMD, 91.3% in LMD and 89.6% in PD, being the presence of deleterious oral habits the most frequent one. Malocclusion groups of bilateral class II (in PRD), frontal open bite (in PRD and PD), unilateral class III and unilateral and bilateral posterior crossbite (in PD) presented significant more orofacial dysfunction compared to no malocclusion group. **Conclusions:** the prevalence of malocclusion and orofacial dysfunction were high and it was detected a positive interrelation between higher impacts on orofacial dysfunction and the presence of malocclusion.

Introduction and literature review

Orofacial function includes vital actions (e.g., breathing, chewing and swallowing)¹ and muscle posture (e.g., mouth and tongue posture)^{2,3}, which is the basis for social interactions in terms of speech, emotional communication, facial expression and appearance.² Orofacial function is the result of complex activities of the central nervous system and the neuromuscular system.⁴ Thus, the alteration of orofacial function, and consequently orofacial dysfunction, can be severely disabling.

Orofacial myofunctional disorder is defined as any pattern that involves oral and/or orofacial musculature and interferes with normal growth, development, or function of structures or calls attention to itself.⁵

This dysfunction can occur at any age⁶ and is a common feature in dentofacial deformity, mouth breathing, temporomandibular disorders, many genetic and congenital disorders and anatomical abnormalities such as cleft lip and palate. However, it may also occur as a consequence of various acquired diseases (e.g., cerebrovascular accidents and traumatic brain injury), degenerative diseases (e.g., Parkinson's disease, amyotrophic lateral sclerosis and multiple sclerosis) and trauma¹ and includes the presence of various habits.²

Assessment of orofacial function is not restricted to patients with debilitating diseases. This evaluation should be undertaken as part of an initial clinical exam for orthodontic treatment. Malocclusion can be defined as the presence of an anomalous relationship between the upper and lower teeth of either dental or alveolar origin.⁷ The development of malocclusion results from interactions among genetically determined developmental factors and several external and internal environmental factors, including orofacial function;⁸ the genotype determines whether and to what extent exterior the influences take effect. It is suggested that 35-50% of malocclusions are caused by external factors.⁹ Thus, it is suggested that a patient's functional status must be considered before deciding on preventive, interceptive or corrective orthodontic treatment.^{8,9} The importance of assessing orofacial function in children and adolescents is therefore evident.

Although a close relationship between form and function is recognized by many authors, the degree of interplay remains a matter of conjecture. The majority of studies have focused on primary and intermediate mixed dentition and have not assessed permanent dentition, though the impact of orofacial dysfunction is expected to be higher during this phase.

The objectives of this study were to determine the prevalence of orofacial dysfunction and malocclusions in children and adolescents with deciduous, mixed and permanent dentition and to establish the relationship between orofacial dysfunction and malocclusion.

Material and Methods

This research was approved by the Ethics Committee in Research of Piracicaba Dental School, University of Campinas (CEP-FOP; protocol number 106/2010). A cross-sectional study was carried out in the city of Piracicaba, São Paulo, Brazil; it included 1,561 children and adolescents ranging in age from 4 to 14 years. The subjects were divided into four groups according to their phase of dentition and were examined for orofacial dysfunction and malocclusion.

- Group PRD – Primary Dentition: This sample consisted of children in the phase of complete deciduous dentition who ranged in age from 4 to 5 years.
- Group IMD – Intermediate Mixed Dentition: This group was characterized by the presence of permanent incisors and first molars fully erupted and presence of deciduous canines, first molar and second molars. The subjects ranged in age from 7 to 8 years.
- Group LMD – Late Mixed Dentition: This group was characterized by shedding of deciduous canines and molars and eruption of permanent canines and premolars. The subjects ranged in age from 10 to 11 years.
- Group PD – Permanent Dentition: These subjects were in the early phase of permanent dentition and had all of their permanent teeth (i.e., the possibility of the presence of second molars but absence of third molars). They ranged in age from 12 to 14 years.

To calculate the sample size necessary to constitute a representative sample for each group, a standard error of 5%, tolerable error of 5%, and estimated prevalence of 50% were assumed. These values suggested a minimum of 384 subjects per group.

Ten public daycare centers and 13 public schools were chosen at random by lottery to be a part of the study. Signed parental permission was required for subjects to participate. Inclusion criteria were signed parental permission and subjects age according to the limits established for each group. Exclusion criteria included inadequate behavior during exams, such as crying or refusal to cooperate with the examination, and previous orthodontic treatment.

The exams were performed in the daycare centers and schools by a trained examiner (M.S.L. - intra-examiner kappa of 0.97).

Orofacial Dysfunction

The presence of orofacial dysfunction was evaluated using the Brazilian version of the Nordic Orofacial Test Screening (NOT-S) protocol.¹⁰ This protocol contains 12 domains of orofacial function, which are divided into two parts each containing six domains, an interview and a clinical examination in which subjects perform various tasks by imitating photographs from a picture manual. The manual is available at the Mun-h-center website¹¹.

Interview	Clinical Examination
I- Sensory function	1- Face at rest
II- Breathing	2- Nose breathing
III- Habits	3- Facial expression.
IV- Chewing and Swallowing	4- Masticatory muscle and jaw function
V- Drooling	5- Oral motor function
VI- Dryness of the mouth	6- Speech

Each domain has 1-5 items and each item contains criteria for impaired function. A 'yes' answer on the interview or performance of a task that met the criteria for impaired function during the clinical examination was given a score of 1, indicating a dysfunction in the scored domain; a 'no' answer or performance of a task that did not meet the criteria was given a score of 0 (zero). The NOT-S total score was the sum of the scores of each domain and could range from 0-12. Higher total NOT-S scores indicated more severe orofacial dysfunction.

NOT-S was applied by the same researcher in all groups. The answers to NOT-S interviews were provided by children's mothers in group 1; in the other groups, children and adolescents answered for themselves. The clinical examinations were conducted using a picture manual, which was a notebook that contained photographs illustrating how to perform the tasks involved in the clinical examination.

Malocclusion

A clinical exam to assess malocclusion was conducted using a dental mirror and a World Health Organization (WHO) millimeter probe with natural light. The following occlusal parameters were used to classify malocclusions based on the criteria of Grabowski et al.³ and the DAI (Dental Aesthetic Index).

Sagittal Occlusal Relationships in the Posterior Region

Sagittal jaw relationships were determined around the primary canines and second deciduous molars in subjects with primary dentition, around primary canines and first permanent molars in those with intermediate and late mixed dentition and around permanent canines and first molars in those with permanent dentition. Malocclusions were classified as Class II unilateral or bilateral or Class III unilateral or bilateral.

Sagittal Occlusal Relationships in the Anterior Region

The overjet was measured in millimeters as the distance between the labial surfaces of the lower incisors and the palatal faces of the upper incisors. A normal overjet was considered to be from 0 to 2 mm. Malocclusions were classified as increased overjet (> 2 mm) or negative overjet (< 0 mm).

Transverse Occlusal Relationships in the Posterior Region

Malocclusions were classified as unilateral crossbite, bilateral crossbite, isolated crossbite or lateral edge-to-edge bite.

Vertical Occlusal Relationships in the Anterior Region

Overbites were measured in millimeters, and the degree to which the upper incisors overlapped the lower incisors was assessed.

In primary dentition, an overbite greater than 2 mm was classified as a deep bite; in mixed and permanent dentitions, an overlap of more than two-thirds of the clinical crown of the lower incisors was classified as a deep bite.

A frontal open bite was defined by an overbite without overlap of the lower incisors and was measured in millimeters.

Crowding and spacing

Both crowding and spacing were measured in millimeters in the anterior region of one or both (i.e., superior and/or inferior) segments. Crowding was classified as malocclusion in all assessed groups. Spacing was only classified as malocclusion in those with permanent dentition.

Arch type

In primary dentition, the arch type was evaluated and classified as either spaced or closed. A spaced arch was identified when there was overall spacing in the upper or lower arch, and a closed arch was identified in the absence of overall spacing.

Statistical analyses

The collected data were statistically assessed using the BioEstat 5.3 program (Mamirauá, Belém, PA, Brazil). The data were not normally distributed, as verified using the Kolmogorov-Smirnov test, and non-parametric tests were used. Descriptive statistics consisted of means, standard deviations, medians, interquartile ranges and percentages. The proportion of malocclusions and affected NOT-S domains in each dentition group was verified using chi-squared tests for evenness of distributions and independence. The proportions of malocclusions and affected NOT-S domains by gender were verified using chi-squared tests for independence. For each dentition group, the presence of differences in total, interview and exam NOT-S scores between the group with malocclusion and that without was assessed using a Mann-Whitney test. Differences in total, interview and exam NOT-S scores by dentition group and gender were established using Kruskal-Wallis and Mann-Whitney tests, respectively. P-values less than 0.05 were considered statistically significant.

Results

The malocclusion distribution according to dentition type and gender are shown in table 1. There was a statistically significant difference among dentition groups within the

no malocclusion group, crowding 1 segment, crowding 2 segments, deep bite and frontal open bite.

The distribution of affected NOT-S domains by phase of dentition and gender are shown in table 2. There was a statistically significant difference among the four dentition groups in the following domains: II- Breathing, 1- Face at rest and 6- Speech ($p < 0.0001$).

Table 7 presents total, interview and exam NOT-S scores according to dentition group and gender. The PRD group presented lower total NOT-S scores than did the IMD, LMD and PD groups.

Tables 3, 4, 5 and 6 present total, interview and exam NOT-S scores to compare malocclusion groups with no malocclusion groups by dentition phase. In the PRD group, those with bilateral class II and frontal open bites had statistically significantly different total NOT-S scores than did those in the no malocclusion group. In the IMD and LMD groups, there was no statistically significant difference between the malocclusion and no malocclusion groups. In the PD group, groups with unilateral class III, unilateral posterior crossbite, bilateral posterior crossbite and frontal open bite exhibited significant differences in total NOT-S scores compared with the no malocclusion group.

Figure 1 illustrates the distribution of total NOT-S scores by dentition group. Orofacial dysfunction was present in 86.6% of the PRD group, 88.1% of the IMD group, 91.3% of the LMD group and 89.6% of the PD group.

Discussion

This epidemiological cross-sectional survey aimed to determine the prevalence of orofacial dysfunction and malocclusion in children and adolescents with deciduous, mixed and permanent dentition and to establish the relationship between orofacial dysfunction and malocclusion.

NOT-S was chosen as a metric of orofacial dysfunction because it is a validated protocol that is available in many languages, including Brazilian Portuguese, which makes comparison with international data possible. To assess malocclusions, the criteria recommended by Grabowski et al.³ and the DAI were followed because they have been widely used.^{2,12-15}

The present study demonstrated that 64.9% of children with deciduous dentition presented with malocclusion. Previous investigations report rates ranging from 36.46% to 87.0% in Brazil^{13,16-18} and 26.06% to 74.7% in international studies^{19-20,3}. The frequency of malocclusion found in this study was similar to those found by Grabowski et al.³ (74.7%) and Sousa et al.¹² (62.4%). Additionally, these previous studies used the same criteria as the study presented here to assess malocclusion with an increased overjet, which was the most prevalent malocclusion in this study (39%), and reported similar frequencies (44.8 and 42.6%, respectively).

Children with intermediate and late mixed dentition presented rates of malocclusion of 83.2% and 80.4%, respectively. The majority of studies do not separate phases of mixed dentition. Grabowski et al.³ and Dimberg et al.²¹ evaluated children with intermediate mixed dentition, whereas Sardenberg et al.²² (8- to 10-year-olds), Gois et al.²³ (8- to 11-year-olds), Perinetti et al.²⁴ (7- to 11-year-olds), Dias and Gleiser²⁵ (9- to 12-year-olds) and Lux et al.²⁶ (9-year-olds) did not specify the stage of mixed dentition. In these studies, malocclusion frequencies ranged from 93% to 32.2%, and the majority of them showed frequencies higher than 80%. Increased overjet and crowding, the most frequent malocclusions in mixed dentition groups, presented rates similar to those found by Perinetti et al.²⁴, Dias and Gleiser²⁵ and Grabowski et al.³.

The frequency of malocclusion in permanent dentition was 90.7%; this rate was similar to the findings of a Brazilian study by Thomaz et al.¹⁴, a Saudi Arabian study by Murshid et al.²⁷ and a Nigerian study by Utomil and Onyaso²⁸, which showed rates of 83%, 91% and 88.3%, respectively. It is important to observe that the prevalence of malocclusion increased from 64.9% in the PRD group to 90.7% in the PD group, representing a 25% of increase. The high frequency of malocclusion in adolescents and the sharp increase in the prevalence of malocclusion reinforces prior claims in the literature that the probability of malocclusion in permanent dentition is higher than in deciduous dentition¹⁶ and that alterations in occlusal findings increase with age provided that neither preventive nor interceptive measures were taken at earlier ages. These findings reflect the importance of the establishment of public health policies in early childhood that aim to avoid this increase in malocclusion rates in adolescence.

The high frequency of malocclusion in the PD group may be related to the fact that orofacial dysfunction also had a high frequency (i.e., close to 90% in the four groups); 'habits' was the most affected domain in all groups, with a 70% frequency. In other words, the rates of orofacial dysfunction and DOH were stable throughout the dentition phases, whereas the malocclusion rates increased throughout dentition phases. These observations reinforce the association between malocclusion and orofacial dysfunction and suggest malocclusion and DOH as an etiological factor.

Frequencies of malocclusion were homogeneous with respect to gender, with the exception of frontal open bite in late mixed dentition.

This is the first epidemiological study to assess orofacial function in healthy children and adolescents in all dentition phases using a NOT-S protocol. Our results demonstrated a high prevalence of orofacial dysfunction in the assessed sample (86.6% in primary dentition, 88.1% in intermediate mixed dentition, 91.3% in late mixed dentition and 89.6% in permanent dentition). The results for primary and intermediate mixed dentitions are similar to those found by Grabowski et al.⁹ (i.e., 88.8% and 89.8% in primary and intermediate mixed dentitions, respectively). Our results demonstrated low mean orofacial dysfunction in primary dentition compared with those of Stahl et al.² (our results: 1.48; Stahl et al.:1.97); however, when comparing the means in the intermediate mixed dentition group, the results are more similar (this study:1.90; Stahl et al.: 2.13). These differences may be due to variations in the protocols followed. While the present study used NOT-S to assess orofacial function, Grabowski et al.⁹ and Stahl et al.² assessed orofacial function in an epidemiological study using their own protocol to assess mouth posture, tongue posture, swallowing patterns, articulation and habits. Although there were differences in orofacial dysfunction means, these differences are not important because the frequencies of orofacial dysfunction found were similar.

A previous study¹⁰ assessing subjects between 8 and 14 years of age reported a frequency of orofacial dysfunction in subjects with mixed and permanent dentition of 94.9% and mean NOT-S scores of 2.81 and 2.38 in mixed (n=198) and permanent dentitions (n=134), respectively. Marquezin et al.²⁹ reported mean NOT-S scores of 2.99 and 3.01 in late mixed (mean age=10.83 years, n=89) and permanent dentitions (mean age=12.27 years, n=134), respectively, and Strini et al.³⁰ reported a mean NOT-S score of

1.80 in subjects with permanent dentition (i.e., 18- to 25-year-old subjects, n=30). The differences between these NOT-S scores and our results may be due to sample size; in the present study, the sample was calculated to be a representative one.

Stahl et al.² observed an increasing trend toward orofacial dysfunction as dentition evolved from primary to mixed, and this was confirmed by our results; the mean NOT-S scores were higher in intermediate and late mixed dentition than they were in primary dentition. However, mean NOT-S scores in permanent dentition were lower than in mixed dentition, in accord with Leme et al.¹⁰, but higher than in primary dentition. These findings may be explained by the fact that mixed dentition is a transitory period and may represent the peak of orofacial dysfunction; however, this hypothesis could be further explored through longitudinal research.

The domain with the highest prevalence of dysfunction in all dentition groups was III-Habits, with frequencies higher than 70%. In deciduous dentition, the domain II-Breathing was the second most frequent, with a rate of 23.8%. In mixed and permanent dentitions, the domain IV-Chewing and swallowing was the second most frequent, with rates of 51%, 50.5% and 32.2%. Domain VI was dysfunctional in approximately a quarter of subjects with mixed and permanent dentition. Based on the examination, the most affected domain was 1-Face at rest, affecting one-fifth of children with intermediate mixed dentition. These affected domains were reported in previous studies^{2,10,30}.

The high frequency of dysfunctional habits in Brazilian children and adolescents has been previously reported^{10,17,31}. It may be related to the high prevalence of malocclusions found in this study because oral habits can interfere with stomatognathic system functions and are often reported to be an etiological factor in malocclusions.^{2,32}

In domain IV-Chewing and swallowing, subjects in the mixed and permanent dentition groups reported difficulty with eating foods that had a certain consistency; this was not perceived by mothers of subjects in the deciduous group. This result may be influenced by eating habits. In a recent survey, it was observed that Brazilian adolescents aged 10 to 19 years had a diet characterized by low fruit and vegetable intake and a high consumption of foods considered to be unhealthy, such as snacks, sweets, cookies and soft drinks.³³

In domain II-Breathing, 23.8% of mothers of children with primary dentition reported that their children had a habit of snoring. In other groups, the frequency was approximately 10%, which suggests a maturation of the involved structures or improvement in superior airway tract problems that may be present at early ages.

Frequencies of orofacial dysfunction were homogeneous with respect to gender in all groups with the exception of the permanent group; in this group, girls presented higher NOT-S scores than boys. This could be caused by statistically significant differences in mean NOT-S scores based on the interviews; girls were more likely to be affected by domains IV and VI than boys, reflecting the fact that girls have greater difficulty eating foods with certain consistencies and cannot eat a cracker without having to drink something.

Our results demonstrated that children and adolescents with primary dentition and a frontal open bite or bilateral class II malocclusion and those with permanent dentition and a unilateral or bilateral crossbite or unilateral class III or frontal open bite malocclusion presented more orofacial dysfunction than those with no malocclusion. An anterior open bite and posterior crossbite are the most frequent malocclusions identified by research on orofacial dysfunction in deciduous dentition.^{8,34-36} These reports use their own protocols to evaluate orofacial dysfunction; they assessed breathing, swallowing, habits and tongue and lip position and found an association between orofacial dysfunction and the studied malocclusions. Sthal et al.² and Grabowski et al.³ evaluated children with deciduous and mixed dentition and found a correlation between orofacial dysfunction and frontal open bite, increased overjet, mandibular prognathism and crossbite. However, these studies did not quantitatively compare scores of orofacial dysfunction but rather the frequency of the presence or absence of a particular type of dysfunction according to types of malocclusion. A previous study quantitatively compared NOT-S scores in subjects aged 8-14 years with mixed and permanent dentition and found that subjects with a frontal open bite were the only malocclusion group that showed significantly higher NOT-S scores than the no malocclusion group.¹⁰

Our results suggest that the impact of orofacial dysfunctions in malocclusion is more highly expressed in permanent dentition. The cross-sectional nature of this study

entails certain limitations. For this reason, it is suggested that a longitudinal study be conducted to elucidate and confirm these findings.

Epidemiological studies are important to determine the prevalence of diseases and offer the possibility of identifying risk factors for a disease distribution with respect to certain environmental conditions. These studies can identify the needs of the studied population and offer professionals a tool for preventive and corrective treatment measures.³⁷

Our results suggest that malocclusion should be treated as a public health problem and that orofacial function assessment should be implemented to aid in early diagnosis and treatment as part of a multidisciplinary approach. The early diagnosis of orofacial dysfunction by pediatric dentists, orthodontists or audiologists and its multidisciplinary treatment is very important.

Conclusions

The prevalence of malocclusion and orofacial dysfunction in the assessed children and adolescents was high. A positive relationship was detected between the severity of orofacial dysfunction and the presence of malocclusion.

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Table 1. Malocclusion distribution [n(%)] according dentition groups and gender

Malocclusions	Categories	Primary dentition			Intermediate mixed dentition			Late mixed dentition			Permanent dentition			<i>p^b</i> -value
		Total (n=387)	Male (n=200)	Female (n=187)	Total (n=387)	Male (n=208)	Female (n=179)	Total (n=402)	Male (n=177)	Female (n=225)	Total (n=385)	Male (n=160)	Female (n=225)	
No malocclusion		136 (35.1)	77 (38.5)	59 (31.5)	65 (16.8)	31 (14.9)	34 (19.0)	79 (19.6)	33 (18.6)	46 (20.4)	36 (9.3)	17 (10.6)	19 (8.4)	<0.0001
					<i>p^a</i> <0.0001			<i>p^a</i> =0.026			<i>p^a</i> <0.001			
	1 segment	11 (2.8)	6 (3.0)	5 (2.6)	105 (27.1)	55 (26.4)	50 (27.9)	99 (24.6)	42 (23.7)	57 (25.3)	90 (23.4)	36 (22.5)	54 (24.0)	<0.0001
					<i>p^a</i> <0.0001			<i>p^a</i> =0.028			<i>p^a</i> <0.001			
Crowding	2 segments	3 (0.8)	2 (1.0)	1 (0.5)	31 (8.0)	14 (6.7)	17 (9.5)	53 (13.2)	22 (12.4)	31 (13.8)	78 (20.2)	37 (23.1)	41 (18.2)	
					<i>p^a</i> =0.001			<i>p^a</i> <0.0001			<i>p^a</i> <0.0001			<0.0001
Spacing	1 segment	-	-	-	-	-	-	-	-	-	59 (15.3)	23 (14.4)	36 (16.0)	-
	2 segments	-	-	-	-	-	-	-	-	-	27 (7.0)	12 (7.5)	15 (6.6)	-
	Unilateral Class II	37 (9.5)	13 (6.5)	24 (12.8)	46 (11.9)	25 (12.0)	21 (11.7)	60 (14.9)	31 (17.5)	29 (12.9)	49 (12.7)	22 (13.7)	27 (12.0)	
								<i>p^a</i> =0.037						
	Bilateral Class II	41(10.6)	17 (8.5)	24 (12.8)	52 (13.4)	28 (13.4)	24 (13.4)	67 (16.6)	28 (15.8)	39 (17.3)	52 (13.5)	19 (11.9)	33 (14.6)	
								<i>p^a</i> =0.027						
Posterior sagittal relationships	Unilateral Class III	2 (0.5)	1 (0.5)	1 (0.5)	8 (2.0)	4 (1.9)	4 (2.2)	13 (3.2)	6 (3.4)	7 (3.1)	22 (5.7)	11 (6.9)	11 (4.9)	0.003
											<i>p^a</i> =0.001			
	Bilateral Class III	11 (2.8)	6 (3.0)	5 (2.6)	9 (2.3)	6 (2.9)	3 (1.7)	29 (7.2)	9 (5.0)	20 (9.0)	36 (9.3)	20 (12.5)	16 (7.1)	<0.0001
								<i>p^a</i> =0.0009			<i>p^a</i> <0.0001			

Table 1 continued

Malocclusions	Categories	Primary dentition			Intermediate mixed dentition			Late mixed dentition			Permanent dentition			<i>p</i> ^b -value
		Total (n=387)	Male (n=200)	Female (n=187)	Total (n=387)	Male (n=208)	Female (n=179)	Total (n=402)	Male (n=177)	Female (n=225)	Total (n=385)	Male (n=160)	Female (n=225)	
Anterior sagittal relationships	Negative overjet	5 (1.3)	1 (0.5)	4 (2.1)	3 (0.8)	1 (0.5)	2 (1.1)	4 (1.0)	1 (0.5)	3 (1.3)	4 (1.0)	2 (1.2)	2 (0.9)	0.0001
	Increased overjet	151 (39.0)	69 (34.5)	82 (43.8)	203 (52.4)	114 (55)	89 (49.7)	207 (51.5)	93 (52.5)	114 (50.6)	204 (53.0)	87 (54.4)	117 (52.0)	
	<i>p</i> ^a =0.0002													
Posterior Transversal Relationships	Isolated crossbite	20 (5.2)	14 (7.0)	6 (3.2)	21 (5.4)	10 (4.8)	11 (6.1)	30 (7.4)	13 (7.3)	17 (7.5)	20 (5.2)	8 (5.0)	12 (5.3)	0.021
	Unilateral crossbite	33 (8.5)	13 (6.5)	20 (10.7)	41 (10.6)	19 (9.1)	22 (12.3)	43 (10.7)	17 (9.6)	26 (11.5)	30 (7.8)	16 (10.0)	14 (6.2)	
	Bilateral crossbite	1 (0.2)	0	1 (0.5)	7 (1.8)	4 (1.9)	3 (1.7)	12 (3.0)	4 (2.2)	8 (3.5)	5 (1.3)	0	5 (2.2)	
Anterior Vertical Relationships	Lateral edge-to-edge bite	6 (1.5)	1 (0.5)	5 (2.6)	1 (0.2)	1 (0.5)	0 (0.0)	1 (0.2)	0	1 (0.4)	0	0	0	0.010
	<i>p</i> ^a =0.011													
	Overbite	58 (15.0)	34 (17.0)	24 (12.8)	20 (5.1)	14 (6.7)	6 (3.3)	16 (4.0)	13 (7.3)	3 (1.3)	16 (4.1)	8 (5.0)	8 (3.5)	0.0001
Anterior Vertical Relationships	Frontal open bite	90 (23.2)	35 (17.5)	55 (29.4)	67 (17.3)	33 (15.9)	34 (19.0)	41 (10.2)	10 (5.6)	31 (13.8)	18 (4.7)	5 (3.1)	13 (5.8)	0.0001
	<i>p</i> ^a <0.0001													
	<i>p</i> ^a =0.016													
<i>p</i> ^a =0.0001														
<i>p</i> ^c =0.011														
<i>p</i> ^a =0.010														
<i>p</i> ^a =0.0001														

^aQui squared partition test; ^bQui squared independence test (difference among dentition groups)^cp value obtained from qui squared independence test (difference between genders)

Table 2. Orofacial dysfunctions distribution [n(%)] according to dentition groups and gender

NOT-S Domains	Primary dentition			Intermediate mixed dentition			Late mixed dentition			Permanent dentition			Valor de p^b
	Total (n=387)	Male (n=200)	Female (n=187)	Total (n=387)	Male (n=208)	Female (n=179)	Total (n=402)	Male (n=177)	Female (n=225)	Total (n=385)	Male (n=160)	Female (n=225)	
<i>Interview</i>													
(I) Sensory function	17 (4.4)	10 (5.0)	7 (3.7)	27 (7.0)	9 (4.3)	18 (10.1)	33 (8.2)	8* (4.5)	25* (11.1)	36 (9.35)	9* (5.6)	27* (12.0)	0.049
				$p^a=0.016$				$p^c=0.025$			$p^c=0.022$		
(II) Breathing	92 (23.8)	54 (27.0)	38 (20.3)	43 (11.1)	19 (9.1)	24 (13.4)	49 (12.2)	24 (13.5)	25 (11.1)	42 (10.9)	15 (9.4)	27 (12.0)	<0.0001
				$p^a<0.0001$			$p^a=0.015$			$p^a=0.021$			
(III) Habits	274 (70.8)	139 (69.5)	135 (72.2)	270 (70.0)	140 (67.3)	130 (72.6)	316 (78.6)	138 (77.9)	178 (79.1)	298 (77.4)	116 (72.5)	182 (80.9)	0.006
							$p^a=0.002$			$p^a=0.096$			
(IV) Chewing and swallowing	45 (11.6)	31 (15.5)	14 (7.5)	197 (51.0)	107 (51.4)	90 (50.3)	203 (50.5)	79* (44.6)	124* (55.1)	124 (32.2)	41** (25.6)	83** (36.9)	<0.0001
				$p^a<0.0001$			$p^a=0.003$	$p^c=0.012$			$p^c=0.002$		
(V) Drooling	0	0	0	0	0	0	1 (0.2)	0	1 (0.4)	1 (0.26)	0	1 (0.4)	
(VI) Dryness of the mouth	11 (2.8)	4 (2.0)	7 (3.7)	94 (24.3)	52 (25.0)	42 (23.5)	104 (25.9)	42 (23.7)	62 (27.5)	103 (26.7)	36* (22.5)	67* (29.8)	<0.0001
				$p^a<0.0001$							$p^c=0.017$		

Table 2 continued

	Primary dentition			Intermediate mixed dentition			Late mixed dentition			Permanent dentition			Valor de p^b
NOT-S Domains	Total (n=387)	Male (n=200)	Female (n=187)	Total (n=387)	Male (n=208)	Female (n=179)	Total (n=402)	Male (n=177)	Female (n=225)	Total (n=385)	Male (n=160)	Female (n=225)	
<i>Clinical Examination</i>													
(1) Face at rest	65 (16.8)	34 (17.0)	31 (16.6)	78 (20.2)	47 (22.6)	31 (17.3)	53 (13.2)	30 (16.9)	23 (10.2)	46 (11.95)	23 (14.4)	23 (10.2)	<0.0001
				$p^a < 0.0001$			$p^a < 0.0001$			$p^a = 0.0003$			
(2) Nose breathing	12 (3.1)	8 (4.0)	4 (2.1)	6 (1.6)	6 (2.9)	0 (0.0)	4 (1)	3 (1.7)	1 (0.4)	2 (0.5)	1 (0.6)	1 (0.4)	0.021
(3) Facial expression.	13 (3.4)	7 (3.5)	6 (3.2)	1 (0.2)	1 (0.5)	0	2 (0.5)	1 (0.57)	1 (0.4)	1 (0.26)	1 (0.6)	0 (0.0)	<0.0001
				$p^a < 0.0001$			$p^a = 0.039$						
(4) Masticatory muscle and jaw function	8 (2.1)	2 (1.0)	6 (3.2)	1 (0.2)	0	1 (0.6)	2 (0.5)	0	2 (0.9)	4 (1.04)	3 (1.9)	1 (0.4)	0.047
				$p^a = 0.009$									
(5) Oral motor function	1 (0.3)	1 (0.5)	0	0	0	0	1 (0.2)	0	1 (0.4)	0	0	0	
(6) Speech	34 (8.8)	19 (9.5)	15 (8.0)	19 (4.9)	10 (4.8)	9 (5.0)	11 (2.7)	5 (2.8)	6 (2.7)	7 (1.8)	3 (1.9)	4 (1.8)	<0.0001
				$p^a = 0.009$			$p^a = 0.001$			$p^a = 0.003$			

NOT-S, Nordic orofacial test-screening

^aQui squared partition test; ^bQui squared independence test (difference among dentition groups)^cp value obtained from qui squared independence test (difference between genders)

Table 3. NOT-S total, interview and exam scores according malocclusion groups in Primary Dentition (n=387).

Malocclusions	Categories		NOT-S total			NOT-S interview			NOT-S exam		
		n	Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range
No malocclusion		136	1.38 (0.90)	1.00 (1.00)	0-3	1.13 (0.75)	1.00 (1.00)	0-3	0.25 (0.47)	0	0-2
Crowding	1 segment	11	1.55 (0.82)	2.00 (1.00)	0-3	1.27 (0.79)	1.00 (0.50)	0-3	0.27 (0.47)	0 (0.50)	0-1
	2 segments	3	2.00 (1.73)	3.00 (1.50)	0-3	2.00 (1.73)	3.00 (1.50)	0-3	0	0	0-0
Posterior sagittal relationships	Unilateral Class II	37	1.59 (1.09)	1.00 (1.00)	0-5	1.22 (0.75)	1.00 (0)	0-3	0.38 (0.64)	0 (1.00)	0-2
	Bilateral Class II	41	1.87 (1.12)	2.00 (2.00)	0-4	1.31 (0.90)	1.00 (1.00)	0-3	0.56 (0.74)	0 (1.00)	0-2
			$p^*=0.011$								
	Unilateral Class III	2	1.50 (2.12)	1.5 (1.5)	0-3	1.00 (1.41)	1.00 (1.00)	0-2	0.5 (0.75)	0.5 (0.5)	0-1
Anterior sagittal relationships	Bilateral Class III	11	1.64 (0.67)	2.00 (0.50)	0-2	1.18 (0.75)	1.00 (1.00)	0-2	0.45 (0.52)	0 (1.00)	0-1
	Negative overjet	5	1.40 (0.89)	2.0 (1.00)	0-2	1.20 (0.84)	1.00 (1.00)	0-2	0.20 (0.45)	0 (0)	0-1
	Increased overjet	151	1.49 (1.03)	1.00 (1.00)	0-5	1.06 (0.68)	1.00 (0)	0-3	0.43 (0.64)	0 (1.00)	0-2
	Isolated crossbite	20	1.70 (1.03)	2.00 (1.00)	0-4	1.15 (0.75)	1.00 (1.00)	0-2	0.55 (0.69)	0 (1.00)	0-2
Posterior Transversal Relationships	Unilateral crossbite	33	1.61 (0.99)	2.00 (1.00)	0-4	1.15 (0.83)	1.00 (1.00)	0-3	0.45 (0.62)	0 (1.00)	0-2
	Bilateral crossbite	1	-	-	-	-	-	-	-	-	-
	Lateral edge-to-edge bite	6	1.83 (1.17)	2.00 (1.50)	0-3	1.00 (0.90)	1.00 (1.50)	0-2	0.83 (0.75)	1 (1.50)	0-2
Anterior Vertical Relationships	Overbite	58	1.29 (0.99)	1.00 (1.00)	0-5	1 (0.82)	1.00 (0.75)	0-3	0.29 (0.53)	0 (0.75)	0-2
	Frontal open bite	90	1.81(0.96)	2.00 (1.00)	0-4	1.27 (0.78)	1.00 (1.00)	0-3	0.54 (0.69)	0 (1.00)	0-2
			$p^*=0.002$								

SD, standard deviation; IQD, interquartile deviation; NOT-S, Nordic orofacial test-screening

* p value obtained from Mann-Whitney test (difference between no malocclusion group and malocclusion groups)

Spacing not considered; Bilateral crossbite (n=1) no statistical is need

Table 4. NOT-S total, interview and exam scores according malocclusion groups in Intermediate Mixed Dentition (n=387).

Malocclusions	Categories	n	NOT-S total			NOT-S interview			NOT-S exam		
			Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range
No malocclusion		65	1.71 (1.01)	2.00 (1.00)	0-4	1.54 (0.99)	1.00 (1.00)	0-4	0.17 (0.42)	0 (0)	0-2
Crowding	1 segment	105	1.90 (1.19)	2.00 (2.00)	0-5	1.66 (1.06)	2.00 (1.00)	0-4	0.24 (0.43)	0 (0)	0-1
	2 segments	31	2.06 (1.26)	2.00 (2.00)	0-4	1.84 (1.13)	2.00 (2.00)	0-4	0.23 (0.50)	0 (0)	0-2
	Unilateral Class II	46	1.80 (1.24)	2.00 (2.00)	0-4	1.63 (1.12)	2.00 (1.00)	0-4	0.17 (0.38)	0 (0)	0-1
Posterior sagittal relationships	Bilateral Class II	52	1.92 (1.38)	2.00 (2.00)	0-5	1.56 (1.14)	1.50 (1.00)	0-4	0.37 (0.53)	0 (0)	0-2
	Unilateral Class III	8	2.00 (0.93)	2.00 (0.25)	1-4	1.75 (1.04)	1.50 (1.00)	1-4	0.25 (0.46)	0 (0.25)	0-1
	Bilateral Class III	9	2.44 (0.88)	2.00 (1.00)	1-4	2.11 (0.78)	2.00 (1.00)	1-3	0.33 (0.50)	0 (1.00)	0-1
Anterior sagittal relationships	Negative overjet	3	2.67 (0.58)	3.00 (0.50)	2-3	2.33 (1.15)	3.00 (1.00)	1-2	0.33 (0.58)	0 (0.50)	0-1
	Increased overjet	203	2.04 (1.29)	2.00 (2.00)	0-7	1.70 (1.09)	2.00 (1.00)	0-4	0.33 (0.55)	0 (1.00)	0-3
	Isolated crossbite	21	1.81 (1.08)	2.00 (1.00)	0-4	1.67 (0.97)	2.00 (1.00)	0-3	0.14 (0.36)	0 (0)	0-1
Posterior Transversal Relationships	Unilateral crossbite	41	2.05 (1.28)	2.00 (2.00)	0-4	1.73 (1.12)	2.00 (2.00)	0-3	0.32 (0.47)	0 (1.00)	0-1
	Bilateral crossbite	7	2.29 (0.95)	2.00 (0.50)	1-4	1.57 (0.98)	2.00 (1.00)	0-3	0.71 (0.76)	1.00 (1.00)	0-2
Anterior Vertical Relationships	Overbite	20	2.00 (1.30)	2.00 (2.00)	0-5	1.85 (1.04)	2.00 (2.00)	0-4	0.15 (0.49)	0 (0)	0-2
	Frontal open bite	67	2.30 (1.36)	2.00 (2.00)	0-7	1.76 (1.05)	2.00 (1.50)	0-4	0.53 (0.66)	0 (1.00)	0-3

SD, standard deviation; IQD, interquartile deviation; NOT-S, nordic orofacial test-screening

p>0,05 (difference between no malocclusion group and malocclusion groups, Mann-Whitney test)

Spacing not considered; Lateral edge-to-edge bite n=1 (no statistical is need)

Table 5. NOT-S total, interview and exam scores according malocclusion groups in Late Mixed Dentition (n=402).

Malocclusions	Categories	n	NOT-S total			NOT-S interview			NOT-S exam		
			Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range
No malocclusion		79	1.81 (1.13)	2.00 (1.00)	0-5	1.63 (1.01)	2.00 (1.00)	0-4	0.18 (0.41)	0 (0)	0-2
Crowding	1 segment	99	1.92 (1.24)	2.00 (2.00)	0-5	1.76 (1.14)	2.00 (1.00)	0-5	0.15 (0.39)	0 (0)	0-2
	2 segments	53	2.04 (1.04)	2.00 (2.00)	0-5	1.83 (0.94)	2.00 (1.00)	0-4	0.21 (0.45)	0 (0)	0-2
Posterior sagittal relationships	Unilateral Class II	60	2.10 (1.23)	2.00 (2.00)	0-5	1.82 (1.07)	1.00 (1.25)	0-5	0.28 (0.45)	0 (1.00)	0-1
	Bilateral Class II	67	1.91 (1.14)	2.00 (2.00)	0-5	1.70 (0.98)	2.00 (1.00)	0-5	0.19 (0.47)	0 (0)	0-2
	Unilateral Class III	13	2.08 (1.19)	2.00 (0)	0-5	1.92 (0.95)	2.00 (0)	0-4	0.15 (0.38)	0 (0)	0-1
	Bilateral Class III	29	1.76 (1.02)	2.00 (2.00)	0-4	1.62 (0.90)	1.00 (1.00)	0-3	0.14 (0.35)	0 (0)	0-1
Anterior sagittal relationships	Negative overjet	4	2.00 (1.15)	2.00 (2.00)	1-3	1.75 (0.96)	1.50 (1.25)	1-3	0.25 (0.50)	0 (0.25)	0-1
	Increased overjet	207	1.98 (1.14)	2.00 (2.00)	0-5	1.77 (1.01)	2.00 (1.00)	0-5	0.20 (0.41)	0 (0)	0-2
Posterior Transversal Relationships	Isolated crossbite	30	1.87 (1.31)	1.50 (2.00)	0-5	1.73 (1.23)	1.00 (1.00)	0-5	0.13 (0.35)	0 (0)	0-1
	Unilateral crossbite	43	1.88 (1.07)	2.00 (2.00)	0-4	1.72 (0.96)	2.00 (1.50)	0-3	0.16 (0.37)	0 (0)	0-1
	Bilateral crossbite	12	1.75 (1.06)	2.00 (1.00)	0-4	1.58 (0.90)	1.50 (1.00)	0-3	0.17 (0.39)	0 (0)	0-1
Anterior Vertical Relationships	Overbite	16	1.69 (1.30)	2.00 (1.00)	0-5	1.56 (1.15)	1.50 (1.00)	0-4	0.13 (0.34)	0 (0)	0-1
	Frontal open bite	41	2.34 (1.09)	2.00 (1.00)	0-5	2.02 (0.91)	2.00 (2.00)	0-4	0.29 (0.46)	0(1.00)	0-1

SD, standard deviation; IQD, interquartile deviation; NOT-S, Nordic orofacial test-screening
 $p > 0,05$ (difference between no malocclusion group and malocclusion groups, Mann-Whitney test)
 Spacing not considered; Lateral edge-to-edge bite (n=1) no statistical is need

Table 6. NOT-S total, interview and exam scores according malocclusion groups in Permanent Dentition (n=385).

Malocclusions	Categories	n	NOT-S total			NOT-S interview			NOT-S exam		
			Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range
No malocclusion		36	1.50 (1.11)	1.00 (1.00)	0-4	1.45 (1.05)	1.00 (1.00)	0-4	0.06 (0.23)	0 (0)	0-1
Crowding	1 segment	90	1.79 (1.15)	2.00 (1.00)	0-6	1.56 (1.02)	1.00 (1.00)	0-5	0.24 (0.45)	0 (0)	0-2
	2 segments	78	1.78 (1.11)	2.00 (2.00)	0-4	1.59 (1.02)	1.00 (1.00)	0-4	0.19 (0.43)	0 (0)	0-2
Spacing	1 segment	59	1.97 (1.05)	2.00 (2.00)	0-4	1.73 (1.00)	2.00 (1.00)	0-4	0.24 (0.43)	0 (0)	0-1
	2 segments	27	1.67 (1.04)	1.00 (1.00)	0-4	1.52 (0.90)	1.00 (1.00)	0-3	0.15 (0.36)	0 (0)	0-1
Posterior sagittal relationships	Unilateral Class II	49	1.63 (0.99)	2.00 (1.00)	0-4	1.47 (0.94)	1.00 (1.00)	0-4	0.16 (0.37)	0 (0)	0-1
	Bilateral Class II	52	1.94 (1.02)	2.00 (2.00)	0-4	1.63 (0.99)	1.50 (1.00)	0-4	0.31 (0.47)	0 (1.00)	0-1
	Unilateral Class III	22	2.32 (1.21)	2.00 (2.75)	1-6	1.95 (1.00)	2.00 (2.00)	1-4	0.36 (0.58)	0 (1.00)	0-2
			$p^*=0.017$								
	Bilateral Class III	36	1.64 (1.27)	1.00 (1.00)	0-4	1.50 (0.93)	1.00 (1.00)	0-4	0.14 (0.35)	0 (0)	0-1
Anterior sagittal relationships	Negative overjet	4	1.00 (0.82)	1.00 (0.50)	0-2	1.00 (0.82)	1.00 (0.50)	0-2	0 (0)	0 (0)	0-0
	Increased overjet	204	1.75 (1.12)	2.00 (1.00)	0-6	1.54 (1.00)	1.00 (1.00)	0-4	0.21 (0.44)	0 (0)	0-2
	Isolated crossbite	20	1.40 (1.19)	1.00 (1.25)	0-4	1.25 (1.07)	1.00 (1.25)	0-4	0.15 (0.37)	0 (0)	0-1
Posterior Transversal Relationships	Unilateral crossbite	30	2.10 (1.16)	2.00 (2.00)	0-4	1.83 (1.05)	2.00 (1.00)	0-4	0.27 (0.45)	0 (0.75)	0-1
			$p^*=0.045$								
	Bilateral crossbite	5	3.00 (1.41)	4.00 (2.00)	1-4	2.40 (0.89)	3.00 (1.00)	1-3	0.60 (0.55)	1.00 (1.00)	0-1
			$p^*=0.036$								

Table 6 continued

Malocclusions	Categories	n	NOT-S total			NOT-S interview			NOT-S exam		
			Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range	Mean (SD)	Median (IQD)	Score range
Anterior Vertical Relationships	Overbite	16	1.56 (0.81)	1.50 (2.00)	0-3	1.31 (0.87)	1.00 (1.00)	0-3	0.25 (0.45)	0 (0.25)	0-1
	Frontal open bite	18	2.28 (1.23)	2.00 (2.00)	1-4	1.83 (0.92)	2.00 (1.75)	0-3	0.44 (0.51)	0 (1.00)	0-1

$p^* = 0.046$

SD, standard deviation; IQD, interquartile deviation; NOT-S, nordic orofacial test-screening

* p value obtained from Mann-Whitney test (difference between no malocclusion group and malocclusion groups)

Posterior Transversal Relationships Lateral edge-to-edge bite n=0

Table 7. NOT-S total, interview and exam scores according dentition groups and gender.

	Primary Dentition			Intermediate Mixed Dentition			Late Mixed Dentition			Permanent Dentition		
	Total (n=387)	Male (n=200)	Female (n=187)	Total (n=387)	Male (n=208)	Female (n=179)	Total (n=402)	Male (n=177)	Female (n=225)	Total (n=385)	Male (n=160)	Female (n=225)
NOT-S total												
Mean (SD)	1,48 ^a (0,97)	1,55 (1,03)	1,41 (0,90)	1,90 ^{bc} (1,19)	1,88 (1,22)	1,93 (1,16)	1,94 ^b (1,15)	1,86 (1,13)	2,00 (1,16)	1,72 ^c (1,09)	1,55 (1,04)	1,85 [*] (1,11)
Median (IQD)	1.00 (1.00)	1.00 (1.00)	1.00 (1.00)	2.00 (2.00)	2.00 (2.00)	2.00 (2.00)	2.00 (2.00)	2.00 (2.00)	2.00 (2.00)	2.00 (1.00)	1.00 (1.00)	2.00 (1.00)
Score range	0-3	0-5	0-4	0-7	0-7	0-5	0-5	0-5	0-5	0-6	0-4	0-6
NOT-S interview												
Mean (SD)	1.13 ^a (0.78)	1,19 (0.84)	1,07 (0.71)	1,63 ^{bc} (1.04)	1,57 (1.01)	1,70 ^{***} (1.06)	1,76 ^b (1.03)	1,64 (0.95)	1,84 (1.08)	1,57 ^c (1.00)	1,36 (0.95)	1,72 ^{**} (1.01)
Median (IQD)	1.00 (1.00)	1.00 (1.00)	1.00 (0.00)	2.00 (1.00)	2.00 (1.00)	2.00 (1.00)	2.00 (1.00)	2.00 (1.00)	2.00 (2.00)	1.00 (1.00)	1.00 (1.00)	2.00 (1.00)
Score range	0-3	0-3	0-3	0-4	0-4	0-4	0-5	0-4	0-2	0-5	0-4	0-5
NOT-S exam												
Mean (SD)	0.34 ^a (0.56)	0.36 (0.00)	0.33 (0.57)	0.27 ^a (0.51)	0.31 (0.56)	0.23 ^{***} (0.43)	0.18 ^b (0.41)	0.22 (0.45)	0.15 (0.37)	0.16 ^b (0.38)	0.19 (0.41)	0.13 (0.36)
Median (IQD)	0.00 (1.00)	0.56 (1.00)	0.00 (1.00)	0.00 (0.00)	0.00 (1.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Score range	0-2	0-2	0-2	0-3	0-3	0-2	0-2	0-2	0-2	0-2	0-2	0-2

SD, standard deviation; IQD, interquartile deviation; NOT-S, nordic orofacial test-screening

Different letters in the same line are significative different (difference between dentition groups, Kruskal-Wallis test, $p < 0.05$).

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (difference between gender for each group of dentition, Mann-Whitney test)

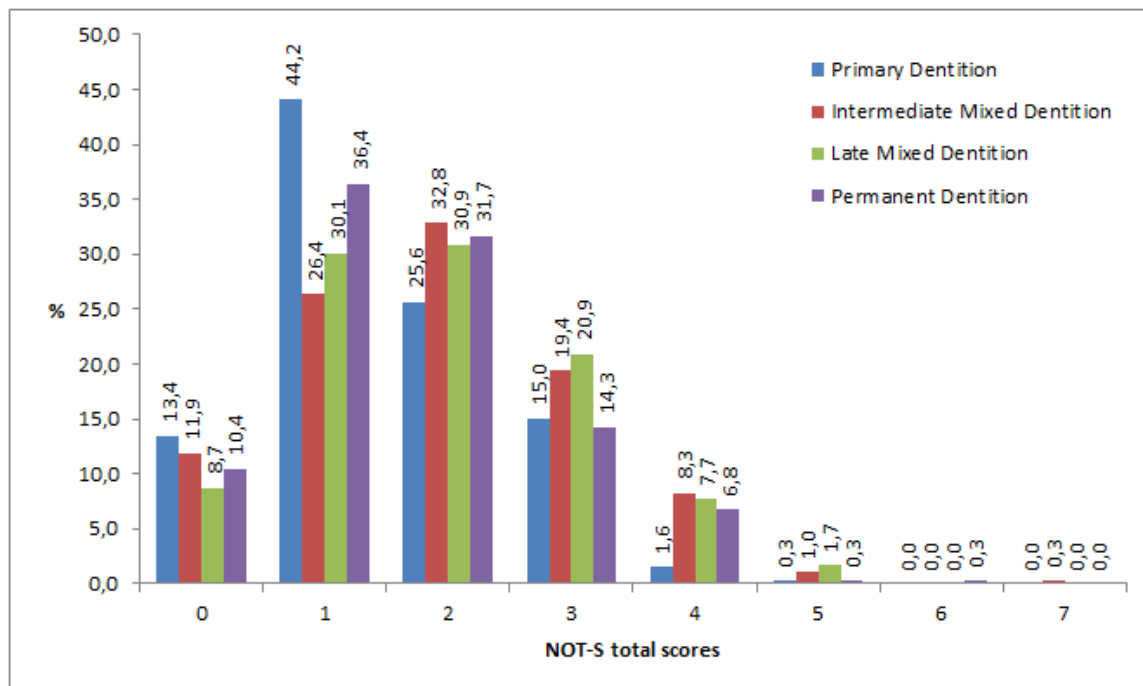


Figure 1. NOT-S total scores distribution (%) according to dentition groups.

CAPÍTULO 2

Relationship between anxiety symptoms and deleterious oral habits in children and adolescents

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Abstract

Deleterious oral habits (DOH) are orofacial dysfunction with anxiety as a possible etiological factor. In this way, the present study aimed to evaluate the relationship between DOH and symptoms of anxiety in children and adolescents aged from 7 to 14 year-old. Subjects (n=1174) were divided in 3 groups: Intermediate mixed dentition (IMD, n=387), Late mixed dentition (LMD, n=402) and Permanent dentition (PD, n=385). The assessment of DOH was done using the domain III (Habits) of the NOT-S, when subjects were divided in Habit group and Habit free group and anxious symptoms were assessed using the Multidimensional Anxiety Scale for Children (MASC). Data were analysed descriptively and with Chi-squared, Mann-Whitney and Kruskal-Wallis tests. The prevalence of DOH was 69.5 % in IMD, 78.9% in LMD and 77.1% in PD. The most frequent one in the assessed groups was nail biting. MASC scores were higher in females in LMD and PD. Habit groups presented more symptoms of anxiety when compared to Habit free group in IMD, LMD and PD. As conclusion children and adolescents with DOH presented significant more symptoms of anxiety.

Key-words: Children. Adolescents. Habits. Anxiety.

Introduction

Habit can be defined as an automatism, a learned stimulus, that with practice, can become unconscious and incorporated to personality. Oral habits are defined as learned patterns of muscular contraction (Moyers, 1991). They are defined as normal, when contribute for the establishment of normal occlusion and facial growth and are defined as deleterious oral habits (DOH) when are considered potential etiological factors for malocclusions and altered facial growth. They can be divided as non-nutritive sucking habits (pacifier and thumb/finger sucking), biting habits (objects, lips, cheeks, bruxism, nail biting) and functional habits (mouth breathing, atypical swallowing, tongue interposition) (Bonsjak, 2002).

A wide range of frequencies of DOH are reported in the literature, from 9.9 to 34.1% (Shetty and Munshi, 1998; Onyeaso and Isiekwe, 2008; Quashie-Williams et al.,

2010) on international studies, and from 70 to 83.1% on Brazilian ones (Leite-Cavalcanti et al., 2007; Hebling et al., 2008; Leme et al., 2013). DOH can interfere on stomatognathic system functions (Felfício et al., 2003) and are usually related to be an etiological factor of malocclusions. The negative effects of oral habits will depend of their frequency, intensity and duration, as well as the type of habit and individual hereditary growth patterns (Hebling et al., 2008).

Two behavioral theories have been used to explain the etiology of oral habits, especially nonnutritive sucking habits: the psychoanalytic, proposed by Freud, and the learning theory (Johnson and Larson, 1993). Both theories believe that some developmentally normal conditions, promote the origin of nonnutritive sucking habits. According to psychoanalytic theory, sucking habits are a pleasurable stimulation of lips and mouth. The learning theory supports that sucking habits are adaptive response (Johnson and Larson, 1993; Bayardo et al., 1996; Vanderas et al., 2001). It is expected that by the age of three years, the majority of children have ceased with oral habits (Johnson and Larson, 1993; Fukuta et al., 1996). For children that continued with habits beyond this age, the psychoanalytic theory suggest that is an indicative of psychological disturbance, caused by an inability to cope with life's stress (Johnson and Larson, 1993). However, the learning theory believes that it is just a learned habit. According to psychoanalytic theory a possible etiological factor for DOH is anxiety (Bayardo et al., 1996).

Anxiety can be defined as the anticipation of future harm or misfortune, accompanied by a feeling of dysphoria (unpleasantness) and/or somatic symptoms of tension. It is an alert signal that can warn of imminent danger and allows the person to take the necessary measures to confront a threat. Because of this, anxiety is considered a normal and, even desirable, feeling or emotional state to deal with day-today situations. When it exceeds a certain intensity or the person's adaptive capacity, anxiety become pathological, with physical, psychological, and behavioral symptoms. In this way, anxiety disorders are characterized by the presence of excessive worry, fear and tension (Guideline Working Group for the Treatment of Patients with Anxiety Disorders in Primary Care, 2008).

In this way, the present study aimed to evaluate the relationship between DOH and anxiety symptoms in children and adolescents.

Methods

This research was approved by the Ethics Committee in Research of Piracicaba Dental School – University of Campinas (CEP-FOP; protocol number 106/2010). A cross-sectional study was carried out in the city of Piracicaba, state of São Paulo, Brazil, with 1,174 children and adolescents aged from 7 to 14 year-old that were divided in three groups according to the phase of dentition:

Group IMD – Intermediate Mixed Dentition: characterized by the presence of permanent incisors and first molars fully erupted and presence of deciduous canine, first molar and second molar, aged from 7 to 8 year-old.

Group LMD – Late Mixed Dentition: characterized by shedding of deciduous canines and molars and eruption of permanent canines and premolars, aged from 10 to 11 year-old.

Group PD – Permanent Dentition: phase of early permanent dentition with all permanent teeth (possible presence of second molars, but absence of third molars), aged from 12 to 14 year-old.

These subjects were examined in relation to the presence of deleterious oral habits and answered a questionnaire that assesses anxious symptoms.

To calculate a representative sample for each group it was established a standard error of 5%, a tolerable error of 5%, and an estimated prevalence of 50%, that result in a minimum of 384 subjects in each group.

Thirteen public schools were chosen at random, by lottery, to have their children to participate. Signed parent permission was required to subjects to participate. Exclusion criteria were: inadequate behavior during exam and refusal to answer the questionnaire

Assessment of deleterious oral habits

For assessment of DOH it was used the domain III (Habits) of the Nordic Orofacial Test – Screening (NOT-S) protocol, which was developed by Bakke et al. (2007) and was translated and culturally adapted to Brazilian Portuguese by Leme et al. (2012). This protocol consists of a structured interview and a clinical examination. The domain III

of NOT-S' interview assesses orofacial dysfunction caused by the presence of oral habits and consists of three questions. All subjects answered the interview questions without parental/guardian assistance, based on a pilot test conducted by this research group that verified that children older than 7 years old are able to answer the interview questions by themselves. The subjects were classified as Habit group if they answered YES to at least one of the three questions in domain III of NOT-S and as Habit free group, if they answered NO to all questions in domain III of NOT-S. On asking the questions of domain III, the type of habits informed by subjects was registered, being detected, as following, nail biting, lip biting or sucking, thumb or finger sucking, pacifier sucking, bottle sucking, cheek biting, tooth grinding, tongue biting and pencil or pen biting.

The domain III of NOT-S was applied individually by the same researcher on a vacant class.

Evaluation of anxious symptoms

Anxiety symptoms data were collected using the Portuguese version of the Multidimensional Anxiety Scale for Children (MASC) (developed by March et al., 1997 and translated and validated to Brazilian Portuguese by Nunes, 2004). The MASC is a self-reported instrument that evaluates the level of anxiety symptoms in children and adolescents with 39 items answered on a Likert 4-point scale, with 0 indicating “never true about me”, 1 indicating “rarely true about me”, 2 indicating “sometimes true about me”, and 3 indicating “often true about me”.

The MASC was developed to assess a wide spectrum of common anxiety symptoms and for this, it is divided in four domains: physical symptoms (tense/restless and somatic/autonomic), harm avoidance (anxious coping and perfectionism), social anxiety (humiliation/rejection and public performance fears), and separation anxiety. Higher scores on total MASC and on four domains indicate more severe anxiety symptoms.

Statistical analysis

Collected data were statistically assessed using BioEstat 5.3 program (Mamirauá, Belém, PA, Brazil). Data abnormally distribution was verified with

Kolmogorov-Smirnov test, and non-parametric tests were used. Descriptive analyses consisted of means, standard deviation, medians, interquartile deviation and percentages.

Type of habits distribution accordingly to dentition groups, was verified using Chi squared partition and independence tests. The proportion of habits accordingly to gender was verified using Chi squared independence test.

Differences in relation to MASC total and domains scores among dentition groups and between genders were verified using Kruskal-Wallis and Mann-Whitney tests, respectively. For each dentition group it was verified the difference on MASC total and domains scores comparing habit free group and the different habit groups assessed. P-values less than 0.05 were considered statistically significant.

Results

Table 1 shows the distribution of deleterious oral habits. 69.5%, 78.9% and 77.1% of subjects presented at least one type of oral habits on IMD, LMD and PD, respectively. The most frequent one was nail biting in the three assessed dentition groups. Lip, cheek and pencil/pen biting habits have their frequencies increased from IMD to PD groups and bottle and thumb/finger sucking habits presented a significant frequency decrease. The DOH presented a similar distribution according genders.

Table 2 presents MASC total and domains scores accordingly dentition groups and gender. Females presented higher MASC total and domains scores compared to males in LMD and PD groups.

Tables 3, 4 and 5 shows means and medians of MASC total and domains scores of habit free group and the sort of habit assessed groups in IMD, LMD and PD groups. With exception of pacifier and bottle sucking habit groups, the other groups of habits presented higher MASC total scores compared to habit free group.

Discussion

Anxiety disorders constitute the most common type of psychiatric disorders in childhood (Mazzone et al., 2007). Brazilian prevalence vary from 4.6 to 5.8% in children

and adolescents, respectively (Fleitlich-Bilyk and Goodman, 2004), and in international data present frequencies from 2.4 to 13% (Spence, 1998; Costello et al., 2003). Children and adolescents are characterized as having chronic courses and debilitating consequences, this fact evidence the importance of early detection and intervention (Yen et al., 2010). With this intent, instruments for pathological anxiety assessment in children and adolescents, which may differentiate from fears occurring as part of normal development process, were developed. In this way the MASC was chosen because it is a well-established instrument and are available in many languages, making possible international data comparison (Silverman and Ollendick, 2005; Yao et al., 2007; Mazzone et al., 2007; Yen et al., 2010; Ivarsson, 2006).

As showed in our results, female presented higher MASC scores in LMD and PD, as previously observed (March et al., 1997; Ólason et al., 2004; Yao et al., 2007; Yen et al., 2010; Ivarsson, 2006). Some explanations for differences between genders in relation to anxiety are: differences in social pressures related to social competence and body image (Fincham et al., 2008) and hormonal changes (Dell'Osso et al. 2002; Mazzone et al. 2007). Estrogens have been reported to influence anxiety symptoms (Pigott, 2003) as hypothalamic pituitary adrenal axis dysregulation (Stroud et al., 2002). In this context, Brazilian studies suggest that menarche age in Brazilian girls occur around of 12 year-old (Castilho et al., 2014; Borges and Junior 2000), this fact can justify higher MASC scores on girls in LMD and PD (11-12 and 12-14 year-old, respectively) once menarche marks a transition in the risk of depression and anxiety disorders in girls. (Patton et al., 1996; Miller et al., 2009; van Veen et al., 2009).

A high frequency of DOH was observed in the studied population (69.5%, 78.9% and 77.1% in IMD, LMD and PD respectively). Brazilian data for the same age group presents frequencies from 60.8% to 80.8% (Vasconcelos et al 2009; Albuquerque Junior et al., 2007; Leme et al., 2013). International results for children and adolescents present rates from 51%, 34%, 29.7%, 25.5% and 9.9% (Garde et al., 2014; Quashie-Williams et al., 2010; Onyeaso et al., 2004; Kharbanda et al., 2003 and Shetty and Munshi, 1998). Nail biting was the most frequent DOH in this report, with is in line with previous Brazilian results (Vasconcelos et al., 2009; Albuquerque Junior et al., 2007; Thomaz et al., 2013 and Leme et al., 2013) and with Shetty and Munshi, 1998, but is in contrast with

international data, which reports bruxism, digit sucking and tongue thrust as the most frequent habits (Onyeaso et al., 2004; Kharbanda et al., 2003; Quashie-Williams et al., 2010; Garde et al., 2014). These differences may be explained by the fact that these papers, which reports lower prevalences of DOH and different habits as the most frequent, were conducted in India and Nigeria. Our results are in line with previous Brazilian ones, and these findings seem to be a national characteristic, being a high frequency of DOH found in Brazil and nail biting being the most common DOH in Brazilian children and adolescents. Moreover, it was observed by Tanaka et al. (2008) that this habit is first observed from 4 to 6 year-old and had its frequency increased considerably during adolescence, supporting our findings.

Lip, cheek and pencil/pen biting were the habits that had significant increased frequencies from IMD to PD groups, this could be explained by the fact that these habits are socially accepted methods of oral gratification, being good ways to transfer sucking and nail biting habits (Tanaka et al., 2008). On the other hand, bottle and thumb/finger sucking presented a significant frequency decrease. Sucking habits tend to be spontaneously abandoned during the third and fourth year of life (Fukuta et al., 1996), because of this fact the sucking habits frequency obtained in this study was low with a tendency to being eliminated during LMD and PD.

DOH presented similar distribution according gender for habits groups, also for nail biting one. To date, there is no consensus in the literature regarding the prevalence of oral habits and their association with gender. While some studies report that females have more oral habits than males (Shetty and Munshi 1998; Stahl et al., 2007; Winocur et al., 2006; Thomaz et al., 2013 and Grade et al., 2014), others found no difference between genders (Bosnjak et al., 2002; Stahl et al., 2007, Hebling et al., 2008 and Kharbanda et al., 2003).

The presence of DOH had a significant increase from IMD to LMD. This result can be explained by the fact that mean total MASC scores also had a significant increase from IMD to LMD, being similar in PD. It has been widely suggested in the literature that DOH are linked to emotional and/or psychological problems, like a found way to escape from pressures, tensions, frustrations, insecurity and boring. All these situations have a

common phenomenon between them, the anxiety (Tanaka et al., 2008; American Dental Association, 2007; Jones and Swearer, 1997; Sachan and Chaturvedi, 2012; Pearson, 1948).

Our results showed that all groups of habits presented significantly higher MASC scores when compared to habit free group, in all the three assessed groups (IMD, LMD and PD), with exception of pacifier and bottle sucking habit groups. We believe that in these two groups difference in MASC scores were no significant because of the sample size ($n \leq 6$), once sucking habits are no frequent in the assessed age (Fukuta et al., 1996). The positive relationship between DOH and anxiety has been widely suggested in the literature, but they were based in psychological theories and clinical observation (Tanaka et al., 2008; American Dental Association, 2007; Jones and Swearer, 1997; Sachan and Chaturvedi, 2012; Pearson, 1948). Deardoff et al., 1974 tried to prove this association but did not found significant difference relating nail biting and anxiety.

This finding association between anxiety symptoms and DHO evidences the importance of multidisciplinary treatment of DHO. Children and adolescents should be given emotional support and encouragement. Behavioral modification techniques, positive reinforcements, and regular follow-ups are important aspects of treatment this kind of approach (Tanaka et al., 2008; Thomaz et al., 2013; American Dental Association, 2007).

Conclusions

The present study showed that children and adolescents with DOH presented significant more symptoms of anxiety.

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Table 1. Habits distribution [n(%)] according dentition groups and gender (only significant p-values are shown).

Habits	Intermediate mixed dentition			Late mixed dentition			Permanent dentition			<i>p</i> ^b value
	Total (n=387)	Male (n=208)	Female (n=179)	Total (n=402)	Male (n=177)	Female (n=225)	Total (n=385)	Male (n=160)	Female (n=225)	
Habit free	118 (30.5)	69 (33.2)	49 (27.4)	85 (21.1)	39 (22.0)	46 (20.4)	88 (22.9)	44 (27.5)	44 (19.6)	0.046
				<i>p</i> ^a =0.019						
Nail biting	170 (43.9)	87 (41.8)	83 (46.4)	217 (54.0)	95 (53.7)	122 (54.2)	198 (51.4)	75 (46.9)	123 (54.7)	
Tongue biting	31 (8.0)	15 (7.2)	16 (8.9)	25 (6.2)	9 (5.1)	16 (7.1)	31 (8.1)	13 (8.1)	18 (8.0)	
Lip biting	39 (10.1)	21 (10.1)	18 (10.1)	64 (15.9)	25 (14.1)	39 (17.3)	96 (24.9)	34 (21.3)	62 (27.6)	<0.0001
							<i>p</i> ^a <0.0001			
Cheek biting	59 (15.2)	31 (14.9)	28 (15.6)	64 (15.9)	22 (12.4)	42 (18.7)	85 (22.1)	23 (14.4)	62 (27.6)	
							<i>p</i> ^a =0.023		<i>p</i> ^c =0.018	
Thumb or finger sucking	42 (10.9)	21 (10.1)	21 (11.7)	38 (9.5)	10 (5.6)	28 (12.4)	6 (1.6)	0	6 (2.7)	<0.0001
							<i>p</i> ^a <0.0001			
Pencil or pen biting	52 (13.4)	21 (10.1)	31 (17.3)	77 (19.2)	23 (13.0)	54 (24.0)	113 (29.4)	35 (21.9)	78 (34.7)	<0.0001
							<i>p</i> ^c =0.029		<i>p</i> ^a <0.0001	
Grinding	61 (15.8)	25 (12.0)	36 (20.1)	72 (17.9)	33 (18.6)	39 (17.3)	51 (13.2)	14 (8.8)	37 (16.4)	
Pacifier sucking	6 (1.6)	3 (1.4)	3 (1.7)	5 (1.2)	1 (0.6)	4 (1.8)	1 (0.3)	0	1 (0.4)	
Bottle sucking	5 (1.3)	1 (0.5)	4 (2.2)	0	0	0	0	0	0	0.006
				<i>p</i> ^a =0.005						

^aChi-squared partition test; ^bChi-squared Independence test (difference among dentition groups)

^c*p*-value obtained from Chi-squared Independence test (difference between genders)

Table 2. MASC scores (total and domains) according dentition groups and gender (only significant p-values are shown).

	Intermediate mixed dentition			Late mixed dentition			Permanent dentition		
	Total (n=387)	Male (n=208)	Female (n=179)	Total (n=402)	Male (n=177)	Female (n=225)	Total (n=385)	Male (n=160)	Female (n=225)
MASC total									
Mean (SD)	39.8 ^a (18.5)	39.0 (18.1)	40.6 (19.1)	46.0 ^b (17.7)	41.7 ^{***} (16.1)	49.3 ^{***} (18.2)	46.4 ^b (18.2)	40.0 ^{***} (16.5)	50.9 ^{***} (18.1)
Median (IQD)	40.0 (25.5)	39.0 (24.0)	40.0 (27.0)	45.0 (23.0)	42.0 (22.0)	49.0 (26.0)	46.0 (25.0)	38.0 (23.0)	50.0 (25.0)
Physical symptoms									
Mean (SD)	8.1 ^a (6.8)	8.4 (6.9)	7.8 (6.6)	9.4 ^b (6.6)	8.4 [*] (6.2)	10.1 [*] (6.8)	9.6 ^b (6.7)	8.0 ^{***} (6.0)	10.8 ^{***} (6.9)
Median (IQD)	6.0 (9.0)	6.0 (10.0)	6.0 (8.0)	9.0 (7.0)	7.0 (9.0)	9.0 (9.0)	9.0 (10.0)	7.0 (7.0)	10.0 (9.0)
Separation anxiety									
Mean (SD)	9.2 ^a (5.3)	8.6 [*] (5.1)	10.0 [*] (5.5)	9.5 ^{ab} (5.2)	8.1 ^{***} (4.7)	10.6 ^{***} (5.3)	8.4 ^{ac} (4.9)	6.5 ^{***} (4.2)	9.8 ^{***} (4.9)
Median (IQD)	8.0 (8.0)	8.0 (7.0)	9.0 (8.0)	9.0 (7.0)	7.0 (6.0)	10.0 (7.0)	8.0 (6.0)	6.0 (6.0)	10.0 (7.0)
Social anxiety									
Mean (SD)	8.7 ^a (5.8)	8.6 (5.6)	8.9 (6.0)	10.7 ^b (6.2)	9.6 ^{**} (5.9)	11.6 ^{**} (6.3)	11.6 ^b (6.4)	9.8 ^{***} (6.1)	12.8 ^{***} (6.3)
Median (IQD)	8.0 (9.0)	8.0 (8.0)	8.0 (9.0)	11.0 (9.0)	9.0 (9.0)	12.0 (9.0)	11.0 (10.0)	9.0 (10.0)	13.0 (9.0)
Harm avoidance									
Mean (SD)	13.7 ^a (6.1)	13.5 (6.1)	13.9 (6.2)	16.4 ^b (5.6)	15.6 ^{**} (5.5)	17.0 ^{**} (5.6)	16.7 ^b (5.7)	15.7 ^{**} (5.2)	17.5 ^{**} (5.9)
Median (IQD)	14.0 (9.0)	14.0 (8.0)	14.0 (10.0)	17.0 (7.0)	16.0 (7.0)	18.0 (7.0)	17.0 (8.0)	17.0 (8.0)	18.0 (7.0)

MASC, multidimensional anxiety scale for children; SD, standard deviation; IQD, interquartile deviation; ns, not significant

Different letters in the same line mean significative difference (difference among dentitions Kruskal-Wallis test, $p < 0.05$).

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (gender difference for each dentition group, Mann-Whitney test)

Table 3. MASC scores (total and domains) comparing habit free with habit groups in Intermediate mixed dentition (n=387).

Only significant p-values are shown.

Groups	N	MASC total		MASC domains							
				Physical symptoms		Separation anxiety		Social anxiety		Harm avoidance	
		Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)
Habit free	118	33.2 (15.4)	33.5 (21.0)	6.2 (5.5)	5.0 (8.0)	7.9 (4.4)	8.0 (5.8)	6.7 (5.0)	6.0 (6.8)	12.4 (6.1)	12.0 (9.0)
Nail biting	170	43.8 (18.7)	42.5 (25.5)	9.1 (7.4)	7.0 (9.0)	10.3 (5.6)	9.5 (8.0)	10.0 (5.8)	9.0 (7.8)	14.5 (5.7)	14.5 (7.8)
		$p^* < 0.0001$		$p^* = 0.0008$		$p^* = 0.001$		$p^* < 0.0001$		$p^* = 0.008$	
Tongue biting	31	56.0 (22.4)	55.0 (24.5)	14.5 (8.2)	14.0 (11.0)	13.1 (6.5)	12.0 (8.5)	12.2 (6.2)	12.0 (9.5)	16.1 (5.9)	16.0 (7.5)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.003$	
Lip biting	39	44.9 (17.7)	43.0 (18.0)	10.0 (7.2)	10.0 (9.0)	9.9 (5.5)	9.0 (7.0)	10.2 (5.8)	10.0 (7.0)	14.7 (5.2)	16.0 (5.0)
		$p^* = 0.0001$		$p^* = 0.0003$		$p^* = 0.035$		$p^* = 0.0005$		$p^* = 0.034$	
Cheek biting	59	42.6 (19.8)	40.0 (29.5)	9.7 (7.4)	7.0 (10.0)	8.5 (6.0)	7.0 (6.5)	9.8 (6.1)	9.0 (9.5)	14.6 (6.2)	15.0 (9.0)
		$p^* = 0.005$		$p^* = 0.0022$				$p^* = 0.001$		$p^* = 0.037$	
Thumb or finger sucking	42	48.7 (21.7)	46.0 (26.8)	10.4 (7.7)	9.0 (9.0)	11.5 (5.8)	11.0 (7.8)	12.7 (5.7)	12.0 (7.5)	14.1 (6.5)	15.0 (8.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.0003$		$p^* < 0.0001$			
Pencil or pen biting	52	44.3 (16.7)	45.0 (23.3)	9.5 (6.5)	8.5 (9.3)	10.8 (4.8)	11.0 (6.3)	10.2 (5.5)	10.5 (10.0)	13.8 (6.4)	14.5 (10.3)
		$p^* < 0.0001$		$p^* = 0.0018$		$p^* = 0.0004$		$p^* = 0.0002$			
Grinding	61	48.3 (24.2)	45.0 (27.0)	11.1 (8.9)	9.0 (12.0)	10.6 (6.9)	9.0 (10.0)	11.2 (6.9)	11.0 (9.0)	15.4 (6.2)	16.0 (10.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.033$		$p^* < 0.0001$		$p^* = 0.003$	

Table 3 continued

Groups	N	MASC total		MASC domains							
				Physical symptoms		Separation anxiety		Social anxiety		Harm avoidance	
		Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)
Pacifier sucking	6	41.8 (38.7)	28.0 (25.5)	8.0 (13.9)	3.0 (5.0)	11.2 (8.5)	9.0 (7.0)	9.8 (9.6)	8.0 (8.0)	12.8 (8.1)	11.0 (8.0)
Bottle sucking	5	40.2 (13.4)	37.0 (15.0)	4.0 (3.5)	3.0 (4.0)	10.2 (5.2)	11.0 (4.0)	8.4 (4.6)	7.0 (3.0)	17.6 (4.7)	18.0 (7.0)

MASC, multidimensional anxiety scale for children; SD, standard deviation; IQD, interquartile deviation

**p* value obtained from Mann-Whitney test (difference between habit free group and each habit group)

Table 4. MASC scores (total and domains) comparing habit free with habit groups in late mixed dentition (n=402).

Groups	N	MASC total		MASC domains							
				Physical symptoms		Separation anxiety		Social anxiety		Harm avoidance	
		Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)
Habit free	85	38.7 (18.2)	38.0 (23.0)	6.6 (5.5)	5.0 (7.0)	8.1 (5.3)	8.0 (6.0)	8.2 (6.5)	7.0 (9.0)	15.8 (6.1)	17.0 (8.0)
Nail biting	217	49.3 (16.7)	47.0 (21.0)	10.3 (6.7)	10.0 (9.0)	10.0 (5.2)	9.0 (7.0)	12.0 (5.9)	12.0 (8.0)	17.0 (5.2)	17.0 (8.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.005$		$p^* < 0.0001$		Ns	
Tongue biting	25	55.3 (15.5)	56.0 (23.0)	15.2 (6.8)	13.0 (8.0)	10.5 (5.0)	11.0 (5.0)	12.7 (5.5)	14.0 (7.0)	16.9 (6.1)	17.0 (7.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.033$		$p^* = 0.001$		Ns	
Lip biting	64	51.4 (17.0)	50.0 (21.5)	10.6 (6.5)	10.0 (8.3)	10.5 (5.1)	10.0 (6.3)	12.4 (6.3)	12.0 (10.0)	17.8 (5.0)	18.0 (8.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.004$		$p^* < 0.0001$		Ns	
Cheek biting	64	50.3 (17.5)	49.0 (28.0)	11.8 (6.6)	12.5 (11.0)	10.5 (5.8)	9.5 (8.0)	11.4 (5.8)	11.0 (7.3)	16.5 (5.3)	17.0 (8.3)
		$p^* = 0.0001$		$p^* < 0.0001$		$p^* = 0.012$		$p^* = 0.001$		Ns	
Thumb or finger sucking	38	49.3 (19.0)	48.5 (27.3)	10.4 (6.5)	10.5 (10.5)	12.2 (5.4)	12.0 (6.8)	11.2 (5.8)	11.5 (8.8)	15.5 (5.7)	16.0 (8.5)
		$p^* = 0.003$		$p^* < 0.001$		$p^* = 0.0003$		$p^* = 0.006$		Ns	
Pencil or pen biting	77	50.1 (18.6)	50.0 (26.0)	11.5 (7.2)	11.0 (9.0)	10.5 (5.2)	11.0 (7.0)	12.0 (6.3)	12.0 (9.0)	16.0 (5.4)	16.0 (8.0)
		$p^* = 0.0001$		$p^* < 0.0001$		$p^* = 0.002$		$p^* = 0.0002$		Ns	
Grinding	72	50.3 (17.5)	49.5 (18.5)	12.2 (7.2)	11.0 (9.0)	9.9 (5.7)	8.5 (7.0)	11.6 (5.9)	11.0 (9.3)	16.6 (5.1)	17.0 (7.0)
		$p^* < 0.0001$		$p^* < 0.0001$		Ns		$p^* = 0.0004$		Ns	

Table 4 continued

Groups	N	MASC domains									
		MASC total		Physical symptoms		Separation anxiety		Social anxiety		Harm avoidance	
		Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)
Pacifier sucking	5	45.8 (24.1)	35.0 (39.0)	12.4 (5.8)	10.0 (5.0)	9.0 (5.8)	10.0 (11.0)	13.0 (7.6)	11.0 (9.0)	11.4 (9.3)	14.0 (12.0)
		Ns		$p^* < 0.022$		Ns		ns		Ns	

MASC, multidimensional anxiety scale for children; SD, standard deviation; IQD, interquartile deviation; ns, not significant

* p value obtained from Mann-Whitney test (difference between habit free group and each habit group)

No child with bottle sucking

Table 5. MASC scores (total and domains) comparing habit free with habit groups in permanent dentition (n=385)

Groups	N	MASC total		MASC domains							
				Physical symptoms		Separation anxiety		Social anxiety		Harm avoidance	
		Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)	Mean (SD)	Median (IQD)
Habit free	88	39.5 (16.7)	39.0 (21.3)	7.2 (5.4)	7.0 (7.0)	7.4 (4.9)	7.0 (6.0)	9.0 (6.0)	7.0 (9.0)	15.9 (5.8)	17.0 (6.5)
Nail biting	198	49.8 (18.5)	48.0 (26.0)	11.0 (7.3)	10.0 (10.0)	9.3 (5.0)	9.0 (6.0)	12.4 (6.3)	13.0 (10.0)	17.0 (5.5)	18.0 (7.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.001$		$p^* < 0.0001$		ns	
Tongue biting	31	50.3 (16.7)	44.0 (26.5)	12.4 (6.8)	10.0 (10.0)	9.4 (5.3)	9.0 (8.0)	12.4 (5.3)	12.0 (6.0)	16.2 (3.8)	16. (5.0)
		$p^* = 0.004$		$p^* = 0.0001$		$p^* = 0.044$		$p^* = 0.002$		ns	
Lip biting	96	51.3 (20.1)	53.5 (28.3)	11.9 (7.4)	11.0 (9.0)	9.1 (5.3)	9.0 (10.0)	13.4 (6.6)	13.5 (9.3)	16.8 (5.9)	18.0 (10.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.017$		$p^* < 0.0001$		ns	
Cheek biting	85	50.4 (19.4)	48.0 (28.0)	10.9 (7.0)	10.0 (9.0)	9.4 (5.3)	9.0 (7.0)	12.8 (6.5)	13.0 (9.0)	17.3 (5.4)	18.0 (7.0)
		$p^* = 0.0002$		$p^* = 0.0002$		$p^* = 0.006$		$p^* = 0.0003$		ns	
Thumb or finger sucking	6	57.7 (18.2)	54.5 (13.3)	16.7 (6.5)	15.5 (4.8)	10.0 (4.4)	10.5 (5.5)	15.5 (5.8)	15.0 (5.0)	15.5 (4.2)	14.5 (5.5)
		$p^* = 0.018$		$p^* = 0.001$		Ns		$p^* = 0.019$		ns	
Pencil or pen biting	113	52.4 (17.2)	51.0 (25.0)	12.1 (7.0)	11.0 (7.0)	9.8 (5.0)	10.0 (7.0)	13.5 (5.8)	13.0 (9.0)	17.0 (5.4)	18.0 (7.0)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.0004$		$p^* < 0.0001$		ns	

Table 5 continued

		MASC total		MASC domains							
				Physical symptoms		Separation anxiety		Social anxiety		Harm avoidance	
Grinding	51	56.2 (14.4)	55.0 (18.0)	13.9 (6.2)	13.0 (7.0)	9.7 (4.7)	10.0 (6.5)	15.0 (5.5)	15.0 (7.0)	17.5 (4.6)	18.0 (6.5)
		$p^* < 0.0001$		$p^* < 0.0001$		$p^* = 0.002$		$p^* < 0.0001$		ns	
Pacifier sucking	1	47	-	2	-	11	-	13	-	21	-

MASC, multidimensional anxiety scale for children; SD, standard deviation; IQD, interquartile deviation; ns, not significant

* p value obtained from Mann-Whitney test (difference between habit free group and each habit group)

No child with bottle sucking

Discussão

Este estudo epidemiológico e transversal teve por objetivo determinar: a prevalência de disfunção orofacial e de maloclusão; a interrelação existente entre disfunção orofacial e maloclusão; e a relação entre presença de HOD e sintomas de ansiedade.

Para isso, escolheu-se o NOT-S e o MASC para a avaliação de disfunção orofacial e sintomas de ansiedade, respectivamente, por serem protocolos validados e disponíveis em diversos idiomas, tornando possível a comparação internacional de resultados. Já para a avaliação da maloclusão, foram utilizados os critérios sugeridos por Grabowski et al., 2007 e o DAÍ (Índice de Estética Dental) porque eles tem sido amplamente utilizados (Sousa et al., 2014; Carvalho et al., 2011; Thomaz et al., 2013; Sthal et al., 2007; Seeman et al., 2011).

Estudos epidemiológicos são importantes para determinar a prevalência de doenças e sua distribuição de acordo com as condições ambientais. Eles podem estabelecer as necessidades da população estudada e oferecer aos profissionais ferramenta para o tratamento preventivo ou corretivo (dos Santos, 2012).

Nossos resultados mostraram alta prevalência de maloclusão (chegando a 90.7% de frequência na dentição permanente) e de disfunção orofacial (frequências acima de 85% nos quatro grupos estudados).

Constatou-se que existe relação significativa entre disfunção orofacial e maloclusão somente nos grupos de mordida aberta anterior (dentição decídua e permanente), classe II bilateral (dentição decídua), mordida cruzada posterior bilateral e unilateral, classe III unilateral (dentição permanente). Este foi o primeiro estudo que comparou quantitativamente os escores do NOT-S nesses grupos de maloclusão e comparou-os aos grupos sem maloclusão. A literatura apresenta a mordida aberta anterior e a mordida cruzada posterior como as maloclusões comumente pesquisadas em relação à disfunção orofacial, somente na dentição decídua. Como este trabalho é um estudo transversal e apresenta limitações inerentes ao respectivo delineamento, sugerimos que estudos longitudinais sejam conduzidos a fim de corroborar a relação entre disfunção orofacial e maloclusão.

A principal disfunção orofacial encontrada na amostra foi a presença de HOD. Sua frequência foi acima de 70% nos grupos avaliados, sendo a onicofagia o HOD mais frequente na população estudada. Esses resultados estão de acordo com pesquisas brasileiras prévias realizadas com a mesma faixa etária (Vasconcelos et al., 2009; Albuquerque Junior et al., 2007; Thomaz et al., 2013 e Leme et al., 2013), sugerindo um padrão nacional com alta frequência de HOD e onicofagia como o mais frequentemente encontrado.

Nossos resultados mostraram que existe relação entre HOD e sintomas de ansiedade já que as crianças e adolescentes que apresentam algum tipo de hábito apresentaram maiores sintomas de ansiedade, ou seja, maiores escores do MASC, quando comparados ao grupo sem HOD. Apesar de a literatura sugerir amplamente a existência da relação entre HOD e sintomas de ansiedade, esta, estava baseada somente em teorias psicológicas e em observações clínicas. Um estudo da década de 70 (Deardoff et al., 1974) tentou provar a relação entre onicofagia e ansiedade mas não obteve sucesso. Acredita-se que essa diferença se deve ao fato da diferença tanto das crianças e adolescentes daquela época, mas também do instrumento avaliador da ansiedade. O MASC foi desenvolvido para avaliar os sintomas de ansiedade nos aspectos: físicos, de ansiedade de separação, de ansiedade social e de evitar o perigo.

Com base nos resultados obtidos, verificou-se que existe relação entre a disfunção orofacial e a maloclusão, assim como existe relação entre ansiedade e OHD. Dessa forma, acreditamos que o tratamento multidisciplinar é essencial tanto para a maloclusão quanto para os HOD. A avaliação ortodôntica inicial deve levar em consideração o estado funcional do paciente, saber diagnosticar as disfunções orofaciais e encaminhar os pacientes que necessitam a outros especialistas. Em relação aos HOD, o odontopediatra e/ou o ortodontista deve estimular o abandono dos HOD e estar ciente de que o hábito pode refletir uma desordem emocional e que muitas vezes pode ser necessária a avaliação psicológica por profissional capacitado.

Conclusões Gerais

Os resultados encontrados na amostra estudada mostraram que:

1. A taxa de prevalência de maloclusão e de disfunção orofacial é alta.
2. Foi encontrada relação positiva entre presença de maloclusão e maiores impactos na disfunção orofacial, somente nos grupos PRD e PD.
3. Crianças e adolescentes com HOD apresentaram mais sintomas de ansiedade quando comparados à amostra sem HOD.

Referências*

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* De acordo com as normas da UNICAMP/FOP, baseadas na padronização do International Committee of Medical Journal Editors. Abreviatura dos periódicos em conformidade com o Medline.

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APÊNDICE 1

Termo de Consentimento Livre e Esclarecido

Nº do registro no CEP: 106/2010

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

Este é um convite para que você participe do estudo citado abaixo. As informações citadas abaixo são para que você possa entender como o projeto será realizado e autorizar a participação do menor sob sua responsabilidade, com liberdade de decisão e com pleno conhecimento dos procedimentos e riscos que a criança será submetida.

1) Título do trabalho:

“Avaliação da maturação da função orofacial, da oclusão, de sinais e sintomas de DTM, de hábitos deletérios e de níveis de ansiedade nas dentições decídua, mista e permanente. Estudo transversal e de coorte”.

2) Responsáveis:

- Marina Severi Leme, aluna do curso de Pós-Graduação em Odontologia, área de concentração em Odontopediatria.
- Prof^ª. Dr^ª Maria Beatriz Duarte Gavião, do Departamento de Odontologia Infantil, Área de Odontopediatria.

3) Justificativa para realização do trabalho:

A justificativa para realização deste trabalho é que a disfunção orofacial pode comprometer ações vitais e que a avaliação das funções orais da criança é muito importante antes de se decidir pelo tratamento ortodôntico (aparelho nos dentes), isto porque as funções orofaciais alteradas e a presença de hábitos bucais deletérios (como chupar o dedo ou roer as unhas) podem desenvolver a maloclusão (dentes mal posicionados).

4) Objetivos do trabalho:

Avaliar a maturação da função orofacial no decorrer do desenvolvimento dos dentes de leite e permanente e avaliar a frequência de hábitos bucais deletérios e a associação desses hábitos com a ansiedade.

5) Metodologia

Os exames abaixo fazem parte da pesquisa:

Exame clínico – será realizado numa sala reservada, na própria escola, com instrumentos utilizados normalmente no exame odontológico (pinça, sonda exploradora e espelho bucal). A função desse exame é avaliar a condição bucal do paciente, ou seja, presença de cárie e maloclusão.

Avaliação das funções orofaciais e da ATM – será realizado numa sala reservada, na própria escola. Estes exames serão realizados por meio de perguntas e exercícios que as crianças deverão realizar, como por exemplo: abrir bem a boca, apertar os dentes e assoviar.

Avaliação dos níveis de ansiedade – será realizado numa sala reservada, na própria escola. Cada criança, ou responsável, receberá um questionário com perguntas que avaliam a frequência de sentimentos ou atitudes de ansiedade.

As crianças que apresentarem alterações orais e faciais causadas por hábitos como chupar chupeta e dedo, vão passar por um exame dos músculos ao redor da boca e por uma coleta de saliva.

6) Riscos Previsíveis

Os procedimentos que serão realizados não oferecem riscos previsíveis, pois os exames clínicos são feitos do mesmo modo que um exame de rotina, utilizando-se instrumental e material adequados e esterilizados.

Os exames dos músculos e a coleta de saliva serão realizados sob supervisão da pesquisadora; estes exames não são invasivos, e não oferecem riscos previsíveis à criança, pois utilizam materiais como o algodão e as placas de borracha e seguem as regras de limpeza da Faculdade de Odontologia de Piracicaba – UNICAMP. É bom dizer que nesta pesquisa não existe grupo controle ou placebo e que não existe método alternativo para obtenção da informação.

7) Benefícios

Com os resultados dos exames feitos, poderemos diagnosticar alguma alteração da função orofacial e da oclusão e assim, encaminhar os sujeitos aos tratamentos necessários.

8) Acompanhamento

O acompanhamento será realizado pelas alunas de pós-graduação Marina Leme e Fabiana Freitas.

Dúvidas com relação à pesquisa, ligar para 19 – 2106 5287; falar com Marina Leme (ma_leme@terra.com.br) ou Maria Beatriz Duarte Gavião (mbgaviao@fop.unicamp.br), endereço: Av. Limeira, 901 – Piracicaba – SP, Tel.: 19 – 21065287 / 5368).

9) Garantias

O responsável pelo menor tem a garantia de que receberá respostas a qualquer pergunta ou esclarecimento sobre qualquer dúvida dos procedimentos, riscos e benefícios empregados neste documento e outras dúvidas relacionadas à pesquisa. Em qualquer momento, terá a garantia de que receberá uma cópia deste termo de consentimento e de que não haverá qualquer punição ou prejuízo à criança e aos pais/responsáveis, seja na escola e/ou no tratamento odontológico na Faculdade de Odontologia de Piracicaba (FOP-UNICAMP), com a saída ou a não participação neste estudo. Também serão oferecidas informações sobre o diagnóstico das alterações encontradas, e a descrição do tratamento que deverá ser feito, de acordo com os critérios adotados pela disciplina de Odontopediatria do Departamento de Odontologia Infantil da FOP – UNICAMP. Além disso, os nomes das crianças serão mantidos em sigilo. O gasto com transporte será ressarcido ao paciente e responsável. Como a pesquisa não tem riscos previsíveis, não há previsão de indenização aos voluntários.

Consentimento pós-informação

Eu, _____,
responsável pelo menor _____,
certifico que, li as informações acima, estou esclarecido (a) com todos os passos da
pesquisa, e estou de acordo com a realização do experimento. Assim, eu autorizo a
participação do menor na pesquisa.

Piracicaba, _____ de _____ de _____.

Nome (legível): _____

RG: _____

CPF: _____

Endereço: _____

Telefone: _____

Assinatura: _____

Assinatura do Pesquisador: _____

Atenção: Em caso de dúvidas quanto aos seus direitos como voluntário de pesquisa entre
em contato com o Comitê de Ética em Pesquisa da FOP: Av Limeira 901, FOP-Unicamp,
CEP 13414-903, Piracicaba – SP. Fone/Fax 19-21065349, e-mail cep@fop.unicamp.br e
webpage www.fop.unicamp.br/cep.

APÊNDICE 2



Nordic Orofacial Test – Screening NOT-S



O NOT-S foi desenvolvido por Merete Bakke, Copenhagen; Birgitta Bergendal, Jönköping; Anita McAllister, Linköping; Lotta Sjögreen, Göteborg; and Pamela Åsten, Oslo; com a ajuda da Associação Nórdica de Disfunção e Saúde Oral, NFC.

Esta avaliação está disponibilizada no site www.mun-h-center.se.

Deve ser utilizado com o manual ilustrado que pode ser pedido através da loja virtual ou do telefone +46 31 750 92 00.

Nordic Orofacial Test NOT-S – exame

O NOT-S é usado quando um paciente tem dificuldade para falar, mastigar ou engolir.

A seção de anamnese é conduzida como uma entrevista estruturada. O examinador faz a pergunta, explica, e faz perguntas adicionais quando necessário, interpreta a resposta e preenche o questionário.

A entrevista do NOT-S contém seis seções: Função Sensorial, Respiração, Hábitos, Mastigação e Deglutição, Salivação e Secura da Boca (I-VI).

O exame do NOT-S contém seis seções: Face em Repouso, Respiração Nasal, Expressão Facial, Músculos Mastigatórios e Função Mandibular, Função motora oral e Fala (1-6).

O manual ilustrado deve ser utilizado durante o exame.

País _____

Examinador ☐ Fonoaudiólogo ☐ Dentista ☐ Médico ☐ Fisioterapeuta ☐ Outros _____

Data do exame ____/____/____

Data de nascimento ____/____/____ ☐ ♀ ☐ ♂

Nome: _____

Primeiro Diagnóstico Médico (especificar somente um):

Código de diagnóstico (ICD-10):

Posição durante o exame ☐ Sentado ☐ Deitado

Posição da cabeça quando sentado ☐ Normal (reta e vertical) ☐ Outra

Respostas com ajuda de outra pessoa ☐

<u>CÓDIGO PARA</u> <u>AVALIAÇÃO:</u> O ESCORE TOTAL DO NOT-S PODE VARIAR DE 0 A 12	X = SIM 0 = NÃO ---- = NÃO AVALIADO	SE EM UMA SEÇÃO HOUVER UMA OU MAIS RESPOSTAS X, COLOQUE O ESCORE 1 NA CAIXA DA COLUNA À DIREITA
---	---	---

NOT-S	ESCORE TOTAL ☐ ☐
-------	--

		Pontuação
I	Função Sensorial A- Escovar seus dentes faz você ter ânsia de vômito? ☐ Isso acontece muitas vezes? Desconforto óbvio como enjôo, vômito, ou refluxo – aumento de sensibilidade. B- Você coloca tanta comida na boca que fica difícil de mastigar? ☐ Isso acontece todo dia? Não consegue perceber quando a boca está cheia – diminuição da sensibilidade.	☐
II	Respiração A- Você respira normalmente ou usa algum suporte para respirar? ☐ CPAP, Oxigênio, respirador, outros. B- Você ronca muito quando dorme? ☐ Isso acontece toda noite? Ronco ou apnéia; não se aplica a sintomas de asma ou alergias.	☐
III	Hábitos A- Você roe as unhas, ou chupa os dedos ou outros objetos todos os dias? ☐ Hábito de sucção de chupeta e dedos não é avaliado abaixo dos 5 anos. B- Você chupa ou morde seus lábios, língua ou bochechas todos os dias? ☐ C- Você aperta forte seus dentes ou os range durante o dia? ☐	☐
IV	Mastigação e Deglutição A- Não come com a boca ☐ Tubo nasogástrico, gastrostomia, outros – pular perguntas B-E B- Você acha difícil comer alimentos com certa consistência (mais duros)? ☐ Excluir alergias e dietas especiais como vegetarianismo e intolerância ao glúten C- Você demora mais do que 30 minutos para comer uma refeição completa? ☐ D- Você engole grandes pedaços sem mastigar? ☐ E- Você costuma tossir durante as refeições? ☐ Acontece em quase todas as refeições.	☐
V	Salivação	

☐

	A - Você fica com saliva no canto da boca ou escorre saliva para o queixo todos os dias? ☐ Tem que limpar a boca, não se aplica enquanto dorme.	
VI	Secura da boca A- Você precisa beber algum tipo de líquido para conseguir comer uma torrada? ☐ B- Você sente dor na mucosa (pele) da boca ou na língua? ☐ Dor recorrente ou sensação de formigamento pelo menos uma vez na semana; não se aplica a dor de dente ou vesículas (lesões bolhosas) na boca.	☐
Nome: <u>ENTREVISTA NOT-S</u> Soma:		

5	Função motora oral		☐	
	Figura 8	A- Ponha sua língua para fora o quanto puder		
		Não consegue alcançar a borda do vermelhão dos lábios com a ponta da língua.	☐	
	Figura 9	B- Lamba os seus lábios		
		Não consegue usar a ponta da língua para molhar os lábios e não consegue alcançar os cantos da boca.	☐	
	Figura 10	C- Encha sua boca de ar e segure por pelo menos 3 segundos ...		☐
		Não consegue encher a boca de ar sem vazamento de ar ou sem fazer barulhos.	☐	
	Figura 11	D- Abra a boca bem grande e diga ah-ah-ah!	☐	
		Não se nota elevação da úvula e o palato mole é observado.		
6	Fala		☐	
		A- Não fala		
		Pular perguntas B-C.	☐	
	Figura 12	B- Conte alto até 10		
		A fala não é clara com um ou mais sons indistinguíveis ou nasalidade anormal.		
		Abaixo de 5 anos de idade exclua sons de R, S da avaliação.		☐
	Figura 13	C- Diga PATAKA, PATAKA, PATAKA	☐	
		Não avalie este item em crianças menores de 5 anos de idade.		
Nome:		<u>EXAME NOT-S</u>	Soma:	

ANEXO 1



COMITÊ DE ÉTICA EM PESQUISA
FACULDADE DE ODONTOLOGIA DE PIRACICABA
UNIVERSIDADE ESTADUAL DE CAMPINAS



CERTIFICADO

O Comitê de Ética em Pesquisa da FOP-UNICAMP certifica que o projeto de pesquisa **"Avaliação da maturação da função orofacial, da oclusão, de sinais e sintomas de DTM, de hábitos deletérios e de níveis de ansiedade nas dentições decídua, mista e permanente. Estudo transversal e de coorte"**, protocolo nº 106/2010, dos pesquisadores Maria Beatriz Duarte Gavião, Fabiana Furtado Freitas e Marina Severi Leme, satisfaz as exigências do Conselho Nacional de Saúde - Ministério da Saúde para as pesquisas em seres humanos e foi aprovado por este comitê em 16/10/2010.

The Ethics Committee in Research of the School of Dentistry of Piracicaba - State University of Campinas, certify that the project **"Evaluation of orofacial function maturation, occlusion, sings and symptoms of TMD, oral habits and anxiety level on deciduous, mixed and permanent dentition. Transversal and coort studies"**, register number 106/2010, of Maria Beatriz Duarte Gavião, Fabiana Furtado Freitas and Marina Severi Leme, comply with the recommendations of the National Health Council - Ministry of Health of Brazil for research in human subjects and therefore was approved by this committee at 10/16/2010.

Prof. Dr. Pablo Agustin Vargas
Secretário
CEP/FOP/UNICAMP

Prof. Dr. Jacks Jorge Junior
Coordenador
CEP/FOP/UNICAMP

Nota: O título do protocolo aparece como fornecido pelos pesquisadores, sem qualquer edição.

Anexo 2 – FICHA DE AVALIAÇÃO DE MALOCCLUSÃO

Nome: _____ Idade: _____ Série: _____ Escola: _____

Apinhamento: _____

Espaçamento: _____

Sobressaliência:

0 – 2

> 2

< 2

Relação Molar:

I

II

III

Relação Canino:

I

II

III

Relação transversal posterior:

Correta

Cruzamentos isolados

Posterior unilateral

Posterior bilateral

Topo a topo em lateralidade

Sobremordida:

Decídua

Até 2 mm

> 2

Mista e permanente

Até 2/3 coroa

> 2/3 coroa

Mordida aberta anterior:

Ausente

Presente: _____mm

Anexo 3 - “MASC” - Escala Multidimensional de Ansiedade para Crianças

Nome: _____ Idade: _____ Sexo: _____ Masc. Fem.
(circule um)

Data: ____/____/____ Série escolar: _____
 dia mês ano

Este questionário pergunta a você como você vem se sentindo, o que você tem pensado, tem sentido ou como tem agido recentemente. Para cada item, por favor faça um círculo ao redor do número que indica com que frequência a afirmativa é verdadeira para você. Se o que a sentença diz é verdade sobre você muitas vezes, circule 3. Se ela é verdade sobre você algumas vezes, circule 2. Se a sentença é verdade sobre você uma vez ou outra, circule 1. Se dificilmente ou nunca a sentença é verdade sobre você, circule 0. Lembre-se, não há respostas certas ou erradas, responda apenas como você vem se sentindo recentemente.

Aqui estão dois exemplos para lhe mostrar como completar o questionário. No exemplo A, se você muito poucas vezes tem medo de cachorro, você deve circular 1, significando que a afirmativa raramente é verdadeira sobre você. No exemplo B, se às vezes os trovões o perturbam, você deve circular 2, significando que a afirmativa é às vezes verdade sobre você.

Nunca é Raramente é Às vezes é Frequentemente
verdade verdade sobre verdade é verdade sobre
sobre mim mim sobre mim mim

Exemplo A
Eu tenho medo de cachorros.....

0 1 2 3

Exemplo B
Trovões me perturbam.....

0 1 2 3

Agora tente esses itens você mesmo. Não se esqueça também de responder as questões no verso deste questionário.

1.	Eu me sinto tenso ou nervoso	0	1	2	3
2.	Eu costumo pedir permissão para fazer as coisas	0	1	2	3
3.	Eu me preocupo que as outras pessoas dêem risada de mim	0	1	2	3
4.	Eu fico com medo quando os meus pais saem	0	1	2	3

5.	Sinto falta de ar	0	1	2	3
6.	Eu fico atento se há algum perigo	0	1	2	3
7.	A idéia de ficar longe de casa me assusta	0	1	2	3
8.	Eu fico tremendo ou inquieto	0	1	2	3
9.	Eu me esforço para obedecer meus pais e professores	0	1	2	3
10.	Eu tenho medo que os outros meninos (ou meninas) gozem de mim	0	1	2	3
11.	Eu tento ficar perto da minha mãe ou meu pai	0	1	2	3
12.	Eu tenho tontura ou sensação de desmaio	0	1	2	3
13.	Eu verifico as coisas antes de fazê-las	0	1	2	3
14.	Eu me preocupo em ser chamado na classe	0	1	2	3
15.	Eu me sinto desassossegado (sobressaltado)	0	1	2	3
16.	Eu tenho medo que os outros achem que eu sou bobo	0	1	2	3
17.	Eu deixo as luzes acesas à noite	0	1	2	3
18.	Eu sinto dores no peito	0	1	2	3
19.	Eu evito sair sem minha família	0	1	2	3
20.	Eu me sinto estranho, esquisito, ou fora da realidade	0	1	2	3
21.	Eu tento fazer coisas que vão agradar aos outros	0	1	2	3
22.	Eu me preocupo com o que os outros pensam de mim	0	1	2	3
23.	Eu evito assistir filmes ou programas de TV que assustam	0	1	2	3
24.	Meu coração dispara ou “falha”	0	1	2	3
25.	Eu evito as coisas que me aborrecem	0	1	2	3

26.	Eu durmo junto de alguém da minha família	0	1	2	3
27.	Eu me sinto inquieto e nervoso	0	1	2	3
28.	Eu tento fazer tudo exatamente do jeito certo	0	1	2	3
29.	Eu me preocupo em fazer alguma coisa boba ou que me deixe sem graça	0	1	2	3
30.	Eu fico com medo quando ando de carro ou de ônibus	0	1	2	3
31.	Eu sinto mal estar no estômago	0	1	2	3
32.	Se eu fico aborrecido ou com medo, eu conto logo para alguém	0	1	2	3
33.	Eu fico nervoso se eu tenho que fazer alguma coisa em público	0	1	2	3
34.	Tenho medo de tempo ruim, escuridão, altura, animais ou insetos	0	1	2	3
35.	Minhas mãos tremem	0	1	2	3
36.	Eu preciso ter certeza que as coisas estão Seguras	0	1	2	3
37.	Eu tenho dificuldade em chamar outros meninos (ou meninas) para brincar comigo	0	1	2	3
38.	Minhas mãos ficam suadas ou frias	0	1	2	3
39.	Eu sinto vergonha	0	1	2	3

Obrigado por completar o questionário.