Relationships between oral parafunctions and functional disturbances and diseases of the stomatognathic system among children aged 7–14 years

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Data from an interview and clinical examination in a study of 440 randomly selected school children were analyzed with regard to relationships between signs and symptoms of functional disturbances and diseases in the stomatognathic system. A correlation was found between reported clicking sounds from the temporomandibular joint (TMJ) and pain when opening the mouth wide. Children who had been treated orthodontically or who were undergoing such treatment did not differ from other children in the frequency of signs and symptoms. Correlations were found between recurrent headaches and tenderness in TMJ and TMJ muscles. Reported pain in the temple region was also correlated to tenderness in the TMJ and TMJ muscles. Further correlations were found between recurrent headaches and oral parafunctions such as lip–cheek-biting and nail-biting and also among nail-biting, tooth clenching, tooth-grinding, and frontal dental wear. Children who reported oral parafunctions had more frequent interferences in RP and tenderness in TMJ muscles. There were correlations between irregular movements of the lower jaw and interferences in RP as well as mediotrusion interferences. Finally, a strong correlation was found between tenderness of the TMJ (laterally and posteriorly) and tenderness of the TMJ muscles. □ *Temporomandibular joint syndrome; epidemiology; child*

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Epidemiological studies have shown that symptoms of functional disturbances and diseases of the stomatognathic system are common among both children and adults. Grosfeld & Czarnecka (14) recorded a frequency of more than 50% of 'musculo-articular disorders' among children aged 6–8 and 13–15 years—56.4% among the 6- to 8-year olds and 67.7% among the 13- to 15-year-olds. Thirty-six per cent of children aged 7–14 (29) and 41% of teenagers aged 15–18 years (28) reported symptoms. In a review of epidemiological studies, Helkimo (21) concluded that at least half of the adult population in Sweden shows signs of diseases in the mandibular joints and muscles. A great proportion of these signs, however, are slight and not even noticed by the individuals and thus of little significance when estimating the need for treatment. A difference in the frequency of certain symptoms such as headaches, clickings, and crepitation seems to exist between adults and children (11, 21, 28, 29). The purpose of this investigation was therefore to investigate the condition of the stomatognathic system among children between 7 and 14 years of age and to analyze the relationships between signs and symptoms and oral parafunctions, occlusal interferences, and malocclusion.

Materials and methods

Four hundred and forty school children between 7 and 14 years old were examined at school dental clinics in Malmö during the autumn of 1976 and the spring of 1977 (Table 1). The socioeconomic structure of the parents of those examined was above average

Table 1. The 440 children examined according to clinic of attendance (LA, RG), age and sex

	Sex				
	Boys		Girls		
Age (years)	LA	RG	LA	RG	Total
7	18	21	14	17	70
8	19	9	12	12	52
9	24	0	23	0	47
10	23	0	24	0	47
11	8	16	16	19	59
12	10	16	14	7	47
13	0	31	0	31	62
14	0	27	0	29	56

in terms of income but somewhat lower than average in terms of education. The children were interviewed with regard to symptoms in the stomatognathic system, and a clinical examination was conducted. This examination included the temporomandibular joint (TMJ) and muscles, mandibular mobility, joint sounds, mandibular deviation, and degree of dental war. A detailed description of the material and methods used has been given previously (29).

The chi-square test was used for an analysis of correlations between variables and differences between groups. The following levels of significance were used and denoted N.S. (not significant): $p \geq 0.05$, $*0.01 \leq p < 0.05$; $**0.001 \leq p < 0.01$; and $***p < 0.001$.

Results

Correlations between symptoms

The relationships between the different answers to the interview are illustrated in Table 2.

Correlations between symptoms, signs, and clinical findings

Correlations between symptoms reported in the interview and tenderness on palpation of TMJ and TMJ muscles are shown in Tables 3 and 4. A significant correlation was found between reported TMJ clicking and deviation on opening the mouth wide and between tenderness to palpation of the attachment of the temporal muscle and of the TMJ laterally ($p < 0.05$).

Children who had been treated orthodontically or who were undergoing such treatment did not differ from other children in the frequency of signs and symptoms. The children who had received orthodontic treatment showed a higher frequency of cuspid rise ($p < 0.01$) and a lower degree of dental wear in the premolar and molar regions ($p < 0.01$). Occlusal interferences in RP were found with similar frequency among children who had received orthodontic treatment and among those who had not.

Several statistically significant correlations were found between oral parafunctions and symptoms, signs, and clinical findings in the stomatognathic system (Table 5). Those who were aware of grinding reported that they clenched their teeth ($p < 0.01$) and that they were lip–cheek-biters and nail-biters ($p < 0.05$). The occurrence of oral parafunctions as estimated by the interview was more frequent among children with interferences in RP and among children tender to palpation in the TMJ muscles ($p < 0.05$).

Table 2. Level of significance of correlations between different answers to the interview, in 440 children

Interview answers	Headaches	Pain in the temple region	Clicking sounds from the TMJ	History of heavy trauma to the face
Pain when opening the mouth wide	***	**	**	N.S.
Restricted mouth opening	N.S.	***	N.S.	**

Table 3. Level of significance of correlations between symptoms reported in the interview and tenderness on palpation of temporomandibular joint and TMJ muscles in 440 children

Symptoms reported in the interview	Location of palpatory tenderness							
	Anterior temporal muscle	Posterior temporal muscle	Attachment temporal muscle	Masseter muscle	Medial pterygoid muscle	Lateral pterygoid muscle	Posterior belly of digastric muscle	Lateral aspect of the TMJ	Posterior aspect of TMJ
Restricted mouth opening	*	*	*	***	*	N.S.	N.S.	*	*
Pain when opening the mouth wide	**	N.S.	N.S.	N.S.	**	*	*	N.S.	*
Pain in the temple region	**	*	*	***	*	N.S.	***	**	**
Recurrent headaches	***	**	*	***	***	**	**	***	**

Table 4. Relationship between recurrent headaces and tenderness to palpation in the anterior temporal muscle

Recurrent headaches	Anterior temporal muscle		Total
	No	Yes	
No	297	80	377
Yes	28	35	63
Total	325	115	440

Correlations between clinical findings

Children who had unilateral interferences in RP (vertical difference RP–IP) showed asymmetrical lateral movement capacity ($p < 0.001$), and among children with bilateral interferences in RP asymmetrical lateral movement capacity was found ($p < 0.05$). There was a correlation between mediotrusion interferences and lateral deviation of the chin on maximal mouth opening ($p < 0.01$) and irregular movements of the lower jaw ($p < 0.05$).

Dental wear in the lateral sections was more pronounced in bites with mediotrusion interferences than in bites without ($p < 0.01$). Children with mesial and distal intermaxillary relationships more often had severe dental wear in the lateral sections than children with neutral relation ($p < 0.05$).

There was a strong correlation between tenderness to palpation of the TMJ (laterally and posteriorly) and tenderness to palpation of the TMJ muscles ($p < 0.01$). The masseter muscle was tender to palpation in children with pain on passive mouth opening ($p < 0.001$), with lateral deviation of the chin on maximal mouth opening ($p < 0.001$) and with lateral deviation of the lower jaw on protrusion ($p < 0.01$). Muscle tenderness to palpation of the lateral pterygoid muscle occurred more frequently in children with lateral deviation on maximal mouth opening ($p < 0.001$).

Tenderness to palpation laterally over the TMJ was found more frequently in children who showed lateral deviations on maximal mouth opening and protrusion ($p < 0.01$).

Table 5. Level of significance of correlations between parafunctions, symptoms and signs in the stomatognathic system in 440 children

Symptoms and signs	Tooth-grinding	Tooth-clenching	Lip–cheek-biting	Nail-biting	Thumb-sucking
Recurrent headaches	N.S.	N.S.	***	*	N.S.
Pain in the temple region	*	*	***	**	N.S.
Tenderness on palpation of the attachment of the temporal muscle	**	**	N.S.	N.S.	N.S.
Frontal dental wear	***	**	N.S.	**	–
Lateral dental wear	**	N.S.	N.S.	N.S.	***
Occlusal interferences in RP	*	N.S.	N.S.	N.S.	–

Discussion

The study of the function and the state of the stomatognathic system of 7- to 14-year-old children was done to provide the means to estimate the need for treatment of functional disturbances and diseases in the stomatognathic system in children of those ages. Furthermore, the epidemiological data can be used to elucidate the etiology of these disorders.

There is always a problem with regard to accuracy and precision in clinical examinations. This problem is enhanced when more than one examiner is involved in the clinical examination. If, however, the number of investigators is low and a standardized technique is applied, the inter-observer variability will be acceptable (7). The present study is based on findings made by two investigators (29), and since the examination methods were standardized and the investigators trained, it is considered justifiable to draw conclusions on the basis of the data from both the interview and the clinical examination.

Many investigations of adults have revealed a correlation between headaches and muscle tenderness (2, 3, 13, 17, 19, 24, 25, 34). The results suggest that annoying, frequent, recurring headaches might be caused by disorders in the muscles of the stomatognathic system. The present findings of recurring, troublesome headaches and pains in the temples were significantly correlated with tenderness to palpation of the TMJ and TMJ muscles and with discomfort and difficulty in moving the jaw and therefore confirm previous results. Difficulties in opening the mouth wide were also associated with a history of trauma to the face. Reports from patients in clinical studies imply that acute trauma is a fairly common cause of symptoms in the stomatognathic system (2, 9, 10).

Temporomandibular joint sounds in the form of clicking are associated with disturbances in the movements of the mandible and are probably caused by structural changes of the joint components, subluxation (caput-disk displacement), and/or muscular incoordination (9, 15, 23, 27, 35). Clicking sounds occurred less frequently in children than has been reported in adults (1, 16, 17, 20, 22, 34). It has been shown that deviation in form of the TMJ among adults increases in extent and frequency with increasing age (15, 18, 30). The increasing frequency of clicking sounds with age may therefore signify deviation in form, in addition to subluxation and muscular incoordination. It is notable that as many as 32% of the children demonstrated irregular opening movements.

Oral parafunctions were common in this study and were correlated with symptoms in the stomatognathic system, including headaches. Associations were found between lip–cheek-biting and headaches, and between lip–cheek-biting, nail-biting, and aches in the temple region. Geering-Gaerny & Rakosi (12) also found a high frequency

of lip–cheek-biting in patients with 'initial symptoms of functional disturbances in the masticatory system' compared with a control group.

The results of this study of 7- to 14-year-old children also revealed a strong correlation between tenderness to palpation of the TMJ and of the TMJ muscles. This lends support to the view that both the joints and musculature are commonly involved simultaneously.

Several different causes may be considered to explain disturbances of mandibular movement patterns and movement capacity. It can be caused by diseases in the TMJ and TMJ muscles, by changes in the neuromuscular functional pattern, and by an unfavorable form–function relationship in the temporomandibular joint (8). Occlusal interferences resulting in grinding and muscle tenderness can be one explanation, since they were correlated to disturbances of the movement pattern (33). Moreover, it is possible that these disturbances of movement are caused directly by a neuromuscular influence aimed at avoiding certain movements (4). Beyron (5, 6) has reported longitudinal investigations of the disadvantageous effect on movement pattern of interferences and the normalization after elimination of the interferences. Against this background, occlusal interferences in association with clinical signs in children ought to be eliminated. Children with mediotrusion interferences often had more dental wear in the lateral sections than others, which demonstrates the unfavorable influence of these interferences on the function of the stomatognathic system previously reported by Ramfjord (31, 32).

The results of this study show that recurrent headaches in children often are associated with oral parafunctions and tenderness of TMJ and TMJ muscles. An examination of the stomatognathic system should therefore be carried out in all cases of juvenile recurrent headaches.

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