Evidenztabelle Pontes, Maia et al. 2017

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Mandibular Protraction Appliance Effects in Class II Malocclusion in Children, Adolescents and Young Adults

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The aim of this study was to evaluate the effects of the mandibular protraction appliance (MPA) for treating mild to moderate Class II malocclusion at different stages of dentofacial development. Lateral radiographs were evaluated before (T0) and at the end (T1) of orthodontic treatment with fixed appliance associated with MPA. Sixty-five consecutively treated patients were divided according to the stage of dentofacial development: 21 children in late mixed dentition, 22 adolescents and 22 young adults with full permanent dentition. The differences between and within groups were analyzed by MANOVA at p<0.05. The correction of anteroposterior discrepancy (Wits) was significantly reduced in all development stages (p<0.01), with no difference between groups. Class II was corrected predominantly by dental changes in the mandibular arch, with accentuated proclination of the mandibular incisors and mesial displacement of mandibular molars. The MPA had no skeletal effects in any of the groups, except for a mild reduction of SNA (p=0.018) and ANB angles (p<0.0001) among the mixed dentition children. With regard to soft-tissue profile, facial convexity decreased significantly in all groups (p<0.01). In conclusion, the MPA associated with fixed appliance corrected the Class II occlusion, basically by a mandibular arch protrusion. A mild skeletal maxillary change was significant only when this treatment protocol began during mixed dentition.

Key Words: Class II malocclusion, functional appliance, dentofacial development.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Patients with mild to moderate skeletal Class II were treated consecutively in three stages of dentofacial development by two orthodontists with over 20 years of experience • Brazil
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	1. at least a half cusp Class II relationship of canines and molars on both sides 2. no extraction therapy 3. available dental casts and cephalometric records
Ausschluss-kriterien	Retreatment cases, surgical patients, or with implant or prosthetic rehabilitation and syndromic individuals were previously excluded.

Intervention Versuchsgruppe 1	**Kieferorthopädische Behandlung** Patients with mixed dentition treated with MPA associated to pre-adjusted brackets, 0.018x0.030 slot, Andrews prescription (Dentaurum, Ispringen, Germany) by two orthodontists with over 20 years of experience. The frequency of the patient’s orthodontic appointments and the duration of treatment were evaluated in months, from installation of the fixed appliance (T0) to the end of the case (T1). **Kointervention** Dental casts the lateral radiographs were available before the start (T0) and at the end of treatment (T1) VERSUCHSGRUPPE: **mandibular protraction appliance in mixed dentition** N=21 (Anfang) / N=21 (Ende) / Alter = 10,1 ± 1,6 Jahre / ♂:♀ = 11:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Intervention Versuchsgruppe 2	**Kieferorthopädische Behandlung** Adolescent Patients with permanent dentition treated with MPA associated to pre-adjusted brackets, 0.018x0.030 slot, Andrews prescription (Dentaurum, Ispringen, Germany) by two orthodontists with over 20 years of experience. The frequency of the patient’s orthodontic appointments and the duration of treatment were evaluated in months, from installation of the fixed appliance (T0) to the end of the case (T1). **Kointervention** Dental casts the lateral radiographs were available before the start (T0) and at the end of treatment (T1) VERSUCHSGRUPPE: **mandibular protraction appliance in permanent dentition - adolescents** N=22 (Anfang) / N=22 (Ende) / Alter = 13,4 ± 2,11 Jahre / ♂:♀ = 11:11 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Kieferorthopädische Behandlung** Adult Patients with permanent dentition treated with MPA associated to pre-adjusted brackets, 0.018x0.030 slot, Andrews prescription (Dentaurum, Ispringen, Germany) by two orthodontists with over 20 years of experience. The frequency of the patient’s orthodontic appointments and the duration of treatment were evaluated in months, from installation of the fixed appliance (T0) to the end of the case (T1). **Kointervention** Dental casts the lateral radiographs were available before the start (T0) and at the end of treatment (T1) KONTROLLGRUPPE: **mandibular protraction appliance in permanent dentition - adults** N=22 (Anfang) / N=22 (Ende) / Alter = 26,5 ± 7,3 Jahre / ♂:♀ = 5:17 • Gebissphase: permanentes Gebiss ≥ 18. Lebensjahr • KFO-Behandlung: Spätbehandlung (Erwachsenenbehandlung)

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Maxillomandibular, Maxilla and Mandible annual changes (Wits, ANB, A-NPerp, SNA, Co-A, ENA-VertPtmi)* SEKUNDÄRZIELGRÖßE: *Annual changes in vertical relation (SN-Go.GN, ENA-Me, S-Go)* TERTIÄRZIELGRÖßE: *Annual changes in in teeth (1.PP, IMPA, U6-OLP, L6-OLP)* QUARTÄRZIELGRÖßE: *Annual changes in soft tissue (H-Nose, H Line)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	In conclusion, the MPA associated with fixed appliance corrected the Class II occlusion, basically by a mandibular arch protrusion. A mild skeletal maxillary change was significant only when this treatment protocol began during mixed dentition.

Zusammen-fassung der Ergebnisse	**1. Gruppe mandibular protraction appliance in mixed dentition VERSUS Gruppe mandibular protraction appliance in permanent dentition – adolescents** **2. Gruppe mandibular protraction appliance in mixed dentition VERSUS Gruppe mandibular protraction appliance in permanent dentition – adults** **3. Gruppe mandibular protraction appliance in permanent dentition – adolescents VERSUS Gruppe mandibular protraction appliance in permanent dentition - adults** ***PRIMÄRZIELGRÖßE*** Wits appraisal had a significant reduction of 2.59 mm (p<0.05, Table 3) from T0 (4.8 mm) to T1 (1.49 mm) in the MD group. ANB angle showed a small but significant decrease of 1.67º (p<0.05, Table 3). The change in ANB was a result of a minor restriction on the anteroposterior maxillary growth, shown by a decrease of approximately 1° for the SNA angle (p=0.02). There was a significant Wits decrease of 3.13 mm for the permanent dentition group (p<0.0001). However, no significant change was observed in the AP displacement of the apical bases (SNA and SNB, p>0.05). Significant increases of 0.81 mm (p<0.017) for the maxillary (Co-A) length and 2.04 mm (p<0.05) for the mandibular length (Co-Gn) was observed in adolescents (Table 4). However, such changes were not significant in young adult patients (p>0.05, Table 5). ***SEKUNDÄRZIELGRÖßE*** The direction of facial vertical growth (SNGoGn) did not change significantly during the orthodontic treatment with MPA (Tables 3, 4 and 5), while the lower anterior facial height (ANS-Me) and the posterior facial height (S-Go) showed a significant increase in the children (MD) and adolescents (PD) groups (p<0.05; Tables 3 and 4). No significant change in the lower anterior facial height was observed in adults; however, a small significant increase of 1.13 mm (p=0.045) was observed for their posterior facial height. ***TERTIÄRZIELGRÖßE*** Class II malocclusion treatment, when started in mixed dentition, was mainly corrected by dentoalveolar changes, primarily via a lower incisor proclination (IMPA) of 3.12° from T0 to T1 (p=0.03). There was a marked mesial displacement of mandibular molars (L6-OLP), with a mean of 8.92 mm (p<0.05, Table 3). There was no significant change in the inclination of the maxillary incisors (p=0.638, Table 3). However, there was an anterior displacement of the maxillary molars of 5.77 mm (p<0.05) in relation to sella (U6-OLP). The mean labial inclination increase of the lower incisors (IMPA) during treatment was 7.24° (p<0.05; Table 4) or 2.35° per year for the permanent dentition group, and 6.27° (p=0.001; Table 5) or 2.24° per year for the adults (Table 6). There was a significant anterior displacement of the maxillary molars (p<0.05, Table 4), while the AP position of the maxillary molars was not modified in the adults (p=0.075, Table 5). On the other hand, the mesial movement of the mandibular first molars was significant for both groups (p<0.05, Tables 4 and 5). ***QUARTÄRZIELGRÖßE*** Regarding the soft-tissue profile, the H-Nose values increased significantly for the group in mixed dentition (5.29 mm, p<0.05) and the adolescents (2.97 mm, p<0.05). A slight increase (0.82 mm) of this measurement was also observed in the adults (p=0.009, Table 5). The facial convexity (H Line) decreased significantly in all groups, although most significantly in the mixed dentition (3.5°, p<0.05) and in the adolescents at permanent dentition (1.58°, p=0.005).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Limitation of lack of an untreated control group in this study prevents greater precision in discussing the real effects of the appliance versus the changes inherent to normal craniofacial growth. *Power der Studie/Patientenzahl:* The sample size was calculated using Wits analysis as the primary variable. To detect 2 mm of difference, with an 80% power and an α level of 0.05, each group required 23 patients. After collecting data, 65 consecutively treated patients were retrospectively selected, which resulted in a final power of 78%. *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* No evidence from other sources is used to demonstrate that the method of outcome assessment is valid and reliable. No confidence intervals been provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: 1. MPA with fixed appliance may successfully correct class II malocclusions mostly by mandibular arch protrusion 2. Mild maxillary changes may occur when treatment starts in the mixed dentition
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle **Prado, Ramos-Jorge et al. 2016**

Prospective evaluation of the psychosocial impact of the first 6 months of orthodontic treatment with fixed appliance among young adults

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ABSTRACT

Objective: To evaluate the psychosocial impact of the first 6 months of orthodontic treatment with a fixed appliance among young adults and compare the results with those of a control group of patients awaiting treatment for malocclusion.

Materials and Methods: A study was conducted with a sample of 120 patients on a waiting list for orthodontic treatment at a university. The participants were allocated to an experimental group submitted to treatment and a control group awaiting treatment. The groups were matched for sex and age. All participants were instructed to answer the Brazilian version of the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) at baseline and after 6 months. Statistical analysis involved the Wilcoxon test for the total PIDAQ score and the score of each subscale. All patients participated until the end of the study.

Results: Significant differences between baseline and the 6-month evaluation were found for the total PIDAQ score as well as the dental self-confidence and social impact subscales in both groups. No differences between baseline and the 6-month evaluation were found regarding the psychological impact or esthetic concern subscales in the control group. The patients in the experimental group reported greater esthetic impact 6 months after beginning treatment ($P < .001$). The first 6 months of orthodontic treatment seem to improve psychosocial impact.

Conclusions: The first 6 months of orthodontic treatment seem to improve the psychosocial impact of malocclusion. The patients analyzed in the present study reported a greater esthetic impact and less psychological impact after 6 months of using an orthodontic appliance. (*Angle Orthod.* 2016;86:644–648.)

KEY WORDS: Quality of life; Orthodontics; Malocclusion

Population *Setting* *Komorbiditäten*	**„Malokklusion/Dysgnathie“ allg.** Patienten die auf eine kieferorthopädische Behandlung an der Universität (Department of Orthodontics, Faculty of Dentistry, UNINCOR) warten; Alter: 18-27
Schweregrad	Slight treatment need bis mandatory treatment
Einschluss-kriterien *Bei Review: PICOS*	Scheduled to begin orthodontic treatment with a fixed appliances; Agreement to participate in this study; Fluent brazilian Portuguese; Free of any cognitive impairment or oral disorder; Free of untreated dental caries, tooth injury or periodontal disease
Ausschluss-kriterien	Keine Angabe

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **Multiband-Gruppe** (**Experimental Group)** Beschreibung: 60 patients between 18-27 years beginning an orthodontic treatment with fixed appliances were instructed to answer the Brazilian version of the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) to evaluate the psychosocial impact of the first 6 months of orthodontic treatment with fixed appliance. N=60 (Anfang) / N=60 (Ende) / Alter = 23.2 ± 4.6 Jahre / ♂:♀ =30:30 • Gebissphase: bleibendes Gebiss ≥ 18 • KFO-Behandlung: Spätbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **Control group** A control group was then formed of 60 patients awaiting treatment N=60 (Anfang) / N=60 (Ende) / Alter = 23.2 ± 4.6 Jahre / ♂:♀ = 30:30 • Gebissphase: bleibendes Gebiss ≥ 18 • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung** PRIMÄRZIELGRÖßE: Psychosoziale Einfluss der ersten 6 Monate einer festsitzenden kieferorthopädischen Behandlung (Psychosozial Impact of Dental Aesthrtics Questionnaire (PIDAQ) (esthetic concern, psychological impact, social impact, dental self-confidence))
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	• The first 6 months of orthodontic treatment seem to improve the psychosocial impact of malocclusion. • The patients analyzed in the present study reported a greater esthetic impact and less psychological impact after 6 months of using an orthodontic appliance

Zusammen-fassung der Ergebnisse	**GRUPPE experimental group VS. GRUPPE control group** **PRIMÄRZIELGRÖßE** All patients participated until the end of the study. The distribution of males and females in the sample was equal (50%). Mean age was 23.2 6 4.6 years in both groups. Orthodontic treatment need was classi- fied as necessary for most of the individuals in both groups (Table 1). Table 2 shows significant reductions in the total PIDAQ score as well as the social impact and dental self-confidence subscales in both groups. Only the group that received treatment exhibited a significant reduction in the psychological impact score (P< .001). However, this group had significantly higher scores on the esthetic concern subscale after 6 months of treatment (P< , .001).
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Einteilung der Behandlungsnotwenigkeit nur über DAI, keine weitere Erläuterung bzgl. Art der Malokklusion oder kieferorthopädischen Behandlung; keine Analyse des Zusammenhangs von klinischen Parametern und Veränderung im Fragebogen, keine weitere Subgruppenanalyse, unklar in welchen Subskalen ein hoher Wert im Fragebogen wünschenswert ist oder nicht, exakte Einteilung der Gruppenaufteilung m/w und Alter, sehr kurzer Studienzeitraum, kein dropout, alle Probanden haben bis zum Ende der Studie teilgenommen, bereits in mehreren vorherigen Studien validierter Fragebogen In den 6 Monaten Studienzeit scheint eine festsitzende kieferorthopädische bereits zu signifikanten Veränderungen der dental self-confidence und des ästhetischen Empfinden zuführen und einen psychosocialen Einfluss zu haben. Power der Studie/Patientenzahl: The sample size was calculated based on a standard deviation of 2.11 points (determined in a pilot study) and a one-point difference to be detected. Thus, 55 individuals would be required to provide an 80% statistical power in identifying a significant difference in psychosocial impact before and after 6 months of treatment. The probability of a type 1 error was 5%. Funding: This study was supported by the Research Foundation of the State of Minas Gerais, the National Council of Technological and Scientific Development, and the Brazilian Coordination of Higher Education, Brazilian Ministry of Education. Interessenkonflikte: keine Angabe Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten): • No comparison is made between participants and non-participants to establish their similarities or differences. • Can’t say if measures will have been taken to prevent knowledge of primary exposure influencing case ascertainment. • The main potential confounders are not identified and taken into account in the design and analysis. • No confidence intervals are provided.
Schluss-	methodische Qualität: insgesamt gut, validierte Methodik

folgerung des Begutachters	Klinische Aussagekraft: Eine festsitzende kieferorthopädische Behandlung scheint bereits nach 6 Monaten den psychosozialen Einfluss der Malokklusion bei jungen Erwachsenen zu verbessern. Die Probanden berichten von einer besseren Ästhetik und weniger Einfluss der Malokklusion auf ihr Psychosozialen Befinden.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Quintao, Helena et al. 2016

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Soft tissue facial profile changes following functional appliance therapy

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SUMMARY The aim of this study was to evaluate changes in the facial profile resulting from the use of a twin block (TB) functional appliance. The sample comprised 38 patients (24 males and 14 females) with a Class II division 1 malocclusion. Nineteen subjects were treated with a functional appliance while the remaining 19, who did not undergo any intervention, served as the control. The mean age of the treated group was 9.5 years (SD 10 months) and of the control group 9.9 years (SD 13 months). Lateral cephalograms were obtained for all subjects at the initial consultation and again after one year. The changes in facial profile, resulting from treatment with the TB, were analysed after the influence of growth had been taken into account.

The results showed a significant improvement in the facial profile, which closely followed the underlying dentoskeletal changes. Thus, the most significant effects were a total facial profile improvement, retraction of the upper lip and anterior movement of soft tissue pogonion ($P < 0.05$). Subjects treated with a TB appliance achieved improved facial harmony, but such changes were not observed in the control group.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** The sample comprised 38 subjects, prospectively recruited, from those awaiting treatment at the Orthodontic Post Graduate Clinic, Dental School, Universidade do Estado do Rio de Janeiro. Nineteen patients were treated with a TB functional appliance and the other 19 formed the control group.
Schweregrad	ANB > 4 degrees, overjet ≥ 6 mm
Einschluss-kriterien *Bei Review: PICOS*	1. Skeletal Class II relationship (ANB > 4 degrees). 2. Class II incisor (overjet ≥ 6 mm), canine and molar relationship. 3. No previous history of orthodontic treatment. 4. Patients in the following epiphyseal stages, as defined by Ferreira (1998): FP, FM, G1 and Psi. These all characterize the initial stages of the pubertal growth spurt
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** - subjects were treated with a functional appliance (TwinBlock) - The design of the TB, used in the present study has been previously described (Brunharo and Quintão, 2001). The initial working bite was recorded with the mandible postured forward by 4 mm. However, in those with large overjets, the TB was re-activated six months after the start of treatment, by addition of acrylic to the upper block. The subjects were instructed to wear the appliance full-time and asked to complete a time sheet to monitor compliance. The subjects were instructed to wear the appliance full-time and asked to complete a time sheet to monitor compliance **Kointervention** lateral cephalogram at start and at end of treatment VERSUCHSGRUPPE: **Twin Block** N=19 (Anfang) / N=19 (Ende) / Alter = 9,5 years ± 10 months / ♂:♀ = 12:7 • Gebissphase: frühes Wechselgebiss bis Ruhephase • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** did not undergo any intervention, served as the control, the control group underwent treatment at the ‘ideal’ stage of development, conforming to the approval granted by the local ethical committee. **Kointervention** lateral cephalogram sex and age matched KONTROLLGRUPPE: **control** N=19 (Anfang) / N=19 (Ende) / Alter = 9,9 years ± 13 months / ♂:♀ = 12:7 • Gebissphase: frühes Wechselgebiss bis Ruhephase • KFO-Behandlung: keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: *linear measurements (VL-Prn, Vertical line–upper lip sulcus (VL–U1S), Vertical line–upper lip (VL–U1), Vertical line–lower lip (VL–L1), Vertical line–lower lip sulcus (VL–L1S), VL–pog’)* SEKUNDÄRZIELGRÖßE: *angular measurements (Z angle, L/HF, N/HF, Nasolabial angle)* TERTIÄRZIELGRÖßE: *Steiner ((Line S)-upper lip, (Line S)-lower lip)* QUARTÄRZIELGRÖßE: *Ricketts (Upper labial position, Lower labial position)* *WEITERE ZIELGRÖßEN: Skeletal component and Dental component (ANB, SNA, SNB, Maxillary length; 1/NA, 1/NA (mm), /1-NB, /1-NB (mm))*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. A significant improvement in facial profile in the treated group compared with the control group, with a reduction in facial convexity. 2. Evidence of upper lip retraction and anterior displacement of soft tissue pogonion. 3. Upper incisor retroclination in the treated patients, with ‘flattening’ of the upper lip profile.
Zusammen-fassung der Ergebnisse	**GRUPPE Twin Block VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** These demonstrate the significance of the variable VL–Ul ($P < 0.05$), indicating that the upper lip was retropositioned following TB therapy. In the treated group 1/NA angle changed significantly, as did the VL–Ui distance, characterizing upper incisor retroclination. ***SEKUNDÄRZIELGRÖßE*** In the treated group 1/NA angle changed significantly, as did the VL–Ui distance, characterizing upper incisor retroclination, which also produced a significant change in upper lip inclination (L/HF angle). The TB appliance significantly improved the Z angle ($P < 0.01$), reflected in reduced soft tissue facial convexity. The significant increase in mandibular length, measured by Co–Gn ($P < 0.05$), between T1 and T2, may have contributed to this improvement in profile. The variable L/HF increased significantly between T1 and T2 ($P < 0.05$) contributing to the change in soft tissue profile. ***TERTIÄRZIELGRÖßE*** The significant increase in S line–upper lip ($P < 0.001$) and upper labial position ($P < 0.001$) further contributed to the changes observed in the Z angle and consequent reduction in facial convexity. Thus, it would appear that the change in soft tissue profile was primarily the result of upper lip modification. ***QUARTÄRZIELGRÖßE*** A vertical positioning of the upper incisors occurred, followed by the upper lip. ***WEITERE ZIELGRÖßEN*** The change in upper lip position was not believed to be induced by skeletal changes (SNA and maxillary length, defined by Co–A distance, did not change significantly between T1 and T2). Furthermore, none of the variables used to evaluate maxillary changes (SNA and Co–A) showed any significant differences at T2. Whilst a significant increase in lower incisor projection occurred (1/NB angle; $P < 0.05$), no change was observed in lower lip position. A correction in the molar relationship was obtained in 15 of the 19 treated patients (80 per cent).
Angaben auffälliger positiver und/oder negativer Aspekte	*Power der Studie/Patientenzahl: limitiert, nicht spezifiziert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *No confidence intervals*
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> insgesamt gut
	<u>Klinische Aussagekraft:</u> 1. A significant improvement in facial profile in the treated group compared with the control group, with a reduction in facial convexity. 2. Evidence of upper lip retraction and anterior displacement of soft tissue pogonion. 3. Upper incisor retroclination in the treated patients
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Raveli et al. 2017

Dental skeletal effects of the metallic splinted Herbst appliance after growth spurt: a lateral oblique cephalometric assessment

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ABSTRACT

The aim of this study was to evaluate dental and skeletal changes induced by the use of Herbst appliance compared to natural growth in young adults with Class II division 1 malocclusion with mandibular retrusion, by means of lateral oblique radiographs. Forty-six subjects, 14 – 18 years old, after pubertal growth peak, with Class II division 1 malocclusion were assessed. Subjects were divided into two groups: the Experimental group included 23 subjects treated with Metallic Splinted Herbst and the Control group included 23 subjects followed without treatment. The Experimental and Control groups were paired by sex and chronological age. Oblique lateral cephalometric radiographs of the left and the right side of the mandible before treatment (T1) and after 8 months' treatment (T2) were used to evaluate dental and skeletal changes. Statistical analysis was performed with Intra Class Correlation and Student t-test, according to the study hypothesis. The results showed that the appliance corrected the Class II relationship in an 8-month period by mesial tipping movement of lower permanent first molars. It had little influence on mandibular structure and mandibular length and no influence on maxillary structure and upper molar. To conclude, late treatment of Class II malocclusion with the Herbst appliance was accomplished by means of dentoalveolar changes. These findings support that this type of treatment can be used in patients after growth has ceased because the results do not depend upon skeletal changes.

Key words: *Angle Class II Malocclusion; Orthodontic Appliances, Activator; Orthodontics.*

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** 23 patients treated with Herbst appliance, untreated 23 patients from Burlington growth study as control group; Herbst Group Brazilian origin
Schweregrad	Facial analysis consisting of convex profile, straight nasolabial angle, short mentocervical line and occlusal characteristics consisting of molar and canines in Class II (more than half cusp) and large overjet were used to determine that the subjects had skeletal Class II division 1 malocclusion.
Einschluss-kriterien *Bei Review: PICOS*	1. bilateral Class II molar relationship, 2. overjet greater than 5 mm, 3. complete permanent dentition, except third molars
Ausschluss-kriterien	1. extreme vertical growth pattern, 2. syndromes

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** were treated with a Metallic Splinted Herbst (MESPHER) appliance. Subjects in the Experimental group used Metallic Splinted Herbst (MESPHER) appliance with onestep mandibular advancement to an incisor ed-geto-edge relationship. The telescopic mechanism used was the FlipLock Herbst (TP Orthodontics, Inc.) model. The upper anchorage was a metallic splint structure in which upper bicuspids and molars were held together and united by a transpalatal welded bar. The lower anchorage was a metallic splint structure in which lower bicuspids and molars were held together and united by a lingual welded bar. Duration: mean 8.50 ± 0.70 months. **Kointervention** - Lateraloblique cephalometric radiographs of both sides of the mandible before treatment (T1) and after treatment (T2) were used to evaluate dental skeletal changes induced by MESPHER. VERSUCHSGRUPPE: H**erbst** N=23 (Anfang) / N=23 (Ende) / Alter = 15,6 ± ?? Jahre / ♂:♀ = 13:10 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Subjects without treatment were selected from Burlington Growth Centre archives and paired with the treated group by gender, age and malocclusion, and used as the Control group. **Kointervention** In the Control group, the same radiographs of both sides of the mandible of untreated patients were used to evaluate dental skeletal changes due to natural growth development at the same mean ages as subjects in the Experimental group (T1 and T2). KONTROLLGRUPPE: **untreated/control** N=23 (Anfang) / N=23 (Ende) / age matched to Herbst group / ♂:♀ = 13:10 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Therapie
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Changes in horizontal and vertical measurements (Co, Go, Me, ANS, PNS, UMC, UMA, LMC, LMA)* SEKUNDÄRZIELGRÖßE: *Mandibular changes (Md length, Md height, Md hor height, Md angle, Incl molar inf)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The results showed that the appliance corrected the Class II relationship in an 8 months period by mesial tipping movement of lower permanent first molars. 2. It had little influence on mandibular structure and mandibular length and no influence on maxillary structure and upper molar. 3. To conclude, late treatment of Class II malocclusion with the Herbst appliance was accomplished by means of dentoalveolar changes; These findings suggest that this type of treatment can be used in patients after growth has ceased because the results do not depend upon skeletal changes.

Zusammen-fassung der Ergebnisse	**GRUPPE Herbst VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE + SEKUNDÄRZIELGRÖßE*** The effects of treatment (Experimental group) compared to natural growth (Control group) showed skeletal and dental changes. Analysis of the horizontal and vertical mandibular changes on each side (Tables 1 and 2) showed that variables related to gonium (Go), mentonium (Me), mandibular length (Md length), horizontal length (Md hor length), mandibular height (Md height) and mandibular angle (Md angle) underwent some small changes. Changes in the same variable differed on the right and left side of the mandible. Only the condyle (Co) presented no significant change. Maxilla showed no significant horizontal or vertical change regarding the points PNS and ANS (Table 1). Regarding dental movements (Table 1), there were no significant horizontal and vertical changes for Upper First Permanent Molar, either for crown (UMC) or apex (UMA). However, Lower First Permanent Molar had a very significant horizontal change in crown (LMC) in mesial direction and showed no apex changes (LMA), leading to a significant increase in its inclination (Incl Molar Inf) as a result of the treatment (Tables 1 and 2). Additionally, there is statistical evidence that a vertical change occurred on the right side for Lower First Permanent Molar apex (LMA) but not on the left side.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Keine Power der Studie bzw. Patientenanzahl angegeben *Power der Studie/Patientenzahl: limitiert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: The late treatment was accomplished mainly through dentoalveolar changes. The skeletal changes were small. Probably is the Herbst appliance a solution for people with class II malocclusions after growth has ceased.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Ren, Steegman et al. 2019

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ORIGINAL ARTICLE

Bone-anchored maxillary protraction in patients with unilateral complete cleft lip and palate and Class III malocclusion

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Abstract

Objective This prospective controlled study evaluated the effect of bone-anchored maxillary protraction therapy in cleft children with Class III malocclusion using CBCT-derived 3D surface models.

Materials and subjects Eighteen cleft patients between 10 and 12 years old were included. Intermaxillary elastics were worn after the placement of four zygoma bone plates for 18 months. Uniquely, three age-matched untreated groups including both cleft subjects and non-cleft subjects with Class III malocclusion served as controls. Profile photos and CBCT scans for each patient were taken before (T0) and 18 months after the protraction (T1). 3D measurements were made on CBCT surface models from the treatment group using tomographic color mapping method. Cephalometric measurements were made on lateral cephalogram reconstructed from the CBCT scans and were compared with those obtained from the control groups.

Results Two thirds of the treatment subjects showed improved lip projection towards more convex facial profile. The most significant skeletal changes on 3D surface models were observed at the zygomatic regions (mean 1.5-mm forward, downward, and outward displacement) and at the maxillary complex (mean 1.5-mm forward displacement). Compared with the control groups, the treatment subjects showed significant increase in the SNA and ANB angles, increased Wits appraisal, a more forward movement of point A and overjet improvement ($p < 0.05$).

Conclusions BAMP in cleft patients gives a significant forward displacement of the zygomaxillary complex in favor of the Class III treatment.

Clinical relevance This treatment method shows clearly favorable outcome in cleft patients after 1.5 years of BAMP.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Patients between 10- 12 years with either cleft, no cleft and Class III or Class I or Class II molar realtionship (dependent on the study group); Dutch
Schweregrad	TG-C: Sagittal overjet was between + 2 mm and −5 mm or with an ANB angle < 0°or a WITs < 0 mm; UG-non cleft: ANB < 0° or WITs < 0 mm; UG-C1: ANB < 0° or WITs < 0 mm; UG-C2: ANB ≥ 0° or WITs ≥ 0 mm
Einschluss-kriterien	**TG-C:** (1.) All patients had previously a secondary bone transplantation procedure by the same surgeon; (2.) Both lower permanent canines have erupted; (3.) Sagittal overjet was between + 2 mm and −5 mm or with an ANB angle < 0°or a WITs < 0 mm; (4.) Prior to bone-anchored protraction, the patients had undergone no or only mild dental alignment in the upper jaw in preparation for bone transplantation. **UG-non cleft:** (1) non-cleft with Class III malocclusion (ANB < 0° or WITs < 0 mm)**. UG-C1:** (1) cleft with Class III malocclusion group (ANB < 0° or WITs < 0 mm)**. UG-C2:** (1) cleft with Class I or II malocclusion group (ANB ≥ 0° or WITs ≥ 0 mm)

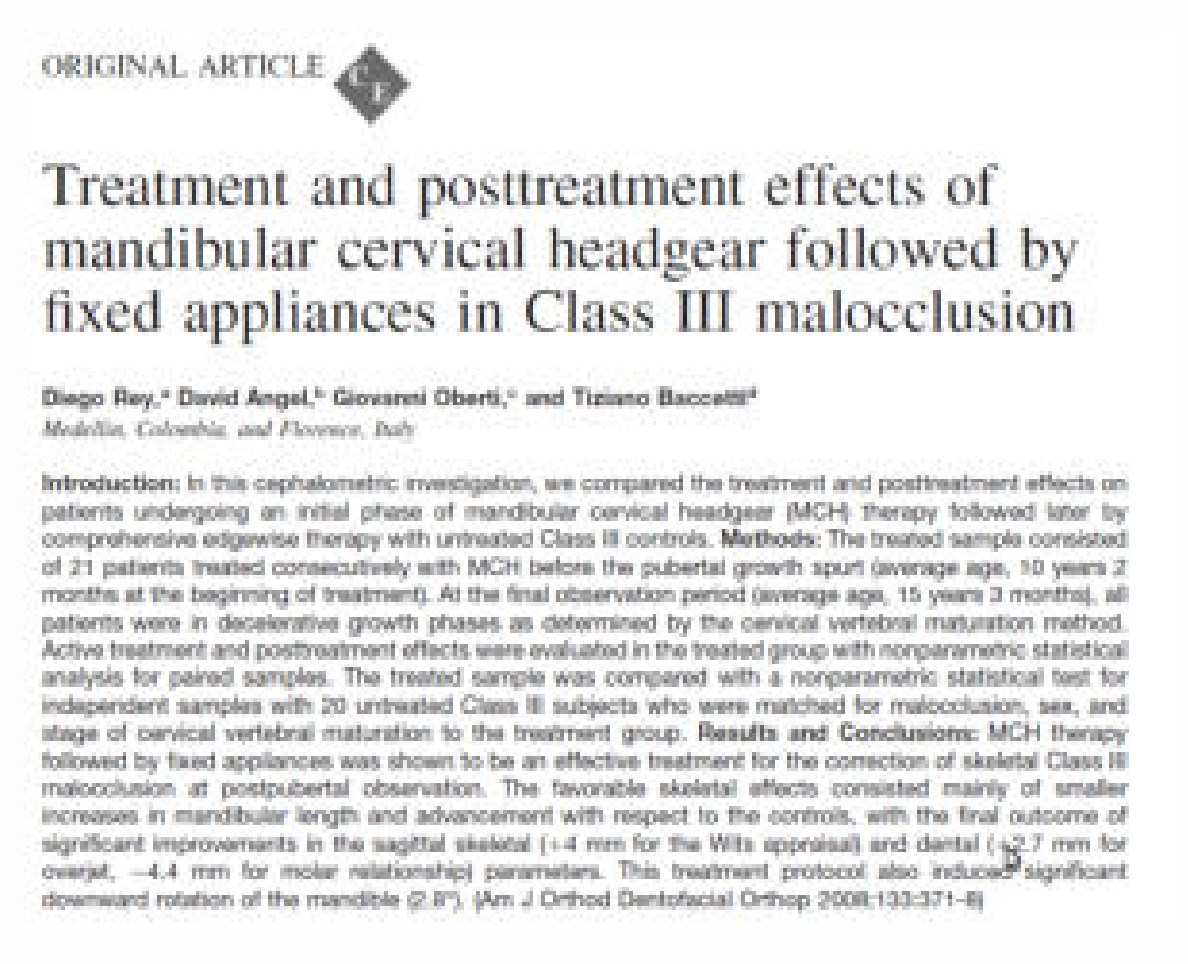
Ausschluss-kriterien	Not fullfilling inclusion criteria
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **TG-C, BAMP:** Four Bollard bone plates were placed by the same surgeon at the age of 11 years under general anesthesia according to previous studies. Maxillary protraction with intermaxillary elastics was started 3 weeks after the placement with an initial force of 150 g each side which was increased to 200–250 g after 2–3 months. All patients were instructed to wear the elastics 24 h per day including meal time and change the elastics once a day. VERSUCHSGRUPPE 1 **TG-C; (Treatment Group Cleft), Class III Cleft** N= 21 (Anfang) / N=18 (Ende) / Alter = 11,3 ± 0,6 years / ♂:♀ = 12:6 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** Uniquely, three age-matched untreated groups including both cleft subjects and non-cleft subjects with Class III malocclusion served as controls. KONTROLLGRUPPE 1: **UG- non cleft (untreated group non cleft) untreated Class III** N=10 (Anfang) / N=10 (Ende) / Alter = 10,2 ± 1,1 years / ♂:♀ = 8:2 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung KONTROLLGRUPPE 2: **UG- C1 (untreated group cleft) untreated Class III Cleft** N=11 (Anfang) / N=11 (Ende) / Alter = 10,2 ± 0,7 years / ♂:♀ = 10:1 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung KONTROLLGRUPPE 3: **UG- C2 (untreated group cleft) untreated Class I or Class II Cleft** N=10 (Anfang) / N=10 (Ende) / Alter = 11,5 ± 1,1 years / ♂:♀ = 6:4 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • dentofaziale Ästhetik PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB, Wits** SEKUNDÄRZIELGRÖßE: **Dental: Overjet** TERTIÄRZIELGRÖßE: **Soft tissue: Facial profile, lip projection**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	BAMP in cleft patients gives **a significant forward displacement of the zygomaxillairy complex** in favor of the Class III treatment. This treatment method shows clearly **favorable outcome in cleft patients after 1.5 years of BAM**P.

Zusammen-fassung der Ergebnisse	**GRUPPE TG-C; (Treatment Group Cleft), Class III Cleft VS. GRUPPE UG- non cleft (untreated group non cleft) untreated Class III** **GRUPPE TG-C; (Treatment Group Cleft), Class III Cleft VS. GRUPPE UG- C1 (untreated group cleft) untreated Class III Cleft** **GRUPPE TG-C; (Treatment Group Cleft), Class III Cleft VS. GRUPPE UG- C2 (untreated group cleft) untreated Class I or Class II Cleft** T0 (pre-treatment) : 11,3, 0,6 yearsTG-C; 10,2, 1,1 years UG-non cleft; 10,2, 0,7 years UG-C1; 9,8, 0,9 years UG-C2 T1 (post-treatment): 12,8, 08 years, TG-C; 11,6, 1,4 years UG-non cleft; 11,8, 0,6 years UG-C1; 11,5, 1,1 years (UG-C2)T1-T3 **Skeletal: SNA, SNB, ANB, Wits**  **Dental: Overjet**  **Soft tissue: Facial profile, lip projection** Variations of individual treatment response were observed in both sex groups. Two thirds of the subjects showed improvement of the lip projection, half with great improvement (between 10 and 26°), and half with mild to moderate improvement (between 1 and 9°). One third of the subjects showed unchanged or worsened lip projection (between 0 and − 10°). Lip projection at T0 and T1 showed a positive correlation (R2 = 45%, slope $p < 0.01$) . The changes between T0 and T1 (T1– T0) seemed to show a weak but negative correlation with the begin severity (T0) (R2 = 26%, slope $p < 0.05$).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Äquivalenz von Versuchs- und Kontrollgruppen gegeben. Dies gilt für die entsprechende Kontrollgruppe (UG-C1) mit Spalten (enge Einschlusskriterien). Baseline characteristics sind angegeben und statistisch verglichen. Die Kontrollgruppe ohne Spalte, bzw. Spaltpatienten mit Klasse I oder Klasse II Okklusionen sind notwendigerweise nicht äquivalent. Insgesamt kleine Gruppengrößen, insbesondere die der Kontrollgruppen. Attrition rate mit 15 % in der TG-C hoch. Power/ Sample Size Berechnungen wurden durchgeführt. Die Auswertung war nicht verblindet. Patienten der Kontrollgruppen stammen aus historischen Wachstumsstudien, bzw. den Archiven. Die Vergleiche mit nicht Spalten Patienten sind unzureichend begründet. Eigentlich interessante prospektive Studie, die allerdings einige deutliche Schwächen in der Durchführung zeigt. Die klinische Relevanz ist für den Vergleich mit der UG-C1 (Class III, cleft) mit Einschränkungen gegeben. *Funding:* keine Angabe *Interessenkonflikte:* The authors declare that they have no conflict of interest *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe ist gegeben. Dies gilt für die entsprechende Kontrollgruppe (UG-C1) mit Spalten (enge Einschlusskriterien). Power/ Sample Size Berechnungen wurden durchgeführt. Eine Verblindung fand nicht statt. Kleine Gruppengrößen, historische Kontrollen unklarer Bedeutung.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel Klinische Aussagekraft: Eigentlich interessante prospektive Studie, die allerdings einige deutliche Schwächen in der Durchführung zeigt. Die klinische Relevanz ist für den Vergleich mit der UG-C1 (Class III, cleft) mit Einschränkungen gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Rey et al. 2008



ORIGINAL ARTICLE

Treatment and posttreatment effects of mandibular cervical headgear followed by fixed appliances in Class III malocclusion

Diego Rey,[a] David Angel,[b] Giovanni Oberti,[c] and Tiziano Baccetti[d]
Medellín, Colombia, and Florence, Italy

Introduction: In this cephalometric investigation, we compared the treatment and posttreatment effects on patients undergoing an initial phase of mandibular cervical headgear (MCH) therapy followed later by comprehensive edgewise therapy with untreated Class III controls. **Methods:** The treated sample consisted of 21 patients treated consecutively with MCH before the pubertal growth spurt (average age, 10 years 2 months at the beginning of treatment). At the final observation period (average age, 15 years 3 months), all patients were in decelerative growth phases as determined by the cervical vertebral maturation method. Active treatment and posttreatment effects were evaluated in the treated group with nonparametric statistical analysis for paired samples. The treated sample was compared with a nonparametric statistical test for independent samples with 20 untreated Class III subjects who were matched for malocclusion, sex, and stage of cervical vertebral maturation to the treatment group. **Results and Conclusions:** MCH therapy followed by fixed appliances was shown to be an effective treatment for the correction of skeletal Class III malocclusion at postpubertal observation. The favorable skeletal effects consisted mainly of smaller increases in mandibular length and advancement with respect to the controls, with the final outcome of significant improvements in the sagittal skeletal (+4 mm for the Wits appraisal) and dental (+2.7 mm for overjet, −4.4 mm for molar relationship) parameters. This treatment protocol also induced significant downward rotation of the mandible (2.8°). (Am J Orthod Dentofacial Orthop 2008;133:371-8)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • At the initial observation (T1), all patients had Class III malocclusion characterized by anterior crossbite and Wits appraisal of - 1.5 mm or less. All patients were white. No permanent teeth were congenitally missing or extracted before or during treatment. • Treated Group (n=21): patients, who were consecutively treated with this protocol by 1 operator (D.R.). • Control Group (n=20): A control group of 20 untreated subjects with dentoskeletal Class III malocclusion was obtained from the Department of Orthodontics at the University of Florence and the University of Michigan Elementary and Secondary School Growth Study.
Schweregrad	Wits appraisal -1.5 mm or less.

Einschluss-kriterien *Bei Review: PICOS*	• Class III malocclusion characterized by anterior crossbite and Wits appraisal21 of -1.5 mm or less. • All patients were white. • No permanent teeth were congenitally missing or extracted before or during treatment.
Ausschluss-kriterien	Keine Angaben
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **CLASS III treated with mandibular cervical headgear (MCH group)** N=21 (Anfang) / N=21 (Ende) / Alter = 10,17 ± 1,25 Jahre / ♂:♀ = 0,4:1 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **CLASS III untreated (control group)** N=20 (Anfang) / N=20 (Ende) / Alter = 9,75 ± 1,58 Jahre / ♂:♀ = 0,67:1 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: sagittal skeletal and dental parameters (ANB, Wits appraisal, overjet and molar relationship) SEKUNDÄRZIELGRÖßE: mandibular length (Co-Gn) TERTIÄRZIELGRÖßE: Mandibular plane angle MPA
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. Treatment with the MCH followed by fixed appliances induced significant dentoskeletal responses in terms of improvement in the sagittal skeletal (+4 mm for the Wits appraisal) and dental (+2.7 mm for overjet, -4.4 mm for molar relationship) parameters; these changes remained stable during the posttreatment period. 2. Overall, MCH therapy is an effective treatment for the correction of skeletal Class III malocclusion in the long term. The favorable skeletal effects consisted mainly of smaller increases in mandibular length and advancement, with the final outcome of significant improvement in sagittal skeletal and dental relationships. 3. A side effect of this treatment protocol was significant downward rotation of the mandible (2.8°).
Zusammen-fassung der Ergebnisse	**Gruppe Class III VS. Gruppe CLASS III untreated (control group)** ***PRIMÄRZIELGRÖßE*** sagittal skeletal and dental parameters (ANB, Wits appraisal, overjet and molar relationship) Treatment with the MCH followed by fixed appliances induced significant dentoskeletal responses in terms of improvement in the sagittal skeletal (+4 mm for the Wits appraisal) and dental (+2.7 mm for overjet, -4.4 mm for molar relationship) parameters; these changes remained stable during the posttreatment period. ***SEKUNDÄRZIELGRÖßE*** mandibular length (Co-Gn) In the treated groupmandibular length (Co-Gn) significantly larger at T3 than at T2. ***TERTIÄRZIELGRÖßE:*** Mandibular plane angle MPA In the long-term skeletal relationship, significant backward rotation of the mandibular plane in relation to the Frankfort horizontal line was also recorded (2.8°).
Angaben auffälliger positiver und/oder negativer Aspekte	*Studiendesign: Kohortenstudie* *Durchführung: Klasse III MCH gegen unbehandelte Klasse III Kohorte verglichen.* *Auswertung: Fehleranalyse durchgeführt, die Analyse valid und reproduzierbar* *Power der Studie/Patientenzahl: nicht kalkuliert,* *Funding: None.* *Interessenkonflikte: None.* *Bias (SIGN/AMSTAR/EinzelstudienRoB –): High quality (++)*
Schluss-	methodische Qualität: insgesamt hoch

folgerung des Begutachters	Klinische Aussagekraft: Die Behandlung mit der MCH, mit anschließender festsitzender Apparatur, führte zu signifikanten dentoskelettalen Reaktionen in Bezug auf die Verbesserung der sagittalen (+4 mm für die Wits-Beurteilung) und dentalen (+2,7 mm für Overjet, -4,4 mm für die Molarenbeziehung) Parameter; diese Veränderungen blieben während der Nachbehandlungszeit stabil. Desweiteren haben MCH und die Therapie mit festsitzenden Apparaten eine deutliche „Clockwise Rotation“ Unterkiefers verursacht, die in einer ähnlichen Studie von Westwood et al 2003 nicht gefunden wurde, bei der die langfristigen Auswirkungen von RME und Gesichtsmaskentherapie untersucht wurde. Daher scheint die MCH -im Gegensatz zur Gesichtsmaske- bei moderateren Formen der dentoskelettalen Klasse III Malokklusion und möglicherweise mit einem ausgeprägten horizontalem Wachstumsmuster indiziert zu sein.
Evidenz-level (SIGN)	**2++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality (++)**

Evidenztabelle Rizk, Kulbersh et al. 2016

Changes in the oropharyngeal airway of Class II patients treated with the mandibular anterior repositioning appliance

Susan Rizk*; Valmy Pangrazio Kulbersh*; Riyad Al-Qawasmi*

ABSTRACT

Objective: To evaluate the effects of functional appliance treatment on the oropharyngeal airway volume, airway dimensions, and anteroposterior hyoid bone position of growing Class II patients.

Materials and Methods: Twenty Class II white patients (mean age, 11.7 ± 1.75 years) treated with the MARA followed by fixed appliances were matched to an untreated control sample by cervical vertebrae maturation stage at pretreatment (T1) and posttreatment (T2) time points. Cone beam computed tomography scans were taken at T1 and T2. Dolphin3D imaging software was used to determine oropharyngeal airway volume, dimensions, and anteroposterior hyoid bone position.

Results: Multivariate ANOVA was used to evaluate changes between T1 and T2. Oropharyngeal airway volume, airway dimensions, and A-P position of the hyoid bone increased significantly with functional appliance treatment. SNA and ANB decreased significantly in the experimental group ($P \leq .05$). Changes in SNB and Sn-GoGn failed to reach statistical significance.

Conclusions: Functional appliance therapy increases oropharyngeal airway volume, airway dimensions, and anteroposterior hyoid bone position in growing patients. (*Angle Orthod.* 2016;86:955–961.)

KEY WORDS: Class II; Airway; Obstructive sleep apnea; Functional appliance; MARA

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** The experimental group consisted of 20 Class II white patients treated with the MARA followed by fixed appliances. The control group consisted of 73 untreated skeletal Class II white subjects, who had CBCT scans taken with the same parameters as did the experimental group.
Schweregrad	SN-GoGn ≥ 27 and ≤ 37, SNB ≤ 77, ANB ≥ 4.5
Einschluss-kriterien *Bei Review: PICOS*	1. SN-GoGn ≥ 27 and ≤ 37 2. SNB ≤ 77 3. ANB ≥ 4.5 4. cervical vertebrae maturation stage (CVMS), as described by Baccetti
Ausschluss-kriterien	All subjects were nonsyndromal. Patients with a CVMS of 5 or greater at the pretreatment time point were excluded due to a lack of remaining growth. Subjects were excluded if, upon visual inspection of the CBCT scan, they were found to be swallowing or having a hyperextended head position while the scan was taken. All subjects who were found to have a nonconcentric condylar position upon visualization of the CBCT-formatted TMJ tomograms were also excluded from the sample.

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Treatment with the MARA followed by fixed appliances. The mean length of functional appliance treatment was 10.6 months. The average length of time from functional appliance removal to debond was 16.8 months. **Kointerventionen** CBCT scans, using the i-CAT Cone Beam 3D Imaging System (Imaging Sciences International, Hatfield, Pa), were taken prior to the placement of any appliances (T1) and immediately after removal of the fixed edgewise appliances (T2). Scans were done with the patients in centric occlusion with the following radiographic parameters: 120 kVp, 18.54 mAs, 8.9-second scan time, and 0.3-mm voxel dimension. Subjects were seated in a chair and asked to hold their breath and refrain from swallowing while the scans were taken in the natural head position. VERSUCHSGRUPPE: **treatment with MARA** N=20 (Anfang) / N=20 (Ende) / Alter = 11,7 ± 1,75 Jahre / ♂:♀ = 7:13 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** The control group consisted of 73 untreated skeletal Class II white subjects, who had CBCT scans taken with the same parameters as did the experimental group **Kointerventionen** CBCT scans, using the i-CAT Cone Beam 3D Imaging System (Imaging Sciences International, Hatfield, Pa), were taken prior to the CVMS stages 1/2/3/4/5/6 KONTROLLGRUPPE: **control group** N=73 (Anfang) / N=73 (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? (N=73) • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** PRIMÄRZIELGRÖßE: *Comparison of Mean Changes from t1-t2 (ΔAirway volume, ΔA-P Hyoid bone position, ΔAirway A-P dimension, ΔAirway transverse dimension, ΔSNA, ΔSNB, ΔANB, ΔSN-GoGn)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	• Functional appliance therapy with the MARA increases oropharyngeal airway volume, airway dimensions, and A-P hyoid bone position in growing patients. • Future studies are necessary to clarify the relationship between the symptoms of sleep-disordered breathing and the effects of functional jaw orthopedics.

Zusammen-fassung der Ergebnisse	**GRUPPE treatment with MARA VS. GRUPPE control group** ***PRIMÄRZIELGRÖßE*** Statistical analysis showed that the airway volume, A-P hyoid bone position, and A-P and transverse airway dimensions were significantly increased in the experimental group compared with the control group (P = .005, .000, .000, .000, respectively). SNA and ANB decreased significantly in the experimental group compared with controls (P = .000 and .026). Although SNB increased in the experimental group from T1 to T2, this change did not reach statistical significance (P = .063). There was no significant change in SN-GoGn (P = .43). Upon visual inspection of TMJ tomograms at T2, we found no patients with condylar distraction. On average, the experimental group had a 5537.4- mm^3 increase in OA volume from T1 to T2 in contrast to the 2220.5-mm^3 increase exhibited by controls attributable to growth. Functional appliance usage explains approximately 39.1% of airway A-P dimensional changes in our sample, 30.3% of A-P hyoid bone positional changes, 28.5% of SNA changes, 27.7% of airway transverse dimensional changes, 18.7% of airway volume changes, and 12.3% of the change in ANB.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl:* Power calculations were done for this study using the following parameters: the level of significance was α = .05 and the power of the test was 80%. It was found that a sample of 11 individuals was need to detect a difference of at least 1400 mm3 with standard deviation of 1650 mm3 as found by our preliminary studies (unpublished data). Multivariate ANOVA was used to evaluate the effect of functional appliances on the experimental variables when controlling for CVMS as previously described. Comparison of the starting forms for the experimental and control groups was also done. *Funding: nicht angegeben* *Interessenkonflikte: nicht angegeben* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: Functional appliance therapy with the MARA increases oropharyngeal airway volume, airway dimensions, and A-P hyoid bone position in growing patients.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Rodrigues de Almeida et al. 2002

Treatment Effects Produced by Fränkel Appliance in Patients with Class II, Division 1 Malocclusion*

Marcio Rodrigues de Almeida, DDS, MSc, PhD[a]; José Fernando Castanha Henriques, DDS, MSc, PhD[b]; Renato Rodrigues de Almeida, DDS, MSc, PhD[c]; Weber Ursi, DDS, MSc, PhD[a]

Abstract: The purpose of this investigation was to evaluate the dentoalveolar and skeletal cephalometric changes produced by the Fränkel appliance in individuals with a Class II, division 1 malocclusion. Lateral cephalograms of 44 patients of both sexes were divided in two groups of 22 each. The control group was comprised of untreated Class II children with an initial mean age of eight years and seven months who were followed without treatment for a period of 13 months. The Fränkel group had an initial mean age of nine years and was treated for a mean period of 17 months. Lateral cephalometric headfilms of each patient were obtained at the beginning and end of treatment. The Fränkel appliance produced no significant changes in maxillary growth during the evaluation period, while a statistically significant increase in mandibular length was observed. The maxillomandibular relationship improved mostly because of an increase in mandibular length. In addition, there were no statistically significant differences in the craniofacial growth direction between the Fränkel and the control group, both showing a slight downward rotation of the palatal plane. The Fränkel appliance produced a labial tipping of the lower incisors and a lingual inclination of the upper incisors as well as a significant increase in mandibular posterior dentoalveolar height. It was concluded that the main effects of the Fränkel appliance during this time period were mostly dentoalveolar with a smaller but significant skeletal mandibular effect. (*Angle Orthod* 2002; 72:418–423.)

Key Words: Functional Regulator appliance; Class II, division 1 malocclusion; Functional orthopedics

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** The control sample was obtained from the files of the Orthodontic Department Longitudinal growth study at the Bauru Dental School of the University of Sao Paulo. Fränkel Group (treatment group) was treated at the orthodontic graduate program at Bauru Dental School, University of Sao Paulo. Brazilian school children.
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	1. Class II, division 1 malocclusion with at least an end-to-end Class II molar relationship 2. minimal or no crowding
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Therapie** Treatment with Functional Regulator of Fränkel (FR-2) for a mean period of 17 month. Patients were instructed to wear the appliances four hours a day in the first week, eight hours a day in the second week, 12 hours a day in the third week, and 24 hours a day thereafter (with the exception of eating and playing certain sports) until the end of treatment. The FR-2 appliances worn by patients were fabricated according to the principles of McNamara and Huge. On average, the FR-2 advanced the mandible forward 5 mm and opened the bite 5 mm from the intercuspal position. When the overjet was larger than 7 mm, the mandible was advanced gradually in 2–3 mm increments following Falck and Fränkel. During this period no appliance was used other than the FR-2. **Kointervention** Lateral cephalometric radiographs in habitual occlusion were taken initially and after 17 months of treatment. VERSUCHSGRUPPE: **Fränkel group** N=22 (Anfang) / N=22 (Ende) / Alter = 9,00 ± ?? Jahre / ♂:♀ = 11:11 • Gebissphase: frühes Wechselgebiss bzw. Ruhephase • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** This sample had no previous orthodontic treatment and was observed for a period of 13 months. **Kointervention** Lateral cephalometric radiographs in habitual occlusion were taken initially and after 13 months of observation. KONTROLLGRUPPE: **control group** N=22 (Anfang) / N=22 (Ende) / Alter = 8 years 7 months ± ?? Jahre / ♂:♀ = 11:11 • Gebissphase: frühes Wechselgebiss bzw. Ruhephase • KFO-Behandlung: keine kieferorthopädische Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *maxillary skeletal (SNA, Co-A, A-FHp, ANS-FHp)* SEKUNDÄRZIELGRÖßE: *mandibular Skeletal (SNB, Ar-Go, Go-Gn, Ar-Gn, Co-Gn, B-FHp, Pog-FHp, Ar.GoMe)* TERTIÄRZIELGRÖßE: *Maxilla to mandible (ANB, NAP)* QUARTÄRZIELGRÖßE: *vertical (*Sn.GoMe, SN.PP, LAFH, S-Go*)* WEITERE ZIELGRÖßEN: *Maxillary dental, Mandibular dental (maxillary: 1.PP, 1.NA, 1-NA, 1.FHp, 6-PP, mandibular: IMPA, /1 to NB, /1 to N-B, /1 to FHp, /6 to GoMe)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. No significant restriction of maxillary growth was observed in functional appliance group. 2. Compared with Class II controls, statistically significant increases in mandibular length were observed in the Fränkel group (patients achieved an additional 1.1 mm of mandibular length) 3. There was a significant improvement of the anteroposterior relationship between the maxilla and the mandible in the FR-2 group. 4. There were no statistically significant differences in the craniofacial growth pattern and in the lower anterior facial height between the groups. 5. The FR-2 appliance produced labial tipping and linear protrusion of the lower incisors as well as a lingual inclination and retraction of the upper incisors in comparison with the controls. In addition, there was a significant increase in mandibular posterior dentoalveolar height and no extrusion of the upper molars in the Fränkel group. The present study suggests that Class II corrections can be achieved with the Fränkel appliance. The FR-2 appliance appears to have mostly dentoalveolar effects with a smaller, but significant, skeletal mandibular effect.
Zusammen-fassung der Ergebnisse	**GRUPPE Fränkel group VS. GRUPPE control group** ***PRIMÄRZIELGRÖßE*** No statistically significant differences were observed between the groups in all measures evaluated. Therefore, no effect should be attributed to the FR-2 as it relates to influencing maxillary sagittal growth and position. ***SEKUNDÄRZIELGRÖßE*** Mandibular size was influenced significantly and positively in the Fränkel group. The effective mandibular length (Co-Gn), for instance, increased 3.2 mm in the control group and 3.9 mm in the FR-2 group. These statistically significant differences between two groups are also evident in the Ar-Gn and GoGn measurements. No significant differences between the two groups were observed in the SNB angle that remained almost unchanged in the control and FR-2 group. ***TERTIÄRZIELGRÖßE*** Considering the maxilla-mandibular measures (ANB, NAP), the Fränkel group produced a reduction in the sagittal Class II discrepancy while the control group remained basically unchanged. The ANB angle was reduced by 0.88 in the FR-2 patients and remained unchanged in the control patients. The NAP angle did not show a significant difference between the two groups. ***QUARTÄRZIELGRÖßE*** Mandibular plane orientation (SNGoMe) was unaffected by treatment, while the palatal plane rotated significantly more clockwise in the treated group. It is interesting to note that the control group actually rotated counter-clockwise. No difference was noted in the increases in lower anterior face height (LAFH) and posterior facial height (S-Go) between the groups. ***WEITERE ZIELGRÖßEN*** Maxillary dental: The upper dentoalveolar component was the single component that presented more significant changes, with incisor retraction of 4.8° for 1-NA and about 1.1 mm for the 1-NA evaluation (control group moved forward 0.8 mm and the treated group moved back 1.1 mm). Vertically, the FR-2 appliance did not inhibited upper molar eruption. Therefore, upper molars extrusion to the palatal plane did not differ significantly between the two groups Mandibular dental: No significant between-group differences in incisor mandibular plane angle (IMPA) were seen. However, the lower incisors proclined significantly in the treated group about 2° more than did the controls at about 0.4 mm, depending on the variable evaluated. The lower molars extruded significantly more (1.1 mm) in the treated group than did the controls (0.3 mm)

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	For Comparison: in order to conduct direct and meaningful comparisons, all cephalometric increments of the FR-2 group were adjusted to the time interval of the control sample, namely 13 months, according to the protocols of Toth and McNamara. *Power der Studie/Patientenzahl: limitiert, nicht spezifiziert* *Funding:* This work was supported by CNPQ (Brazilian National Research Foundation) *Interessenkonflikte: keine Angabe* The study does not indicate how many of the people asked to take part did so, in each of the groups being studied. No confidence intervals provided.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: The FR-2 appliance appears to have mostly dentoalveolar effects with a smaller, but significant, skeletal mandibular effect.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Rodriguez de Guzman-Barrera et al. 2017

PLOS ONE

RESEARCH ARTICLE

Effectiveness of interceptive treatment of class III malocclusions with skeletal anchorage: A systematic review and meta-analysis

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Abstract

Recently, new strategies for treating class III malocclusions have appeared. Skeletal anchorage appears to reduce the dentoalveolar effects while maximising the orthopaedic effect in growing patients. The purpose of this systematic review and meta-analysis is to examine the effectiveness of bone anchorage devices for interceptive treatment of skeletal class III malocclusions. Searches were made in the Pubmed, Embase, Scopus and Cochrane databases, as well as in a grey literature database, and were complemented by hand-searching. The criteria for eligibility were: patients who had undergone orthodontic treatment with skeletal anchorage (miniplates and miniscrews). Patients with syndromes or craniofacial deformities or who had undergone maxillofacial surgery were excluded. The following variables were recorded for each article: author, year of publication, type of study, sample size, dropouts, demographic variables, treatment carried out, radiographic study (2D or 3D), follow-up time, and quality of the articles on the Newcastle-Ottawa Scale. The means and confidence intervals of the following variables were employed: Wits, overjet, ANB, SNA and SNB. Initially, 239 articles were identified. After removing the duplicates and applying the selection criteria, 9 were included in the qualitative synthesis and 7 in the quantitative synthesis (meta-analysis). It may be concluded that skeletal anchorage is an effective treatment for improving skeletal Class III malocclusion, but when compared with other traditional treatments such as disjunction and face mask, there is no clear evidence that skeletal anchorage improves the results.

OPEN ACCESS

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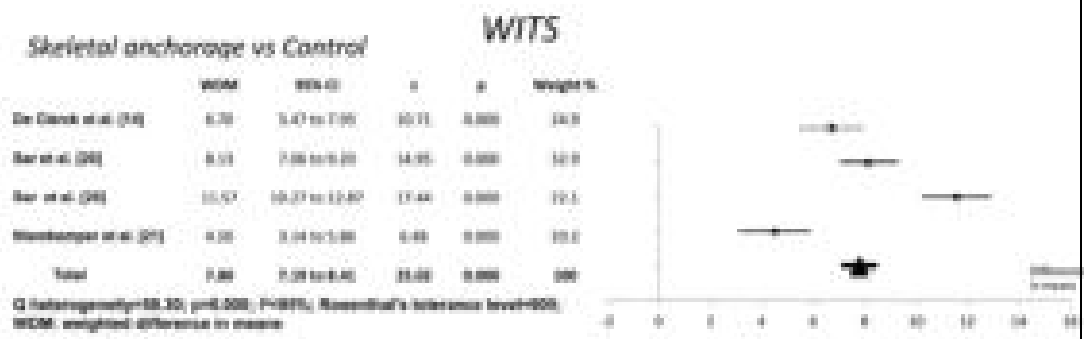
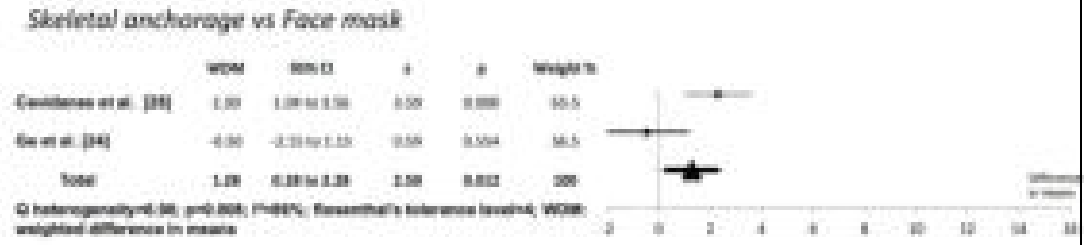
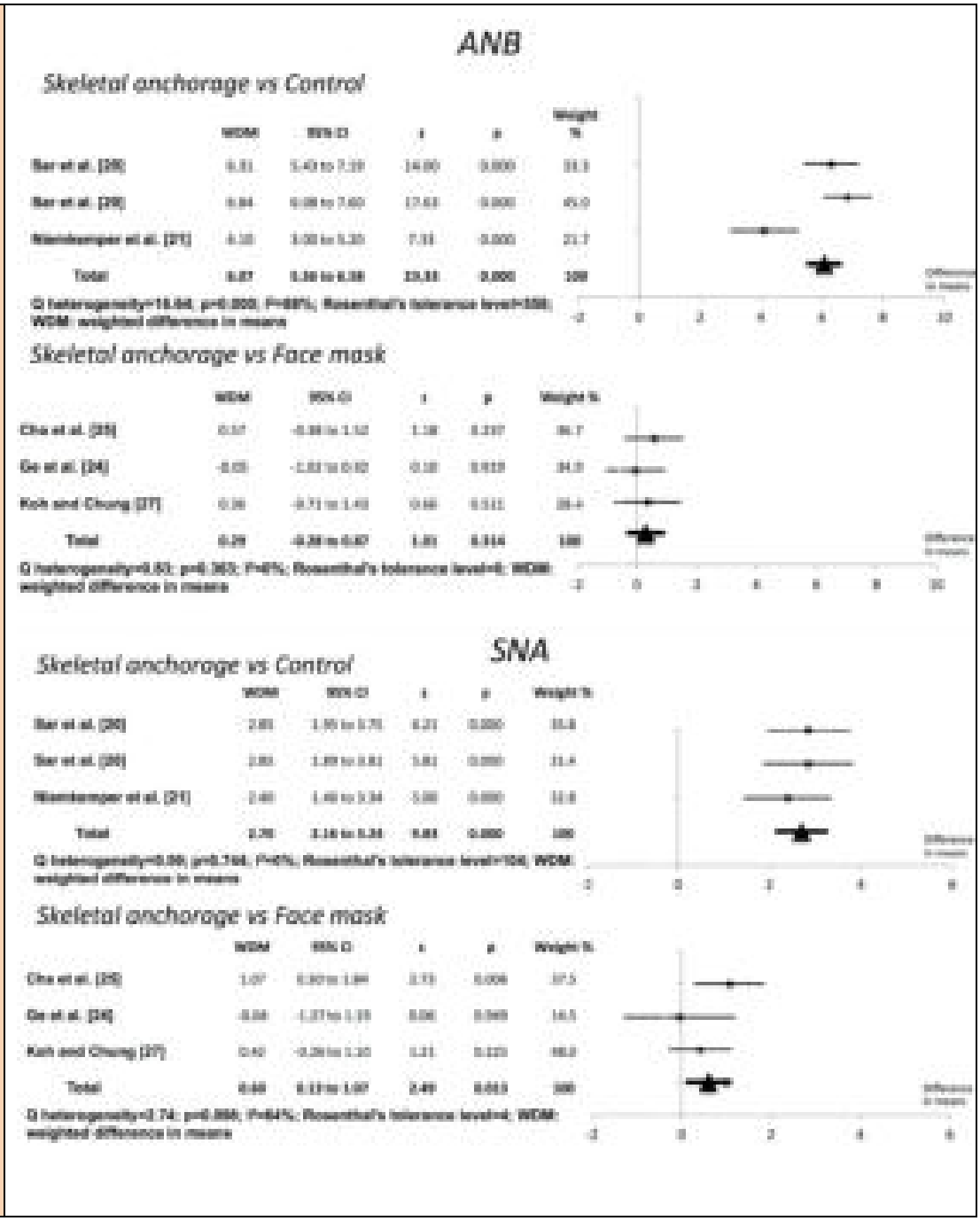
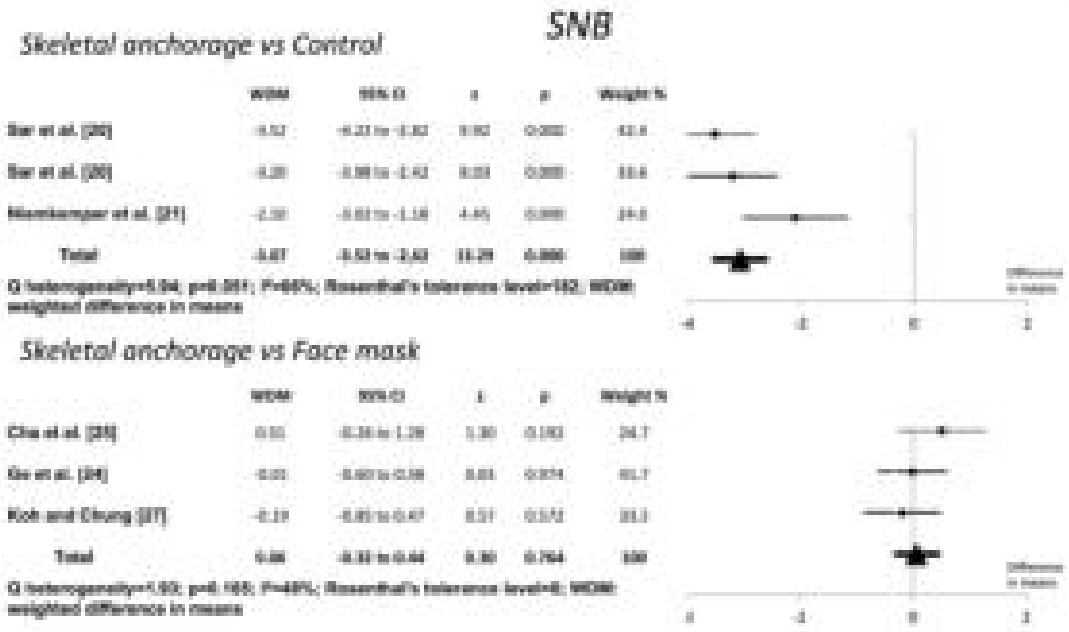
Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • Growing patients with skeletal class III malocclusionwho had undergone orthodontic treatment with skeletal anchorage, including miniplates and miniscrews. • Review: articles, articles in press and reviews concerning studies inhumans. Only systematic reviews, meta-analyses, randomized clinical trials (RCTs), case-controlstudies and cohort studies were accepted. Both retrospective and prospective studies were included. • Single Center Studien aus Belgien, Deutschland, China, den USA und der Türkei.
Schweregrad	Keine Angaben

Einschluss-kriterien *Bei Review: PICOS*	• Population: Growing patients with skeletal class III malocclusionwho had undergone orthodontic treatment with skeletal anchorage, including miniplates and miniscrews. • Intervention orthodontic treatment with skeletal anchorage, including miniplates and miniscrews • Comparison The control group did not receive any type of treatment OR the control group was treated with arapid maxillary expander and a face mask • Outcome, Behandlungserfolg (Effectivness) Follow-up 7,4m – 1,2 y
Ausschluss-kriterien	Patients with syndromes or craniofacial deformities or who had undergone previous maxillofacial surgery Case reports, case series, literature reviews, systematic reviews, meta-analyses and editorials.
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **skeletal anchorage, including miniplates and miniscrews** • N= 130(Anfang) / N= ? (Ende) / Alter = 10,1; 1,2/ ♂:♀ = 31:24 (Angaben zum Geschlechterverhältnis unvollständig) • Gebissphase: frühes Wechselgebiss • KFO Behandlung: Frühbehandlung (interzeptiv)
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie; kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/** KONTROLLGRUPPE: **FM±RME OR untreated Class III** • N= ?(Anfang) / N= 96(Ende) / Alter = 10,5; 0,9 / ♂:♀ =31:24 (davon 45 untreated Class III; Angaben zum Geschlechterverhältnis unvollständig und nicht zwischen Versuchs- und Kontrollgruppe unterschieden? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv) (ohne skeltale Verankerung ODER keine kieferorthopädische Behandlung)

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: Wits SEKUNDÄRZIELGRÖßE: Overjet TERTIÄRZIELGRÖßE: ANB QUARTÄRZIELGRÖßE: SNA WEITERE ZIELGRÖßEN: SNB Alle Ergebnisse: Skeletal anchorage vs. control (untreated Class III) UND Skeletal anchorage vs. FM (± RME) Follow-up 7,4 m- 1,2 y *WITS* *Skeletal anchorage vs Control*  *Skeletal anchorage vs Face mask*  *OVERJET* *Skeletal anchorage vs Control*  *Skeletal anchorage vs Face mask* 

Outcome	 ANB Skeletal anchorage vs Control Skeletal anchorage vs Face mask SNA Skeletal anchorage vs Control Skeletal anchorage vs Face mask

Outcome	
Studientyp	**Systematisches Review mit Meta-Analyse** Systematisches Review N= 9 (8 Fall-Kontrollstudien, 1 pCCT) davon 7 für die Meta-Analyse *Review:* Gesamt-Teilnehmerzahl in Bezug auf PICO: N = 226
Schluss-folgerungen der Autoren	It may be concluded that **skeletal anchorage is an effective treatment for improving skeletal Class III malocclusion**, but when compared with other traditional treatments such as disjunction and face mask, there is **no clear evidence that skeletal anchorage improves the results**.
Zusammen-fassung der Ergebnisse	**GRUPPE skeletal anchorage, including miniplates and miniscrews VS. GRUPPE FM±RME OR untreated Class III** Compared to the no-treatment **control groups,** the **skeletal anchorage groups showed significant changes in all the variables examined**. The **Wits** value increased by 7.80 mm (95% CI 7.19±8.41) (p = 0.000). **Overjet** increased by 6.52 mm (95% CI 6.17±6.88) (p = 0.000). ANB increased by 6.07° (95% CI 5.56±6.58) (p = 0.000). The **SNA** increased by 2.70° (95% CI 2.16± 3.24) (p = 0.000). **SNB** decreased by 3.07° (95% CI -3.52 to -2.62) (p = 0.000). The studies used to obtain the weighted mean differences for **Wits, overjet and ANB showed a high degree of heterogeneity** (I2>85%), but those used for **SNA and SNB were more homogenous**. On comparing the skeletal anchorage treatments with the **expander and face mask groups**, the difference in mean **Wits increased by a significant 1.28 mm** (95% CI 0.28±2.28) (p = 0.012). **Overjet did not present significant differences**, however (-0,03 mm; 95% CI -0,70 to 0,64) (p = 0.923), **nor did ANB** (0.29°, 95% CI -0.28 to 0.87) (p = 0.314). **SNA, on the other hand, did** (0.60°, 95% CI 0.13±1.07) (p = 0.013), **although SNB did not** (0.06°, 95% CI -0.32 to 0.44) (p = 0.764). The studies used in the **Wits** appraisal comparison exhibited **high heterogeneity** (I2 = 86%). The heterogeneity in **overjet was I2 = 69%.** For ANB, **SNA** and SNB it was I2 = 0%, **I2 = 64**% and I2 = 48% respectively.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Gut durchgeführter systematischer Review mit Meta-Analyse, der Ausschluss von Arbeiten für die Meta-Analyse wird begründet. Es fehlt lediglich eine dezidierte Beurteilung einer möglichen Rolle der Förderung bei den eingeschlossenen Einzelstudien. Die Qualität der Einzelstudien wurde anhand der NOS bewertet und war im Mittel moderat. Die Ergebnisse im Vergleich zur Behandlung mit FM/RME zeigten insbesondere für Wits, overjet und SNA eine hohe Heterogenität. Dies schränkt die klinische Relevanz etwas ein.
Schluss-folgerung des Begutachters	methodische Qualität: Review: sehr gut; Einzelstudien: moderat- (laut Review)
	Gut durchgeführtes Review. Die Qualität der Einzelstudien wurde anhand der NOS bewertet und war im Mittel moderat. Die Ergebnisse im Vergleich zur Behandlung mit FM/RME zeigten insbesondere für Wits, overjet und SNA eine hohe Heterogenität. Dies schränkt die klinische Relevanz etwas ein.
Evidenz-level (SIGN)	**2++**
Qualität **(RoB, /AMSTAR II)**	**Hoch ⊕⊕⊕**

Evidenztabelle Rongo, D'Anto et al. 2017

Journal of Oral Rehabilitation

Journal of Oral Rehabilitation 2017 44; 945–962

Review

Skeletal and dental effects of Class III orthopaedic treatment: a systematic review and meta-analysis

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SUMMARY To summarise the skeletal, dental and soft tissue effects of orthopaedic treatment on growing skeletal class III patients compared with a concurrent untreated similar control group and to evaluate whether the design of the primary studies may affect the results. A literature search was performed up to the end of February 2016. No restrictions were applied concerning language and appliances. Once the quality score was assessed, a meta-analysis was performed for the appliances used in more than three studies. A moderator analysis for study design was performed. The level of evidence was evaluated by means of the Grades of Recommendation, Assessment, Development and Evaluation (GRADE) tool. The search resulted in 21 papers. The quality of most of the studies was medium. Each study reported skeletal sagittal improvement and overjet correction. Fourteen studies reported a significant increase in lower facial height. Follow-up data showed slight relapses in about 15% of patients. Meta-analyses were performed for the facemask and chin cup. The two appliances were efficient for correcting the sagittal discrepancy, increasing the divergence. In the analysis for study design, the retrospective studies showed a more efficient appliance than RCTs for 6 of 11 variables. The level of evidence was between very low and moderate. There is very low to low evidence that orthopaedic treatment is effective in the correction of Class III skeletal discrepancies and moderate evidence for the correction of the overjet. A common side effect is mandibular clockwise rotation in older subjects.

KEYWORDS: malocclusion, angle class III, orthodontic appliances, meta-analysis, evidence-based dentistry, child, growth and development

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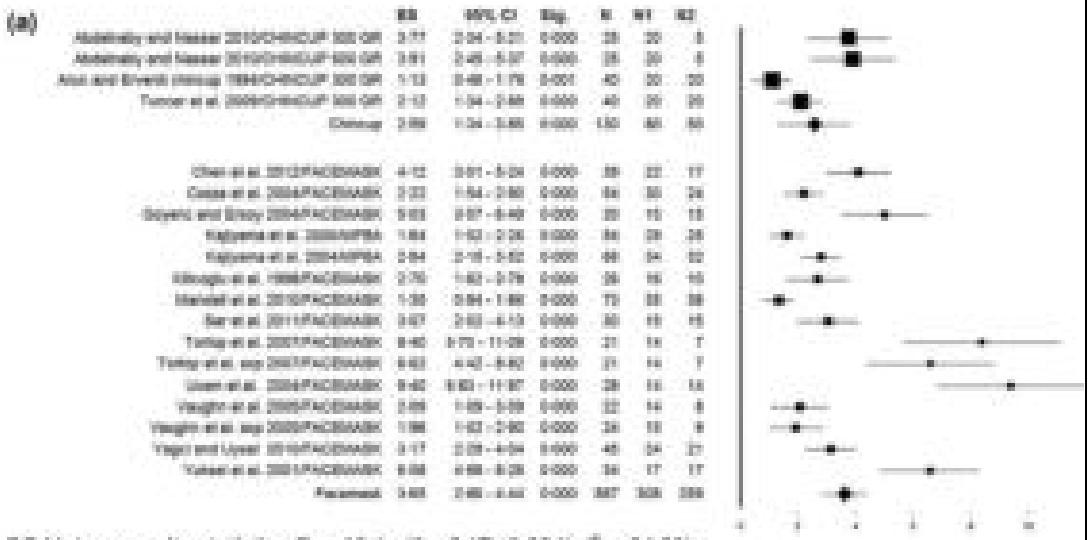
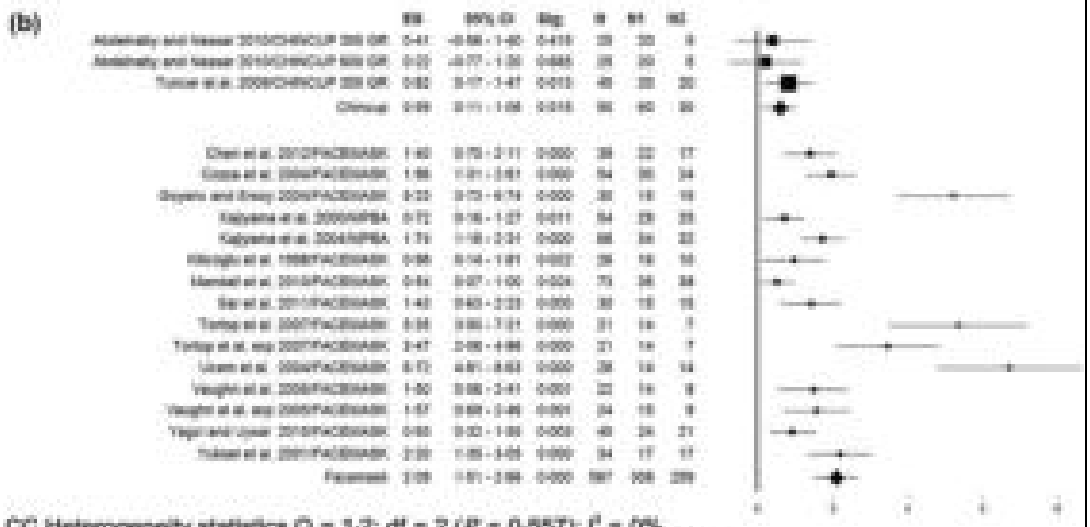
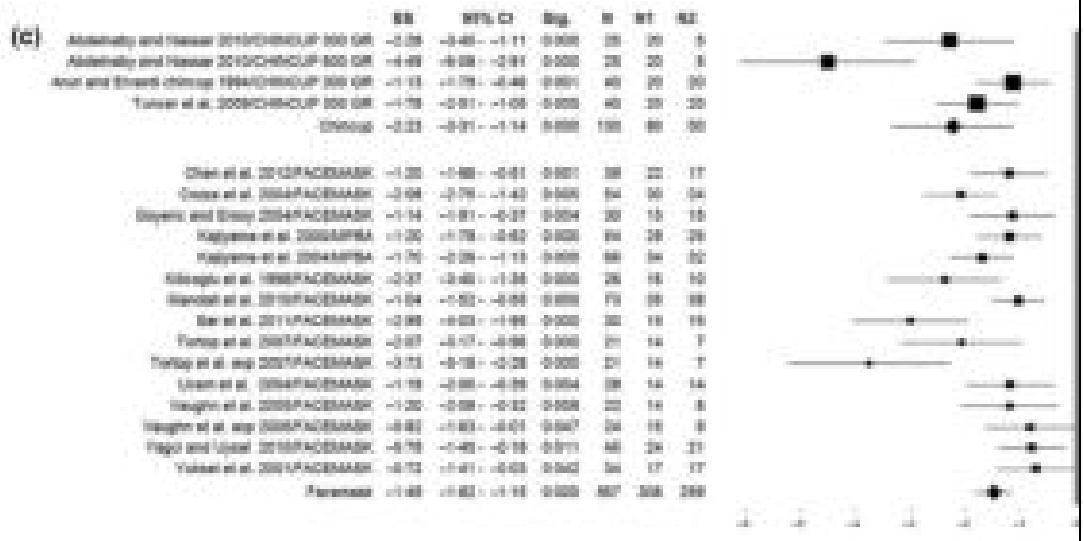
Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Growing skeletal Class III patients. Review: Randomised Clinical Trials (RCT), prospective non-Randomised Clinical Trial (CCT) and retrospective non-Randomised Clinical Trial (Ret), with or without follow-up. Articles published from January 1966 to February 2016. Studies on growing skeletal Class III patients (4-14 years). Studies conducted on lateral cephalograms including measurements of total mandibular length, total maxillary length, intermaxillary vertical and sagittal relationship. Untreated Class III concurrent control groups. Single Center Studien aus Europa, China und den USA.
Schweregrad	Keine Angabe
Einschluss-kriterien *Bei Review: PICOS*	Population: Growing skeletal Class III patients. Intervention: Treated with an orthopaedic appliance (Chin Cup, FM, MBPA (maxillary bow protraction appliance)). Comparison: Untreated concurrent control group of growing skeletal Class III patients. Outcome: PRIMÄRZIELGRÖßE: Skeletal outcomes, SEKUNDÄRZIELGRÖßE: Dental outcomes, TERTIÄRZIELGRÖßE: Soft tissue outcomes, QUARTÄRZIELGRÖßE, WEITERE ZIELGRÖßEN; Follow-up: treatment duration (5.2 months – 24 months)

Ausschluss-kriterien	Case reports, case series, descriptive studies, review articles, opinion articles; Studies about the association between Class III malocclusion and craniofacial malformations; Studies on growth prediction; Studies concerning the comparison between different malocclusions; Studies without an untreated control group or with a Class I control group; Studies only on dental casts; Treatment combined with extractions; Surgically assisted treatment; Success of therapy as a criterion for case selection Lack of statistics; Hinsichtlich der Population keine angegeben.
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE**: Treated with an orthopaedic appliance (Chin Cup, FM, MBPA (maxillary bow protraction appliance)** N= ?(Anfang) / N= 508 (Ende) / Alter = 9,3 ± 1,6/ ♂:♀ =251:257 (Angaben zum Geschlechterverhältnis unvollständig davon 157 in RCTs) • Gebissphase: frühes Wechselgebiss • KFO Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated Class III** N= ?(Anfang) / N= 330 (Ende) / Alter = 9,1 ± 1,5 / ♂:♀ =162:168 (davon 94 in RCTs Angaben zum Geschlechterverhältnis unvollständig) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • dentofaziale Ästhetik Alle Ergebnisse: Chin Cup vs. control (untreated Class III) FM (all) vs. control (untreated Class III) MPBA vs. control (not for maxillary length) Skeltal outcomes ANB, SNA, SNB ANB  CC Heterogeneity statistics Q = 19·1; df = 3 (P<0·001); I^2 = 84·3% FM Heterogeneity statistics Q = 135·3; df = 14 (P<0·001); I^2 = 89·6% SNA  CC Heterogeneity statistics Q = 1·2; df = 2 (P = 0·557); I^2 = 0% FM Heterogeneity statistics Q = 110·5; df = 14 (P<0·001); I^2 = 87·3%

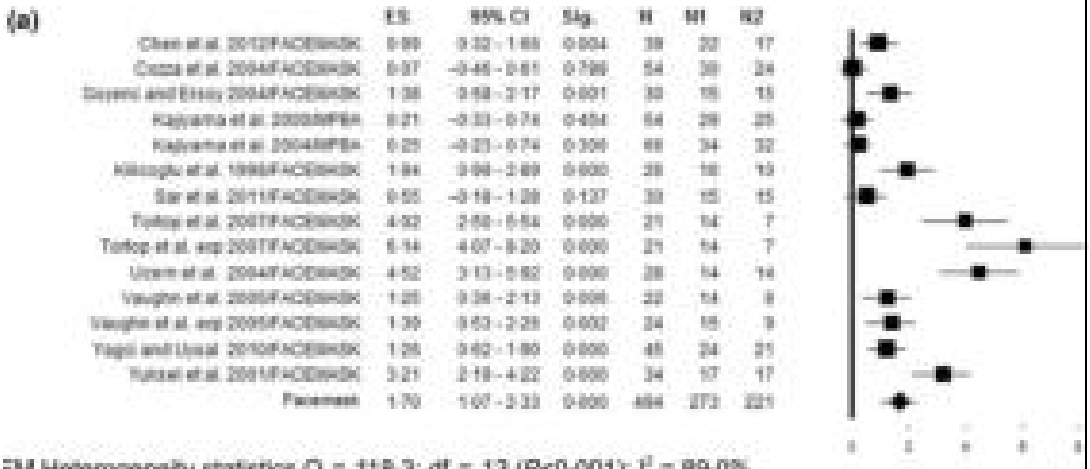
Outcome	**SNB**

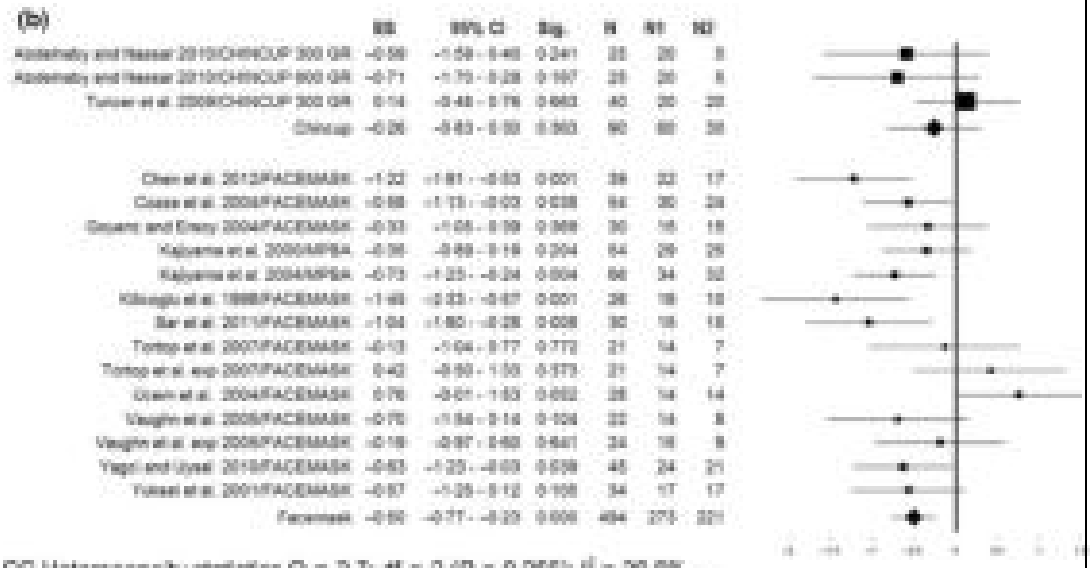
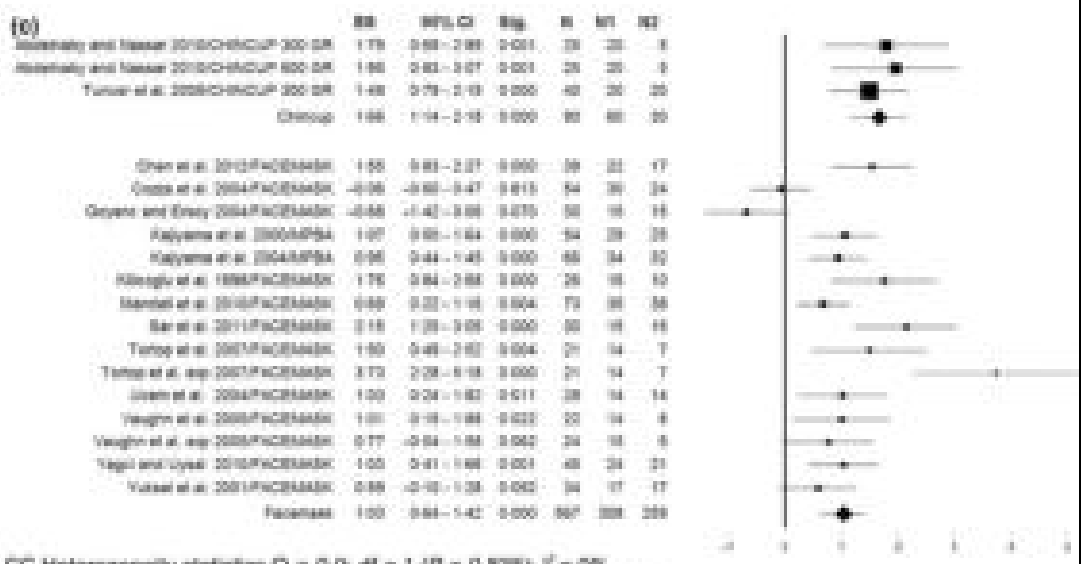


Soft tissue outcomes

maxillary length , mandibular length and mandibular divergence

maxillary length



Outcome	mandibular length  CC Heterogeneity statistics Q = 2·7; df = 2 (*P* = 0·256); I^2 = 26·6% FM Heterogeneity statistics Q = 27·9; df = 13 (*P* = 0·009); I^2 = 53·3% mandibular divergence  CC Heterogeneity statistics Q = 0·0; df = 1 (*P* = 0·835); I^2 = 0% FM Heterogeneity statistics Q = 62·3; df = 14 (*P*<0·001); I^2 = 77·5%
Studientyp	**Systematisches Review und Meta-Analyse** Systematisches Review, Meta-Analyse: N= 16 (5 RCT, 6 pCCT, 5 retrospective non randomized clinical trials)
Schluss-folgerungen der Autoren	**Facemask and chin cup were efficient for correcting the sagittal discrepancy, increasing the divergence**. **Overall, the level of evidence was between very low and moderate**. There is **very low to low evidence** that **orthopaedic treatment** is effective in the **correction of Class III skeletal discrepancies** and **moderate evidence for the correction of the overjet.** A common side effect is mandibular clockwise rotation in older subjects.

Zusammen-fassung der Ergebnisse	**GRUPPE Treated with an orthopaedic appliance (Chin Cup, FM, MBPA (maxillary bow protraction appliance) VS. untreated Class III** Skeletal effects: All the studies reported skeletal effects of the treatment. On the sagittal plane, most of the studies showed effects on both the maxilla and mandible, depending on the appliance used. In the **FM meta-analysis**, **strong effects were found on ANB, SNA, SNB**, with a significant Egger's test: ANB (P < 0_001); SNA (P < 0_001); SNB (P = 0_016) . Some moderators explained the heterogeneity of ANB and SNA, in fact for both variables, the Ret studies presented better results (ANB, P = 0_001; SNA, P = 0_004) (ANB, SMD = 6_63 CI = 3_82–9_44, SNA, SMD = 3_68 CI = 2_17–5_20) than CCT (ANB, SMD = 3_09 CI = 2_18–4, SNA SMD = 1_74 CI = 0_95–2_54) and RCT (ANB, SMD = 1_90 CI = 1_30–2_5, SNA, SMD = 1_05 CI = 0_51–1_59. Moreover, **changes in SNA were lower (P = 0_038) with expansion than without expansion** (EXP, SMD = 1_41 CI = 0_68–2_13, NO EXP, SMD = 2_64 CI = 1_73–3_55). For maxillary length a significant increase was found with a significant Egger's test (P < 0_001). The **high heterogeneity** might be explained by an effect of the study design (P = 0_008) as Ret studies showed higher values (SMD = 3_54 CI = 1_26– 5_81), than the CCT (SMD = 0_71 CI = 0_26–1_15) and RCT (SMD = 1_51 CI = 0_99–2_03) (P = 0_008). **The FM** also produced an effect on **mandibular length**. In **CC meta-analysis, significant changes were found for ANB, SNA and SNB, while there was no effect on mandibular length**. No data were found on maxillary length
Angaben auffälliger positiver und/oder negativer Aspekte	Prinzipiell ambitionierter und eigentlich gut durchgeführter Review. Die große Schwäche ist aber, dass die Meta-Analyse nicht getrennt für RCTs und NRSI Studien durchgeführt wurde, dies muss zur Abwertung führen. In Anbetracht der sonst guten und hinsichtlich der Qualitätsbewertung sehr guten Durchführung ein Verlust für die leitlinienrelvante Evidenz. Die Qualität (Evidenz) der Einzelstudien wurde umfassend bewertet und war überwiegend sehr schlecht bis schlecht, nur in Ausnahmen moderat. Die anscheinend qualifizierte Qualitätseinstufung der Primärliteratur schwächt daher die klinische Relevanz, aufgrund der schwachen Primärliteratur, deutlich.
Schluss-folgerung des Begutachters	methodische Qualität: Review: niedrig; Einzelstudien: sehr schlecht- moderat, im Mittel schlecht- (laut Review)
	Klinische Aussagekraft: Die Qualität (Evidenz) der Einzelstudien wurde umfassend bewertet und war überwiegend sehr schlecht bis schlecht, nur in Ausnahmen moderat. Die anscheinend qualifizierte Qualitätseinstufung der Primärliteratur schwächt daher die klinische Relevanz, aufgrund der schwachen Primärliteratur, deutlich. In Anbetracht der sonst guten und hinsichtlich der Qualitätsbewertung sehr guten Durchführung ein Verlust für die leitlinienrelvante Evidenz.
Evidenzlevel (SIGN)	**1+**
Qualität **(RoB, /AMSTAR II)**	**Moderat ⊕⊕**

JEvidenztabelle Ruf, Pancherz 1999

Dentoskeletal effects and facial profile changes in young adults treated with the Herbst appliance

Sabine Ruf, DDS, Dr. med. dent; Hans Pancherz, DDS, Odont. Dr.

Abstract: This prospective Herbst study analyzed the sagittal dental and skeletal changes contributing to Class II correction in young adults. Additionally, the alteration in skeletal and soft tissue convexity occurring during treatment was assessed. Early adolescent subjects in the permanent dentition who had been treated with the Herbst appliance were used for comparison. Lateral headfilms from before and after an average treatment period of 8.5 months for the young adults and 7.1 months for the adolescents were evaluated. All adult and adolescent subjects were treated to either Class I or overcorrected Class I occlusal relationships. In both groups the improvement in sagittal incisor and molar relationships was achieved more by dental changes than by skeletal ones. The amount of skeletal change contributing to overjet and molar correction was smaller in the young adult group (22% and 25%, respectively) than in the early adolescent group (39% and 41%, respectively). Skeletal and soft tissue facial profile convexity was reduced in adults and adolescents. Facial profile improvement did not differ between the two groups. The results of this study revealed that the Herbst appliance is most effective in the treatment of Class II malocclusion in young adults. It is suggested that this treatment method could be an alternative to orthognathic surgery in borderline Class II cases.

Key Words: TMJ adaptation, Growth stimulation, Young adults, Class II malocclusion, Herbst appliance, Orthodontics, Dentofacial orthopedics, Dentoskeletal treatment effects, Facial profile

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • The first 14 young adult subjects with a Class II malocclusion in the permanent dentition applying for treatment at the Department of Orthodontics of the University of Giessen in 1995 were prospectively selected for Herbst treatment. Young adulthood was defined by handwrist radiographic stages R-IJ and RJ. Another group of 25 consecutive early adolescent Herbst patients in the permanent dentition served as controls. Early adolescence was defined by handwrist radiographic stages MP3-E to MP3-G. All patients in both maturity groups were treated with a fixed cast splint Herbst appliance. • University of Giessen, Germany
Schweregrad	Nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	• Class II malocclusion • Permanent dentition For young adults: handwrist radiographic stage R-IJ and R-J For controls adolsescent: handwrist radiographic stage MP3-E to MP3-G
Ausschluss-kriterien	-

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** All patients were treated with fixed Herbst appliances. At the start of the treatment the mandible was advanced to an incisal edge to edge position in all subjects. Treatment time averaged 8.5 months. **Kointervention** Lateral headfilms in habitual occlusion from before and after Herbst treatment were evaluated. Tracings were made and linear and angular measurements were performed to the nearest 0.5 mm and 0.5 degrees, respectively. VERSUCHSGRUPPE: **herbst appliance in young adults** N=14 (Anfang) / N=14 (Ende) / Alter = 16,5 ± ?? Jahre / ♂:♀ = 4:10 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung, Spätbehandlung (Erwachsenenbehandlung)
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** All patients were treated with fixed Herbst appliances. At the start of the treatment the mandible was advanced to an incisal edge to edge position in all subjects. Treatment time averaged 7.1 months. **Kointervention** Lateral headfilms in habitual occlusion from before and after Herbst treatment were evaluated. Tracings were made and linear and angular measurements were performed to the nearest 0.5 mm and 0.5 degrees, respectively. KONTROLLGRUPPE: **herbst appliance in adolescent** N=25 (Anfang) / N=25 (Ende) / Alter = 12,8 ± ?? Jahre / ♂:♀ = 13:12 • Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: Dentoalveolar effects of Herbst appliance *(*Overjet, molar relationship, maxillary incisor, mandibular incisor, maxillary molar, mandibular molar*)* SEKUNDÄRZIELGRÖßE: Skeletal effects of Herbst appliance *(*Maxillary base, mandibular base, condyle and mandibular length*)* TERTIÄRZIELGRÖßE: Skeletal and facial convexity effects of Herbst appliance *(*Skeletal convexity and soft tissue convexity*)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. The present study demonstrates for the first time that dentofacial adaptation to fixed functional appliance treatment is possible in young adults 2. Although the Herbst appliance is most successful in Class II patients at the end of growth period, this treatment method could be an alternative to orthognathic surgery in borderline skeletal class II cases.
Zusammen-fassung der Ergebnisse	**GRUPPE herbst appliance in young adults VS. GRUPPE herbst appliance in adolescents** ***PRIMÄRZIELGRÖßE*** *Young adults showed more anterior mandibular molar movement (mean = +1.3 mm, p<0.01). Furthermore, in young adults there was a greater tendency for increased mandibular protrusion (mean = +1.1 mm; n.s.)* ***SEKUNDÄRZIELGRÖßE*** *Adolescents exhibited a greater increase in mandibular length (mean = +2.5 mm, p<0.001) and greater advancement of the mandibular base (mean = +2.0 mm, p<0.01) than young adults.* ***TERTIÄRZIELGRÖßE*** *In both young adults and early adolescents skeletal and soft tissue facial profile convexity were significantly (p<0.001) reduced during Herbst treatment. No difference existed when the two maturity groups were compared.*
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Adult group is small. *Power der Studie/Patientenzahl: limitiert, nicht spezifiziert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* The design keeps subjects and investigators ‘blind’ about treatment allocation but no further information about the method is mentioned. The assignment of subjects to treatment groups is randomised but method is not specified.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut Klinische Aussagekraft: 1. dentofacial adaptation to fixed functional appliance treatment may be possible in young adults 2. Herbst appliance could be an alternative to orthognathic surgery in borderline skeletal class II cases
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Ryan, Chris et al. 2006

ORIGINAL ARTICLE

Treatment effects of the edgewise Herbst appliance: A cephalometric and tomographic investigation

Ryan VanLaecken,[a] Chris A. Martin,[b] Terry Dischinger,[c] Thomas Razmus,[d] and Peter Ngan[e]
Watertown, SD, Morgantown, WV, and Lake Oswego, Ore

Introduction: The crown Herbst appliance was introduced in the late 1980s because of shortcomings of the banded Herbst. In edgewise Herbst treatment, a fixed appliance is used with the crown Herbst to maximize the skeletal effects of treatment. Treatment response to the edgewise Herbst appliance has not been reported in the literature. Our objective was to investigate skeletal and dental changes in patients with Class II malocclusions treated with the edgewise Herbst appliance. **Methods:** Fifty-two consecutive patients were treated with the edgewise Herbst appliance; 32 (18 girls, 14 boys) met the criterion of 16 months out of Herbst treatment and were included in the study. Mean treatment time with this appliance was 8.0 ± 1.8 months. Patients in the mixed dentition received additional treatment with 2 × 4 appliances until proper overbite, overjet, and torque on the incisors and permanent first molars were achieved. Patients in the permanent dentition were treated with full appliances to finalize the occlusion. Cephalometric measurements were taken at pretreatment, posttreatment, and 16 months after removal of the Herbst appliance, and the results were compared with 32 untreated Class II subjects from the Bolton Brush Study, matched for sex, age, and cephalometric dentofacial morphology. Data were analyzed with ANOVA, Tukey-Kramer multiple comparison tests, and 2-tailed *t* tests. **Results:** After 8 months of Herbst treatment, incisal relationship was overcorrected to an end-to-end incisal relationship and improved 8.4 mm, compared with the control group. The maxilla moved backward 1.4 mm at Point A, and the mandible moved forward 1.7 mm. The maxillary incisors moved lingually 1.7 mm, and the mandibular incisors were proclined 3.6 mm. The molars were corrected to a Class II relationship with a change of 7.2 mm compared with the control group. The mandible moved downward and forward. However, the condyle showed only 0.2 mm forward movement in the fossa. Sixteen months after appliance removal, the molars had relapsed into a Class I relationship, for a net change of 2.4 mm compared with the control group. Net overjet gain was 2.7 mm. Net restraint of maxillary growth was 1.3 mm, and net forward movement of the mandible was 1.0 mm. The maxillary incisors had no net movement, and the mandibular incisors had a net forward movement of 0.3 mm. Overall, skeletal change contributed 85% of the net overjet correction. **Conclusions:** Class II treatment with the edgewise Herbst appliance is accompanied by both skeletal and dental changes. The changes are stable, with significant skeletal differences remaining 16 months after appliance removal. The forward and downward movement of the mandible with minimal changes in the position of the condyles in the fossae suggests a combination of condylar growth and remodeling of the glenoid fossa with treatment. (Am J Orthod Dentofacial Orthop 2006;130:582-93)

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Fifty-two patients were treated consecutively by an author (T.D., in his own private practice, Oregon) with the edgewise Herbst appliance. Thirty-two patients (14 boys, 18 girls) who met the criterion of 16 months out of Herbst treatment were included in the treatment group. The control group consisted of serial cephalometric radiographs of 32 subjects (16 boys, 16 girls) with no history of orthodontic treatment from the Bolton-Brush Study. The control subjects were closely matched in sex, age, and craniofacial morphology with the experimental subjects

Schweregrad	skel. Kl. II, nicht spezifiziert
Einschluss-kriterien *Bei Review: PICOS*	• who met the criterion of 16 months out of Herbst treatment control group: The control subjects were closely matched in sex, age, and craniofacial morphology with the experimental subjects.
Ausschluss-kriterien	-
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** Fifty-two patients were treated consecutively by an author (T.D.) with the edgewise Herbst appliance. Thirty-two patients (14 boys, 18 girls) who met the criterion of 16 months out of Herbst treatment were included in the treatment group. The edgewise Herbst appliance consisted of stainless steel crowns on the maxillary and mandibular first molars. The mandible was advanced initially to an end-to-end position and reactivated 3 mm every 10 weeks until an overcorrected Class III canine relationship was achieved with the maxillary canines in an end-to-end relationship with the mandibular first premolar. In more severe cases, the maxillary canine was in a full-tooth Class III in relationship to the mandibular first premolar and the incisors in an anterior crossbite. The stages of dental development varied from early mixed to early permanent dentition. The mean treatment time with the Herbst appliance was 8 years 0 months ± 1.8 months. **Kointervention** Lateral cephalograms were taken at pretreatment (T1), immediately after Herbst treatment (T2), and 16 months after removal of the Herbst appliance (T3). VERSUCHSGRUPPE: **Herbst appliance** N=32 (Anfang) / N=32 (Ende) / Alter (girls) = 10,6 ± 1,7 Jahre / Alter (boys) = 9,9 ± 1,5 Jahre / ♂:♀ = 14:18 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** Untreated control, The control subjects were closely matched in sex, age, and craniofacial morphology with the experimental subjects. **Kointervention** Because the Bolton-Brush cephalograms were taken at either 6- or 12-month intervals, attempts were made to match the treatment radiographs by annualizing the time periods of the control group from T1-T2 and T2-T3 to correspond with the matched subjects in the treated group. KONTROLLGRUPPE: **untreated control** N=32 (Anfang) / N=32 (Ende) / Alter (boys) = ??± ?? Jahre / ♂:♀ = 16:16 • Gebissphase: Ruhephase, frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** PRIMÄRZIELGRÖßE: *Sagittal and angular changes T1 to T3 (OLp-A pt, OLp-Pg, OLp-Co, Co-A pt, Co-Gn, Co-Gn minus Co-A pt, Wits, Is/OLp, Ii/OLp, Overjet, Ms/OLp, Mi/OLp, Molar Rel., SNA, SNB, ANB, SNL-NL, SNL-ML, SNL-OLs, Is/SNL, Ii/ML, Is/Ii)* SEKUNDÄRZIELGRÖßE: *Vertical and angular changes T1 to T3 (OLs-A pt, ANS-Me, Is-NL, Ii-ML, Overbite, Msc-NL, Mic-ML, SNA, SNB, ANB, SNL-NL, SNL-ML, SNL-OLs, Is/SNL, Ii/ML, Is/Ii)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Correction of overjet and molar relationship by edgewise Herbst treatment was a combination of posterior movement of the maxilla and the maxillary teeth, increased horizontal component of condylar growth, anterior displacement of the mandible. 2. During the 16 months of post-Herbst treatment, part of the initial skeletal correction was lost without retention. However, the net effects of the treatment were found to be mostly skeletal, suggesting the advantage of edgewise treatment combined with Herbst treatment to maximize the skeletal outcome.

Zusammen-fassung der Ergebnisse	**GRUPPE Herbst appliance VS. GRUPPE untreated control** ***PRIMÄRZIELGRÖßE*** Compared with the control group, treatment induced backward movement of the maxillary base (OLp-A pt) from T1 to T2 (1.4 mm) and forward movement (0.1 mm) during the follow-up period (T2-T3), with a net restraint of forward growth of 1.3 mm (T1-T3). The position of the condyle (OLp-Co) was found to move forward 0.1 mm with treatment, but there was no change during the follow-up period, with a net movement of 0.1 mm. The effective maxillary length (Co-A pt) was restrained 1.9 mm compared with the control group during treatment; there was an increase of 0.3 mm during the follow-up period, for a net restraint of 1.6 mm. Effective mandibular length (CoGn) increased 1.9 mm during treatment and decreased 0.9 mm during follow-up, for a net increase of 1.0 mm compared with the control group. The position of the maxilla relative to the mandible (Wits) decreased 6.9 mm during treatment and increased 2.8 mm during observation, for a net decrease of 4.1 mm. For the angular measurements, the position of the maxilla relative to the cranial base (SNA) had a decrease during treatment (1.3°) compared with the control group and an increase of 0.2° during the follow-up period, for a net decrease of 1.1°. The treatment induced forward movement of the mandible (1.5°) relative to the cranial base (SNB). This increase was maintained during the follow-up period, for a net increase of 1.5°. ANB angle had a decrease of 2.8° from T1 to T2 and an increase of 0.4° during the follow-up period, for a net decrease of 2.4°. Dentally, the maxillary incisor (Is/OLp) showed backward movement of 3.1 mm after treatment compared with the control group and forward movement of 1.8 mm during the follow-up period, for a net forward movement of 1.3 mm. Treatment effects on the position of the mandibular incisor (Ii/OLp) showed forward movement of 5.3 mm with treatment and backward movement of 4.0 mm during follow-up, for a net forward movement of 1.3 mm. Overjet improved significantly, showing a decrease of 8.4 mm during treatment. There was a return of 5.8 mm of overjet during the follow-up period, with an overall decrease of 2.6 mm. The maxillary molars moved backward 3.4 mm compared with the control group during treatment and moved forward 2.2 mm during follow-up, for a net backward movement of 1.2 mm. The mandibular molars moved forward 3.8 mm and backward 3.0 mm during the follow-up, for a net forward movement of 0.8 mm. The molar relationship was altered significantly, with a change of 7.2 mm during treatment resulting from forward movement of the mandibularmolars and backward movement of the maxillary molars. During the follow-up period, the molar relationship relapsed 4.7 mm, giving a net change of 2.0 mm. The maxillary incisor angle (Is/SNL) moved lingually 2.8° during treatment and moved labially 8.2° during follow-up, for a net labial movement of 5.4°. The mandibular incisor angle (Ii/ML) proclined 10.4° during treatment and moved back 8.0° during follow-up, for a net proclination of 2.4°. The interincisal angle decreased 9.1° during treatment and increased 1.2° during follow-up, for a net decrease of 7.9°. ***SEKUNDÄRZIELGRÖßE*** The vertical position of the maxilla (OLs-A pt.) showed downward movements of 2.5 mm compared with the controls during treatment and 0.2 mm during follow-up, for a net downward movement of 2.7 mm. The lower facial height (ANS-Me) increased 0.3 mm during treatment and decreased 0.5 mm during followup, for a net decrease of 0.2 mm. The palatal plane (SNL/NL) exhibited downward movement of 2.6° with treatment and upward movement of 0.7° during followup, for a net downward movement of 1.9°. The occlusal plane (SNL/OLs) had clockwise tipping of 4.9° during treatment and counterclockwise tipping of 3.2° during follow-up, for a net clockwise tipping of 1.7°. Dentally, the maxillary incisor (Is/NL) was intruded 0.4 mm during treatment and extruded 0.7 mm during follow-up, for a net extrusive movement of 0.3 mm. The mandibular incisor (Ii/ML) exhibited intrusive movement of 1.7 mm during treatment and extrusive movement of 0.1 mm during follow-up, for a net intrusive movement of 1.6 mm. Overbite decreased 3.8 mm compared with the controls during treatment and increased 1.4 mm during follow-up, for a net decrease of 2.4 mm. The maxillary molar (Msc/NL) was intruded 1.1 mm during treatment and extruded 0.2 mm during follow-up, for a net intrusion of 0.9 mm. The mandibular molar (Mic/NL) was extruded 1.0 mm during treatment and intruded 0.3 mm during followup, for a net extrusive movement of 0.7 mm.

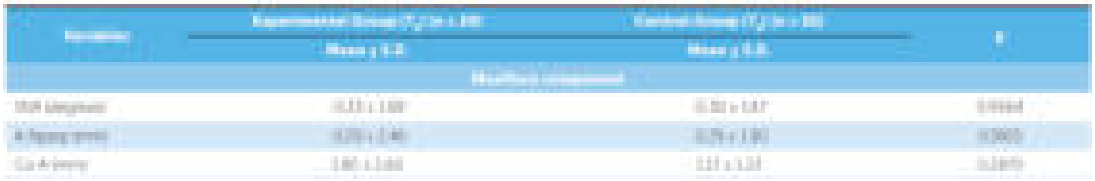
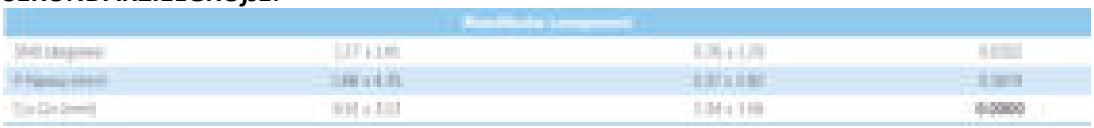
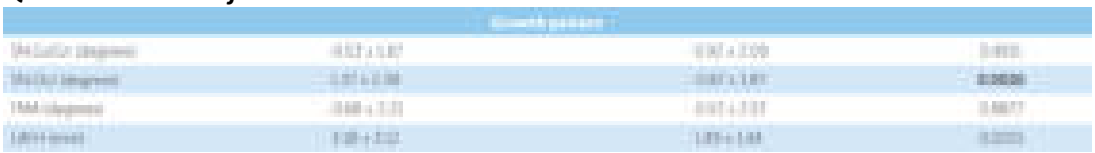
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl: limitiert* *Funding: keine Angabe* *Interessenkonflikte: keine Angabe* *No confidence intervals been provided.*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: 1. Correction of overjet and molar relationship by edgewise Herbst treatment was a combination of posterior movement of the maxilla and the maxillary teeth, increased horizontal component of condylar growth, anterior displacement of the mandible. 2. During the 16 months of post-Herbst treatment, part of the initial skeletal correction was lost without retention.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

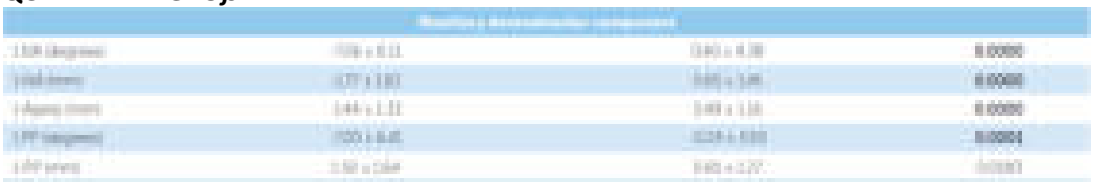
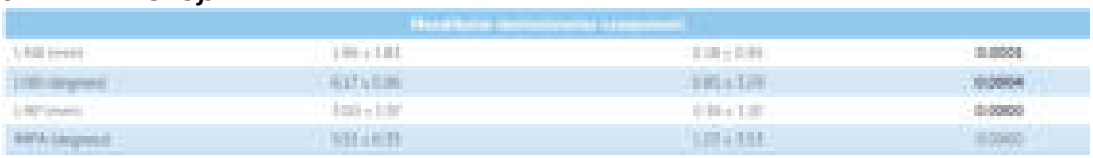
Evidenztabelle Saikoski, Cancado et al. 2014

original article

Dentoskeletal effects of Class II malocclusion treatment with the Twin Block appliance in a Brazilian sample: A prospective study

Population	**Klasse-II-Anomalien** Patients with Class II malocclusions (Department of Orthodontics, Ingá College (Brasil)
Schweregrad	ANB values greater than 4 degrees
Einschluss-kriterien	1) presence of Class II division 1 malocclusion assessed on the dental casts and clinically confirmed (no cephalometric criterion was used to determine that individuals presented skeletal Class II with ANB values greater than 4 degrees); 2) crowding in the mandibular arch not greater than 4 mm; 3) no previous orthodontic treatment; 4) presence of clinically observable facial convexity.
Ausschluss-kriterien	keine Angabe
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *who were treated with the modified Twin Block functional orthopedic appliance Beschreibung der Intervention. The mean treatment time was 1.13 ± 0.40 years* VERSUCHSGRUPPE: **twin block** N= 20/20 / Alter = 11,76 ± 1,64 Jahre / ♂:♀ = 11:9 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=25/25 / Alter = 11,36 ± 1,35 Jahre / ♂:♀ = 14:11 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Maxillary component (SNA, A-Nperp, Co-A)* SEKUNDÄRZIELGRÖßE: *Mandibular component (SNB, P-Nerp, Co-Gn)* TERTIÄRZIELGRÖßE: *Maxillomandibular relationship (ANB, Wits)* QUARTÄRZIELGRÖßE: *Growth pattern (SN.GoGn, SN.Ocl, FMA, LAFH)* QUINTÄRZIELGRÖßE: *Maxillary dentoalveolar component (1.NA, 1-NA, 1-Aperp, 1.PP, 1-PP)* SEXTÄRZIELGRÖßE: *Mandibular dentoalveolar component (1.NB, 1-NB, 1-AP, IMPA)* SEPTÄRZIELGRÖßE: *Dental relationships (overjet, overbite, molar relationship)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Based on the methods applied and the results achieved, it is reasonable to conclude that the Twin Block appliance presented great effectiveness for correction of Class II malocclusion in growing individuals. Most changes were of dentoalveolar nature with a marked component of dental inclination associated with a significant skeletal effect on the mandible.
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE twinblock** ***PRIMÄRZIELGRÖßE:***  ***SEKUNDÄRZIELGRÖßE:***  ***TERTIÄRZIELGRÖßE:***  ***QUARTÄRZIELGRÖßE:*** 

Zusammen-fassung der Ergebnisse	***QUINTÄRZIELGRÖßE:***  ***SEXTÄRZIELGRÖßE:***  ***SEPTÄRZIELGRÖßE:*** 
Angaben auffälliger positiver und/oder negativer Aspekte	*Gut duchgeführte retrospektive Kohortenstudie. Keine Angaben zur Finanzierung. Autoren berichteten keine Interessenskonflikte.Keine Verblindung, keine Angabe zum Patientenscreening, zu möglichen Störgrößen, von Kofidenzintervallen. Imbalancen zu Studienbeginn beim overjet.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Twin Block-Apparatur hat eine große Wirksamkeit bei der Korrektur von Klasse-II-Malokklusionen. Die meisten Veränderungen waren dentoalveolarer Natur, wobei eine ausgeprägte Komponente der Zahnneigung mit einer signifikanten Skelettwirkung auf den Unterkiefer verbunden war.
Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable ⊕**

Evidenztabelle Sambataro, Fastuca et al 2017

Cephalometric changes in growing patients with increased vertical dimension treated with cervical headgear

Kephalometrische Veränderungen bei Patienten mit erhöhter vertikaler Dimension bei Behandlung mit einem Zervikal-Headgear

Sergio Sambataro[1] · Rosamaria Fastuca[2,8] · Nelson J. Oppermann[3,4] · Paola Lorusso[5] · Tiziano Baccetti[6] · Lorenzo Franchi[6] · Alberto Caprioglio[7]

Abstract

Purpose The aim of the present study was to investigate the cephalometric changes in patients with increased vertical dimension after treatment with cervical headgear compared to controls.

Methods The sample of the present retrospective study consisted of 20 Class II patients (10 males, 10 females; mean age 8.54 ± 1.15 years) with increased vertical dimension treated with cervical headgear (treatment group) and 21 Class II patients (11 males, 10 females, mean age 8.41 ± 1.15 years) with increased vertical dimension who underwent no treatment (control group). Cephalograms were available for each subject at baseline (T1) and after treatment/observation time (T2) for both groups and cephalometric analysis allowed for evaluation of changes between time points and between groups.

Results Regarding facial axis, N-ANS/ANS-Me, and overbite, there were no negatively significant changes in the treated group showing no significant worsening in the vertical dimension. Regarding facial angle, there was a significant increase in the treated group between the time points and when compared to the control group, showing counterclockwise rotation of the mandible in the treated group.

Conclusions The vertical dimension was not significantly altered after cervical headgear treatment although the anterior facial height was higher at the beginning of treatment. There was significant counterclockwise rotation of the mandible, and clockwise rotation and distal displacement of the maxilla after treatment.

Tiziano Baccetti: Deceased.

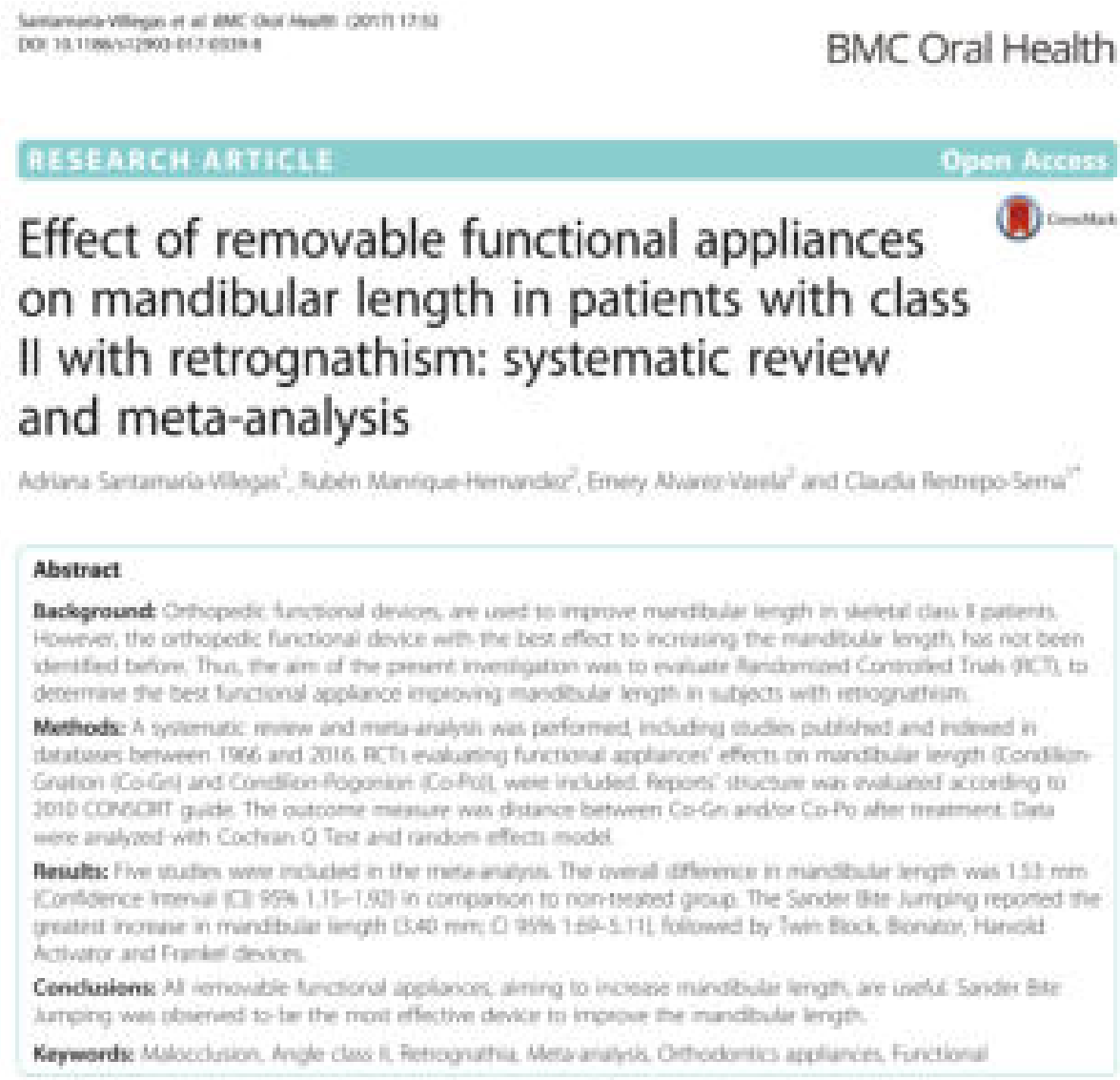
✉ Rosamaria Fastuca
rosamaf@hotmail.it

Population	**Klasse-II-Anomalie** patients with class II malocclusions selected from a private practice and treated or followed by the same trained operator.
Schweregrad	bilateral Class II (full cusp or end to-end) molar relationship
Einschluss-kriterien	• bilateral Class II (full cusp or end-to-end) molar relationship; • increased vertical dimension (Facial Axis \90 degrees • prepubertal stage (CVMSI) as assessed on lateral cephalograms of the examined subjects according to the cervical vertebral maturation method [4]; • early mixed dentition; • no other orthodontic or pediatric dentistry treatment provided (except cervical headgear for the treated group) [15]; • good general health (absence of craniofacial syndromes or other craniofacial anomalies) [2, 9, 14].
Ausschluss-kriterien	• loss of deciduous teeth during treatment • use of other appliances such as lip bumper, mandibular lingual arch or fixed or functional appliances before or during the observation time.

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *In all the treated patients, a Ricketts' face bow large type with loops in outer arms associated with an elastic neck strap were applied for no more than 10–12 h per day (night plus a few hours during the day at home) with a force of 500 g in total.* VERSUCHSGRUPPE: **headgear** N=132 (Anfang) / N=20 (Ende) / Alter = 8,54 ± 1,15 Jahre / ♂:♀ = 10:10 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** VERSUCHSGRUPPE: **untreated** N=120 (Anfang) / N=21 (Ende) / Alter = 8,41 ± 1,15 Jahre / ♂:♀ = 11:10 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Skeletal measurements (Ba-N-A, Convexity, Na-Ba-PtGn, FH-Npo, ANS-PNS to FH, Co-A, Co-Gn, Co-Go-Me, FH-GoGn, ANS-Xi-Pm, BaNa to XiPm, N-ANS/ANS-Me)* SEKUNDÄRZIELGRÖßE: *Dental measurements (Overjet, Overbite, U6 to PTV, U6 To L6, U6 axis to PP, U6 to PP)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	In this study, the cervical headgear showed control over the vertical dimension and produced favorable changes in mandibular position when compared to untreated controls. The findings of the present study showed that • Cervical headgear treatment produced a significant distalization and extrusion movement of first upper molars, • The vertical dimension was not worsened in patients with increased vertical dimension after cervical headgear treatment but showed an improvement of the mandibular vertical position, the chin, and of the Class II malocclusion, • Significant counterclockwise rotation of the mandible and clockwise rotation of the maxilla occurred in the treated group indicating that vertical skeletal relationships in the growing face could be altered predictably by controlling the direction of the extraoral force, and, • There was a statistically significant mean difference in vertical dimension changes between cervical headgear patients and untreated controls.

Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE headgear** ***PRIMÄRZIELGRÖßE*** [illegible]
	SEKUNDÄRZIELGRÖßE [illegible]
Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführt retrospektive Kohortenstudie. Reliabel und valide Auswertung erfolgte einen erfahrenen Untersucher. Powerkalkulationenen durchgeführt. Keine Angaben zum Funding. Es lagen keine Interessenskonflikte vor. Keine Verblindung, keine Angabe von Konfidenzintervallen oder möglichen Störgrößen.*
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> gut
	<u>Klinische Aussagekraft:</u> Die vertikale Dimension war nach Behandlung mit einem zervikalen Headgear nicht verändert. Nach der Behandlung zeigten sich eine Rotation des Unterkiefers gegen den Uhrzeigersinn und eine Rotation des Oberkiefers im Uhrzeigersinn sowie eine Distalverlagerung des Oberkiefers.
Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable ⊕**

Evidenztabelle Santamaria-Villegas et al., 2017



Santamaria-Villegas et al. BMC Oral Health (2017) 17:92
DOI 10.1186/s12903-017-0393-8

BMC Oral Health

RESEARCH ARTICLE Open Access

Effect of removable functional appliances on mandibular length in patients with class II with retrognathism: systematic review and meta-analysis

Adriana Santamaria-Villegas[1], Rubén Manrique-Hernandez[2], Emery Alvarez-Varela[2] and Claudia Restrepo-Serna[1*]

Abstract

Background: Orthopedic functional devices are used to improve mandibular length in skeletal class II patients. However, the orthopedic functional device with the best effect to increasing the mandibular length has not been identified before. Thus, the aim of the present investigation was to evaluate Randomized Controlled Trials (RCT), to determine the best functional appliance improving mandibular length in subjects with retrognathism.

Methods: A systematic review and meta-analysis was performed, including studies published and indexed in databases between 1966 and 2016. RCTs evaluating functional appliances' effects on mandibular length (Condilion-Gnation (Co-Gn) and Condilion-Pogonion (Co-Po)), were included. Reports' structure was evaluated according to 2010 CONSORT guide. The outcome measure was distance between Co-Gn and/or Co-Po after treatment. Data were analyzed with Cochran Q Test and random effects model.

Results: Five studies were included in the meta-analysis. The overall difference in mandibular length was 1.53 mm (Confidence Interval (CI) 95% 1.15–1.92) in comparison to non-treated group. The Sander Bite Jumping reported the greatest increase in mandibular length (3.40 mm; CI 95% 1.69–5.11), followed by Twin Block, Bionator, Herwidt Activator and Frankel devices.

Conclusions: All removable functional appliances, aiming to increase mandibular length, are useful. Sander Bite Jumping was observed to be the most effective device to improve the mandibular length.

Keywords: Malocclusion, Angle class II, Retrognathia, Meta-analysis, Orthodontics appliances, Functional

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • growing patients with Class II malocclusion by retrognathism between 6 and 18 years of age
Schweregrad	Nicht angegeben

Einschluss-kriterien *Bei Review: PICOS*	• population: growing patients with Class II malocclusion by retrognathism between 6 and 18 years of age • intervention: growing patients with Class II malocclusion by retrognathism between 6 and 18 years of age • comparison: untreated class II subjects • outcome: PRIMÄRZIELGRÖßE: mandibular length (cephalometric measurements Co-Gn and/or Co-Po, measured in milimeters) • study type: randomized clinical trial RCTs
Ausschluss-kriterien	1. Studies which evaluated mandibular length with point Ar. 2. Studies evaluating outcomes with MRI. 3. Studies which utilized the Herbst appliance. 4. Insufficient data for analysis 5. Treatment combined with extractions. 6. Treatment combined with fixed appliances. 7. Surgical treatment
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **minium of 6 months treatment with removable functional appliances (Bionator, Twin Block, Activator, Sander Bite Jumping or Frankel)** N=208 (Anfang) / N=?? (Ende) / Alter = 9,4 -13 Jahre / ♂:♀ = ?:? • Gebissphase: frühes und spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: Frühbehandlung (interzeptiv), reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated class II subjects** N=191 (Anfang) / N=?? (Ende) / Alter = 9,4 13 Jahre / ♂:♀ = ?:? • Gebissphase: frühes und spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: mandibular length (cephalometric measurements Co-Gn and/or Co-Po, measured in milimeters)
Studientyp	**Systematisches Review mit Meta-Analyse** Inkludierte Studien in Bezug auf PICO: randomized clinical trial RCTs N=5 Gesamt-Teilnehmerzahl in Bezug auf PICO: N=399

Schluss-folgerungen der Autoren	The findings of this meta-analysis, showed a **slight increase in mandibular length** (Co-Gn and/or Co-Po), after treatment either with Harvold Activator, Twin Block, type II Bionator, Frankel and Sanders Bite Jumping. The **Sanders Bite Jumping reported the greatest results**. The clinical relevance of this results ha ve to be explored in further studies.
Zusammen-fassung der Ergebnisse	**GRUPPE minium of 6 months treatment with removable functional appliances (Bionator, Twin Block, Activator, Sander Bite Jumping or Frankel) VS. GRUPPE untreated class II subjects** **mandibular length (cephalometric measurements Co-Gn and/or Co-Po, measured in milimeters):** the effect of functional appliances revealed a statistically **significant increase in mandibular length** measured as the distance between points Co-Gna or Co-Po (Fig. 2), with a difference in average mandibular length of **1.53 mm** (CI 95% 1.15– 1.92) with respect to non-treated control groups. With respect to the efficacy of functional appliances, the **Sander Bite Jumping reported the greatest increase in total mandibular length** (3.40 mm; CI 95% 1.69–5.11), in comparison with other appliances which included, Twin Block (1.80 mm; CI 95% 0.87–2.73), Bionator (1.41 mm; CI 95% 0.94–1.89), Harvold Activator (1.32 mm; CI 95% −0.42–3.06) and Frankel (0.69 mm; CI 95% −0.84–2.22) (Fig. 3), although there were overlapping of the confidence intervals of the effects of Sander Bite Jumping, Twin Block and Bionator.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: nur RCTs eingeschlossen mit plausibler Erklärung, PROSPERO-Registrierung a priori, spezifische Einschlusskriterien (bzgl. population & outcome)* *Durchführung: gute Bias-Analyse, Literatursichtung und Datenextration nicht durch mehrere unabhänige Auswerter* *Auswertung: gut durchgeführte Meta-Analyse, Diskussion berücksichtigt Störfaktoren* *Power der Studie/Patientenzahl: 5/ 399 – limitierte Studienzahl, gleichmößige Aufteilung in Veruschs- und Kontrollgruppe* *Funding:* All funding for this investigation was provided by Universidad CES. Medellín, Colombia. *Interessenkonflikte:* All authors declare that they have no competing interests. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **4. Did the review authors use a comprehensive literature search strategy?** **5. Did the review authors perform study selection in duplicate?** **6. Did the review authors perform data extraction in duplicate?** **7. Did the review authors provide a list of excluded studies and justify the exclusions?** **10. Did the review authors report on the sources of funding for the studies included in the** **12. If meta-analysis was performed, did the review authors assess the potential impact of** **individual studies on the results of the meta-analysis or other evidence synthesis?** *Publikationsbias (Reviews):* Funnel diagram of included studies. The funnel plot does not show the existence of publication bias among the included studies
Schluss-folgerung des Begutachters	methodische Qualität: Systematisches Review gut, Einzelstudien von mittlerer bis hoher Qualität
	Klinische Aussagekraft: Bei wachsenden Patienten, die eine Klasse II mit retrognathen Unterkiefer aufweisen, scheinen herausnehmbare funktionskieferorthopädische Apparaturen die Unterkieferlänge positiv beeinflussen. Dabei wirken verschiedene Geräte und die Aussage, die Sander Bite Jumping Apparatur führe zu den besten Ergebnissen, sollte noch weiter evaluiert werden.

Evidenz-level (SIGN)	**1+**
Qualität (RoB, SIGN /AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle Schiavon, Gandini et al 2001

Effects of cervical headgear and edgewise appliances on growing patients

Marcia R. E. A. Schiavon Gandini, DDS, MS, PhD,[a] Luiz G. Gandini, Jr. DDS, MS, PhD,[b] Joel C. da Rosa Martins, DDS, MS, PhD,[1] and Marinho Del Santo, Jr. DDS, MS, MSD, PhD[a]
Araraquara, São Paulo, Brazil

Maxillary basal bone, dentoalveolar, and dental changes in Class II Division 1 patients treated to normal occlusion by using cervical headgear and edgewise appliances were retrospectively evaluated. A sample of 45 treated patients was compared with a group of 30 untreated patients. Subjects were drawn from the Department of Orthodontics, Araraquara School of Dentistry, Brazil, and ranged in age from 7.5 to 13.5 years. The groups were matched based on age, gender, and malocclusion. Roughly 67% of the treated group had a mesocephalic or brachicephalic pattern, and 13% had a dolicocephalic pattern. Cervical headgear was used until a Class I dental relationship was achieved. Our results demonstrated that the malocclusions were probably corrected by maintaining the maxillary first molars in position during maxillary growth. Maxillary basal bone changes (excluding dentoalveolar changes) did not differ significantly between the treated and the untreated groups. Molar extrusion after the use of cervical headgear was not supported by our data, and this must be considered in the treatment plan of patients who present similar facial types. (Am J Orthod Dentofacial Orthop 2001;119:531-9)

Population	**Klasse-II-Anomalie** Brazilians of European descent with class II division I malocclusion
Schweregrad	overjet of 3 mm or greater
Einschluss-kriterien	patient have a Class II Division 1 (molar and canine) malocclusion, with an overjet of 3 mm or greater; that had been treated to a Class I relationship with nonextraction therapy.
Ausschluss-kriterien	poor-quality records, craniofacial disorders, previous orthodontic or orthopedic treatment.
Intervention Versuchsgruppe	**kieferorthopädische Therapie** *Cervical headgear appliances were adjusted to have a 20° upward angulation of the headgear external bow, to apply 400 g of force per side on the maxillary first molars for 14 to 18 hours per day until a Class I relationship was achieved, and to apply the same force for 8 to 10 hours per day thereafter.27 The edgewise appliance prescription presented a –6° angulation (distal tip) on the mandibular first molars.* VERSUCHSGRUPPE: **headgear** N=45/45 / Alter = 11,0 ± 1,3 Jahre / ♂:♀ = 19:26 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=30/30 / Alter = 10,2 ± 1,6 Jahre / ♂:♀ = 12:18 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Jaw relationship (SNA, SNB, ANB, SN.PP, SN.OP, SN.GoMe, Wits)* SEKUNDÄRZIELGRÖßE: *Horizontal changes of maxillary molars (A, CR, C)* TERTIÄRZIELGRÖßE: *Vertical changes of maxillary molars (A, CR, C)* QUARTÄRZIELGRÖßE: *Horizontal changes of mandibular molars (A, CR, C)* QUINTÄRZIELGRÖßE: *Vertical changes of mandibular molars (A, CR, C)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	In this study, statistically significant maxillary basal bone changes did not occur. Cervical headgear appliances corrected the Class II Division 1 malocclusion to a Class I relationship by maintaining the maxillary first molars and redirecting dentoalveolar growth in the maxilla, rather than by significantly changing the growth of the maxillary jaw base. Vertical changes were not supported by our data. Absence of statistically significant extrusion of the maxillary molars after the use of cervical headgear in patients with Class II Division 1 malocclusion is a valuable piece of information for the clinician.
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE headgear** ***PRIMÄRZIELGRÖßE*** *SNA and ANB angles and Wits distances changed significantly (Table III). Moreover, slight counterclockwise rotation of the occlusal plane and clockwise rotation of the palatal plane were observed*. ***SEKUNDÄRZIELGRÖßE*** *Partial superimposition showed significant distal relocation (negative sign) in the apex, center of resistance (furcation region), and cusp of the maxillary first molars, including dentoalveolar and dental changes. However, maxillary basal bone changes were not significantly different between the treated and untreated groups (Table IV). Distal dental relocation was more significant in the apex of the maxillary molars and gradually decreased in the center of resistance and in the molar cusp (Table IV). On the other hand, potential skeletal changes were more pronounced in the region of the molar cusp and gradually decreased in the region of the center of resistance and the apex.* ***TERTIÄRZIELGRÖßE*** *Vertically, none of the skeletal or dental changes in the apex, center of resistance, or molar cusp were significant (Table V).* ***QUANTÄRZIELGRÖßE*** *Mandibular skeletal or dental horizontal changes were not significant when the treated and untreated groups were compared (Table VI).* ***QUINTÄRZIELGRÖßE*** *Furthermore, the mandibular molars did not present any significant vertical change (Table VII). The mandibular molar cusp showed a tendency to move back, but the center of resistance and especially the apex displayed a tendency to move forward*.

Angaben auffälliger positiver und/oder negativer Aspekte	*Insgesamt gut durchgeführte retrospektive Kohrtenstudie. Durchführung durch graduate Student, Cephalogramme nur von einem Arzt ausgewertet. Die Observation/Treatment time zwischen den beiden Gruppen unterschied sich allerdings deutlich (treated: 3,4 control: 1,3), weshalb Wachstumseffekte nicht ausgeschlossen werden können. Keine Powerkalkulation, Verblindung, Angabe möglicher Störgrößen oder von Konfidenzintervallen. Keine Informationen zum Funding oder möglicher Interessenkonflikte.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Molare Extrusion nach Verwendung Headgears konnte nicht gezeigt werden.
Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable ⊕**

Evidenztabelle Schulz, Koos et al 2016

Skeletal effects in Angle Class II/1 patients treated with the functional regulator type II

Cephalometric and tensor analysis

Skelettale Therapieeffekte des Funktionsreglers Typ II bei Klasse-II/1-Patienten

Evaluierung mittels Kephalometrie und Tensoranalyse

Simone Schulz[1] · Bernd Koos[1] · Kathrin Dathe[1] · Franka Stahl[1]

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Abstract
Objectives The purpose of this work was to employ both cephalometric and tensor analysis in characterizing the skeletal changes experienced by patients with Angle Class II/1 malocclusion during functional orthodontic treatment with the functional regulator type II.
Methods A total of 23 patients with Class II/1 malocclusion based on lateral cephalograms obtained before and after treatment with the functional regulator type II were analyzed. Another 23 patients with Angle Class II/1 malocclusion who had not undergone treatment were included as controls.
Results Our cephalometric data attest to significant therapeutic effects of the functional regulator type II on the skeletal mandibular system, including significant advancement of the mandible, increases in effective mandibular length with enhancement of the chin profile, and reduction of growth-related bite deepening. No treatment-related effects were observed at the cranial base and midface levels. In addition, tensor analysis revealed significant stimulation of mandibular growth in sagittal directions, without indications of growth effects on the maxilla. Its growth-pattern findings differed from those of cephalometric analysis by indicating that the appliance did promote horizontal development, which supports the functional orthodontic treatment effect in Angle Class II/1 cases.
Conclusions Tensor analysis yielded additional insights into sagittal and vertical growth changes not identifiable by strictly cephalometric means. The functional regulator type II was an effective treatment modality for Angle Class II/1 malocclusion and influenced the skeletal development of these patients in favorable ways.

Keywords Class II/1 · Functional regulator type II · Tensor analysis · Cephalometry · Growth changes

Zusammenfassung
Zielsetzung Ziel der vorliegenden Arbeit war es, skelettale Veränderungen während der Therapie mit dem Funktionsregler Typ II (FR2) bei Angle-Klasse-II/1-Patienten mittels Kephalometrie und Tensoranalyse zu charakterisieren.
Methoden Die Untersuchungsgruppe bestand aus 23 Patienten mit Angle-Klasse-II/1-Anomalie, deren Fernröntgenseitenbilder vor und nach FR2-Therapie analysiert wurden. Als Kontrollgruppe dienten 23 unbehandelte Probanden mit Angle-Klasse-II/1-Gebissanomalie. Die Auswertung erfolgte mittels Kephalometrie und Tensoranalyse.
Ergebnisse Unter Anwendung der Kephalometrie zeigte sich, dass die Therapie mit dem Funktionsregler Typ II zu signifikanten Therapieeffekten in Bezug auf das skelettale mandibuläre System führt. Hierzu zählen eine signifikante Vorverlagerung des Unterkiefers, eine Zunahme der effektiven Unterkieferlänge mit einer Verbesserung des

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Population	**Klasse-II-Anomalie** Patients with Class II/1 malocclusion based on lateral cephalograms obtained before and after treatment with the functional regulator type II or left untreated.
Schweregrad	Treatment group: Class II relationship of 3/4-1 cusp widths. Control group: molar Class II relationship of 1/2-1 cusp widths
Einschluss-kriterien	Treatment: Cases were included if characterized by an increased overjet with protruded upper anterior incisors and bilateral distoclusion of 3/4-1 cusp widths.; Control group: no congenitally missing or otherwise anomalous (supernumerary) teeth, no tooth-eruption disturbances, no craniofacial anomalies, Caucasian descent, molar Class II relationship of 1/2-1 cusp widths, overjet>4 mm, and ANB angle>3°.

Ausschluss-kriterien	Exclusion criteria were pseudo-Class II due to premature primary tooth loss, bilateral distoclusion of\3/4 cusp widths, pretreatment with other orthodontic appliances, cleft disease or other syndromic disorders, congenitally missing teeth, or extraction of teeth before or during treatment.
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *Angle Class II/1 patients who had been treated exclusively with the functional regulator type II in the early or late stage of mixed dentition* VERSUCHSGRUPPE: **functional regulator type II** N=23/23 / Alter = 8,2 ± 1,4 Jahre / ♂:♀ = 9:14 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** VERSUCHSGRUPPE: **untreated** N=23/23 / Alter = 8,03 ± 1,9 Jahre / ♂:♀ = 9:14 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss KFO-Behandlung: frühe Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *cranial-base and midface level (NSBa, NSAr, S-N, S-Ba)* SEKUNDÄRZIELGRÖßE: *mandibular and maxillar level (SNB, SNPog, Cond-Gn, Cond-Pog, Cond-Go, Pog-NB, S-Gn, SNA, Cond-A)* TERTIÄRZIELGRÖßE: *growth pattern and intermaxillary relationship (ML-NSL, NL-NSL, ML-NL, ArGoMe, NgoMe, NSGn, S-Go, Spa-Me, ANB)* QUARTÄRZIELGRÖßE: *Tensor analysis (SNBa,SNA, CondGnGo, ArGoMe, SNB, SNGo, SNMe, SgoGn, CondAB)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Our cephalometric data attest to significant therapeutic effects of the functional regulator type II on the skeletal mandibular system, including significant advancement of the mandible, increases in effective mandibular length with enhancement of the chin profile, and compensation for growth-related bite deepening. No treatment-related effects were observed at the cranial-base and midface levels. Tensor analysis, in addition, revealed significant stimulation of mandibular growth in sagittal direction, with no indications of growth effects on the maxilla. Its growthpattern findings differed from those of cephalometric analysis by indicating that the appliance did promote horizontal development, which supports the functional orthodontic treatment effect in Angle Class II/1 cases

Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE functional regulator type II** ***PRIMÄRZIELGRÖßE*** *Both groups had a retrognathic profile type. A treatment-related effect on the S-N-Ba angle was not seen. The length of the posterior cranial basewas significantly greater in the study group than in the control group at baseline (T1; Table 2), while this difference was no longer significant upon completion of active therapy in the treatment group (T2; Table 3). The N-S-Ar angle decreased significantly more during treatment than during nontreatment (T2-T1;Table 4), although a significant difference was not apparent after the treatment or observation period (T2). Both groups exhibited retroposition of themaxilla relative to the anterior cranial base at both time points. A treatment-specific effect on this parameter was not observed. In addition, the changes in midface length did not differ significantly between the two groups.* ***SEKUNDÄRZIELGRÖßE*** *Analysis of the S-N-B angle yielded retroposition of the mandible for both groups at both time points (Tables 2, 3, 4). This finding was, however, significantly more pronounced in the study groups versus the control group at T1. Compared to the untreated control group, we noted significant advancement of the mandible during therapy. Treatment was also associated with additional mandibular growth of the chin prominence (Cond-Pog), although a significant difference was not seen after treatment. Interestingly, anterior growth of the pogonion prominence (Pog- NB) was significantly less in the study group than in the control group. Once again, however, this differential growth was not reflected by the absolute values measured at T1 and T2 (Table 3). Similarly, no group difference at T1 or T2 was seen for effective mandibular length (Cond- Gn), while the observation period revealed a significant treatment-related increase of this parameter in the treatment group. Ramus height (Cond-Go) did not show any significant group differences in any of the comparisons.* ***TERTIÄRZIELGRÖßE*** *As expected, both groups were similarly characterized by mandibular retroclination (ML-NSL) and maxillary proclination (NL-NSL) at both time points (Tables 2, 3, 4). While the interbasal and lower gonial angles (ML-NL, N-Go-Me) suggested a vertical growth type, the mandibular angle (Ar- Go-Me) argued more in favor of a horizontal rotational behavior. This angle decreased significantly less in the treatment group, indicating stabilization of the overbite during treatment, while ongoing growth in the untreated control group was associated with bite deepening. At the same time, the smaller gonial angle (N-Go-Me) increased in the treatment group but decreased in the control group. Posterior facial height (S-Go) was similar in both groups at T1 but was significantly greater in the treatment group T2, which was also reflected in a significant additional growth of this parameter during treatment (T2-T1). Analysis of the A-N-B angle yielded skeletal Class II in both groups at both time points, but the group treated with the functional regulator type II underwent significantly more pronounced decreases toward normal occlusion than the untreated control group (T2-T1).* ***QUARTÄRZIELGRÖßE****The SNBa triangle reflects changes at the level of the anterior and posterior cranial base (Fig. 3; Table 5). Both groups showed comparable increases of the D1 and D2 dilatations. Orientations were different, however, with D1 being more anterior in the control and anterior–caudal in the treatment group, and with D2 being vertical in the control and vertical–posterior in the treatment group. The SNA triangle reflects changes at the level of the maxilla relative to the anterior cranial base and alveolar process. This parameter indicated comparable developments in anterior–caudal (D1) and vertical–posterior (D2) directions. This absence of significant group differences for the SNA triangle demonstrates that the position of the maxilla was not affected by treatment with the functional regulator type II.*

Angaben auffälliger positiver und/oder negativer Aspekte	*Retrospektive Kohortenstudie mit unterschiedlichne Inklusionskriterien für Kontrol- und Treatment-Gruppe. Keine Powerkalkulation, Verblindung, Angaben von möglichen Störgrößen oder Konfidenzintervallen. Keine Informationen bzgl. Funding. Es lagen keine Interessenkonflikte der Autoren vor.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Behandlung mit dem Funktionsregler Typ II war effektiv und fu¨hrte zu positiver skelettaler Nachentwicklung.
Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable ⊕**

Evidenztabelle Seehra, Fleming et al. 2012

Original Article

A comparison of two different techniques for early correction of Class III malocclusion

J. Seehra[a]; P. S. Fleming[a]; N. Mandall[b]; A. T. DiBiase[a]

ABSTRACT

Objective: To compare the effectiveness of Reverse Twin-Block therapy (RTB) and protraction face mask treatment (PFM) with respect to an untreated control in the correction of developing Class III malocclusion.

Materials and Methods: A retrospective comparative study of subjects treated cases with either PFM (n = 9) or RTB (n = 13) and untreated matched controls (n = 10) was performed. Both the PFM and control group samples were derived from a previously conducted clinical trial, and the RTB group was formed of consecutively treated cases. The main outcome variables assessed were skeletal and dental changes. Lateral cephalograms were taken at the start and end of treatment or during the observation period. Analysis of variance was used to compare changes in cephalometric variables arising during the study period in the lateral group. Linear regression analysis and an unpaired *t*-test were used to determine the impacts of treatment duration and gender, respectively.

Results: Significantly greater skeletal changes arose with PFM therapy than with RTB therapy or in the control group (SNA, SNB, and ANB; $P < .001$). The dentoalveolar effects of RTB therapy exceeded those of PFM treatment, with significantly more maxillary incisor proclination ($P < .001$) and mandibular incisor retroclination ($P < .006$) arising with treatment.

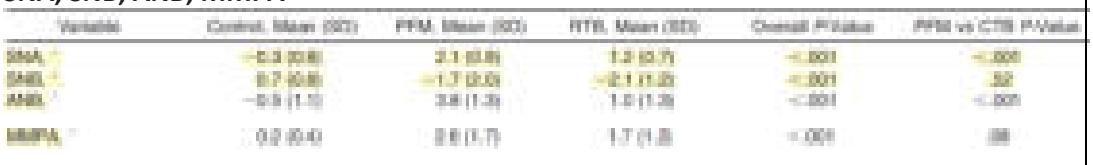
Conclusions: Both appliances are capable of correction of Class III dental relationships; however, the relative skeletal and dental contributions differ. Skeletal effects, chiefly anterior maxillary translation, predominated with PFM therapy. The RTB appliance induced Class III correction primarily as a result of dentoalveolar effects. (*Angle Orthod.* 2012;82:96–101.)

KEY WORDS: Class III; Protraction face mask; Reverse Twin-Block appliance

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Growing children with skeletal Angle Class-III and anterior crossbite involving three to four incisors in ICP, and edge-edge incisorrelationship in RCP with minimal dental decompensation of the upper and lower incisors • UK
Schweregrad	- a maxillo-mandibular planes angle greater than 35°or lower face height greater than 70 mm (PFM)
Einschluss-kriterien	RTB: - growing patients, - anterior crossbite involving three to four incisors in ICP, and edge-edge incisorrelationship in RCP with minimal dental decompensation of the upper and lower incisors. PFM: - seven to nine years old at the time of registration - three or four incisors in crossbite in the intercuspal position - clinical assessment of a class III skeletal problem.

Ausschluss-kriterien	RTB: - Class III malocclusion not amenable to interceptive correction; - craniofacial syndromes, including cleft lip and palate; - repeated histories of broken appliances and failed appointments; and - unavailability of adequate records, including complete diagnostic records, treatment notes, and pre- and posttreatment lateral cephalograms PFM: - child of non-Caucasian origin - cleft lip and palate and/or craniofacial syndrome - a maxillo-mandibular planes angle greater than 35°or lower face height greater than 70 mm - previous history of TMJ signs or symptoms - lack of consent

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RTB (Reverse Twin Block):** Adams cribs on molars or premolars and interproximal ball-ended claps were utilized for retention. A midline expansion screw was incorporated into the upper component to permit arch coordination. Upper and lower inclined bite planes at 70° to the occlusal plane and of a minimum height of 5 mm were placed bilaterally. A recurved spring was placed palatal to the upper incisors, and a lower labial bow was used to control the position of the lower labial segment. Subjects were encouraged to wear the appliances on a full-time basis, with removal for toothbrushing, eating, and engaging in contact sports. Subjects were reviewed on a 4-week to 6-week basis; the appliance was discontinued following establishment of a positive overjet and overbite. **PFM (RME + FM Del)**: Rapid maxillary expansion (RME). A bonded maxillary acrylic expansion device was placed as outlined by Baccetti et al. This consisted of a metal framework and a midline expansion screw to which 3 mm acrylic was adapted. The appliance was modified, if needed, with acrylic extending over the upper incisor edges to increase appliance retention. One vestibular hook was located, on each side, in the upper deciduous first molar position, for elastic traction. For patients with posterior crossbites, the expansion screw was activated one quarter turn (0.25 mm) per day until the lingual cusps of the upper posterior teeth approximated the buccal cusps of the lower posterior teeth. If no transverse change was required the maxillary splint was still activated once a day for 7– 10 days in order to disrupt the circum-maxillary sutures. Protraction facemask. Acommercially available adjustable facemask was used (TP Orthodontics), which had bilateral vertical rods connected to both chin and forehead pads. Elastics were connected bilaterally to the adjustable midline crossbow in a downwards and forwards direction. Extra oral elastics of increasing strength were used (3/ 80 8 oz elastics for 1–2 weeks; then 1/20 14 oz elastics; then 5/160 14 oz elastics) until a force of 400 g per side was delivered.24 The direction of elastic traction was downwards and forwards 30u from the vestibular hooks on the bonded maxillary expander to the adjustable crossbar of the facemask. Patients were asked to wear the facemask for 14 hours per day, continuously, during the evening and night. VERSUCHSGRUPPE 1: **RTB** N= 13 (Anfang) / N=13 (Ende) / Alter = 9,9 ± 0,99 / ♂:♀ = 33%:66% • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung (Von den Autoren als “early correction” bezeichnet) VERSUCHSGRUPPE 2: **PFM** N= 9 (Anfang) / N=9 (Ende) / Alter = 8,8 ± 0,56 / ♂:♀ = 33%:66% • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **untreated Class III** N=10 (Anfang) / N=10 (Ende) / Alter = 8,5 ± 0,5 / ♂:♀ = 3:7 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB, MMPA** SEKUNDÄRZIELGRÖßE: **Dental: Upper incisor to palatal plane; lower incisor to mandibular plane**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	- PFM and RTB therapy are effective (compared to effects in untreated controls) in the early treatment ofa Class III malocclusion. However, long-term stability of these treatment effects will be influenced by favorable growth. - The primary effects of the RTB appliance are dental, as characterized by upper incisor proclination and lower incisor retroclination, with minimal skeletal effects. - In contrast, significant maxillary advancement and less pronounced dental changes occurred with PFM therapy.
Zusammen-fassung der Ergebnisse	**GRUPPE RTB VS. GRUPPE untreated Class III** **GRUPPE PFM VS. GRUPPE untreated Class III** T1 (pre-treatment): mean age 9,9 years, RTB; 8,8 years, PFM; 8,5 years, untreated Class III T2 (post treatment/ observation): mean age 10,7 years, RTB; 9,6 years, PFM; 9,9 years, untreated Class III **SNA, SNB, ANB, MMPA**  **Upper incisor to palatal plane; lower incisor to mandibular plane** 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe wurde nachvollziehbar überprüft. Hinsichtlich der relevanten skeletalen, dentoalveolären Merkmale ist die Äquivalenz gegeben. Das unterschiedliche Alter (9,9 vs. 8,8 Jahre) zwischen den PFM und RTB Gruppen könnte eine Rolle spielen und wird diskutiert. Geschlechterunterschiede wurden nicht beobachtet. Damit wurden immerhin zwei mögliche Confounder berücksichtigt und diskutiert. Power/ Sample Size Berechnungen wurden durchgeführt. Die Kontrollgruppe und eine Versuchsgruppe stammen aus einer vorausgegangen randomisierten Studie. Die Beschreibung dieser Gruppen, auch hinsichtlich der Behandlung ist mangelhaft. Eine Verblindung fand nicht statt. Trotz einiger methodischer Schwächen ist das Gesamtdesign der Studie noch akzeptabel. Die kleinen Gruppengrößen dieser retrospektiven Studie schränken die klinische Relevanz jedoch ein. *Funding:* keine Angabe *Interessenkonflikte* keine Angabe *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe ist gegeben. Power/ Sample Size Berechnungen wurden durchgeführt. Eine Verblindung fand nicht statt. Trotz einiger methodischer Schwächen ist das Gesamtdesign der Studie noch akzeptabel. Die kleinen Gruppengrößen dieser retrospektiven Studie schränken die klinische Relevanz jedoch ein.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Die kleinen Gruppengrößen dieser retrospektiven Studie schränken die klinische Relevanz ein.
Evidenzlevel (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle Sepaninan, Sonnesen 2018

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Original article

Incisor root resorption in class II division 2 patients in relation to orthodontic treatment

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Summary

Background/Objectives: The aims were 1. to analyse differences in the occurrence of orthodontic induced inflammatory root resorption (OIIRR) of the upper and lower incisors in Angle Class II division 2 patients, between patients treated with fixed appliance only (one-phase treatment group) and patients treated with removable appliance before treatment with fixed appliance (two-phase treatment group) and 2. to analyse differences in OIIRR between treatment time, age, gender, craniofacial morphology and deviations in the dentition for the two groups together.

Materials/Methods: Seventy-four subjects treated for Class II division 2 malocclusion were divided into two groups: 46 patients in the one-phase treatment group (28 girls, 18 boys, mean age 14.4) and 28 patients in the two-phase treatment group (19 girls, 10 boys, mean age 12.4) where 336 and 201 incisors were analysed respectively. OIIRR was assessed on intra oral radiographs, deviations of the dentition were assessed on orthopantomograms and the craniofacial morphology was assessed on lateral cephalograms. Differences were tested by Fisher Exact test, McNemar, and multiple regression analysis.

Results: The one-phase treatment group showed significantly more OIIRR for lower central incisors ($P = 0.002$) compared to the two-phase treatment group. For the both groups combined, boys showed more OIIRR than girls ($P = 0.002$) and patients with agenesis showed more OIIRR than patients without agenesis ($P = 0.019$) for the lower central incisors.

Conclusion: The results indicate that two-phase treatment modalities may be considered as an option for Angle Class II division 2 patients with enhanced risk for OIIRR.

Population	**Klasse-II Anomalie** Subjects treated for Class II division 2 malocclusion were divided into two groups: a one-phase treatment group and a two-phase treatment.
Schweregrad	The mean horizontal overjet was 3.4 mm and the mean vertical overbite was 5.9 mm
Einschluss-kriterien	at least half distal molar relationship on one side (21); retroclined upper incisors (ILs/NL < 1 SD (104°), (22); positive vertical overbite; patients treated orthodontically, with none-extraction therapy and with conventional brackets during the phase with fixed appliance.

Ausschluss-kriterien	incomplete exposed teeth due to film displacement; incomplete exposed roots due to overlapping adjacent teeth; root filled incisors; distorted x-rays due to positioning error; patients treated with self-ligating bracket systems and teeth showing signs of resorption prior to orthodontic treatment
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *patients were treated with fixed appliance only.* VERSUCHSGRUPPE: **one-phase** N=46/46 / Alter = 14,2 (MIN: 11,0; MAX: 16,7) / ♂:♀ = 18:28 • Gebissphase: spätes Wechselgebiss, permantentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** *pre-treatment consisted of expansion plates, followed with or without treatment with functional appliances (Modified Andresen (23), Bionator (24), or Teuscher (25) with high pull headgear) and finishing in fixed appliance.* KONTROLLGRUPPE: **two-phase** N=28/28 / Alter = 12,3 (MIN: 10,3; MAX: 15,1) / ♂:♀ = 10:18 • Gebissphase: spätes Wechselgebiss, permantentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Outcome	**medizinischer Schaden, Nebenwirkungen bzw. Zunahme der Anomalie /Malokklusion/Dysgnathie** • **Reduktion therapiebegleitender Nebenwirkungen (v.a. Wurzelresorptionen)** PRIMÄRZIEL: *Difference in the occurrence of teeth with OIIRR between the two treatment groups (OIIRR).*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Patients in the one-phase treatment group showed significantly more OIIRR than patients in the two-phase treatment group for the lower central incisors. Boys showed more OIIRR than girls and patients with agenesis showed more OIIRR than patients without agenesis, in both cases for the lower central incisors. The results indicate that two-phase treatment modalities may be considered as an option for Angle Class II division 2 patients with enhanced risk for OIIRR.
Zusammen-fassung der Ergebnisse	**GRUPPE one-phase VS. GRUPPE two-phase** ***PRIMÄRZIELGRÖßE***: *The one-phase treatment group showed significantly more OIIRR for the lower central incisors compared to the two-phase treatment group (31.0% versus 7.7%, P = 0.025; Figure 2). The same pattern also applied for the lower lateral incisors (26.2% versus 8.0%), but the difference was not significant (P = 0.069, Figure 2). For the upper incisors there was no significant difference in OIIRR between the two groups.*

Angaben auffälliger positiver und/oder negativer Aspekte	*Studie zur Untersuchung der Auswirkung von one-phase/two-phase Behandlungsmodalitäten auf Wurzelresorptionen. Die Auswertung erfolgte verblindet. In den Abbildungen sind keine Standardabweichungen angegeben, was eine Wertung der Ergebnisse erschwert. Es wurde keine Powerkalkultation durchgeführt. Keine Angabe zum Funding, möglichen Störgrößen, dem Patientenscreening, Konfidenzintervallen. Es bestanden keine Interessenskonflikte der Autoren.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Ergebnisse deuten darauf hin, dass zweiphasige Behandlungsmodalitäten als Option für Patienten mit Angle Class II Division 2 mit erhöhtem Risiko für OIIRR in Betracht gezogen werden können.
Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable (+)**

Evidenztabelle Servello, Fallis et al 2015

Analysis of Class II patients, successfully treated with the straight-wire and Forsus appliances, based on cervical vertebral maturation status

David F. Servello[a]; Drew W. Fallis[b]; Lisa Alvetro[c]

ABSTRACT

Objective: To assess skeletal and dental changes in patients successfully treated with the Forsus appliance based on cervical vertebral maturation status.

Methods: Forty-seven Class II patients, successfully treated with the Forsus appliance, were divided into peak and postpeak growth groups determined immediately prior to Forsus placement. The mean (SD) ages of the peak and postpeak groups were 13.4 (1.0) and 14.1 (1.3) years, respectively. Superimpositions of initial, Forsus placement, Forsus removal, and final cephalometric radiographs were completed, allowing the measurement of changes during three treatment phases.

Results: There were no significant differences between groups during treatment phase 1 (alignment/leveling), with both groups demonstrating a worsening of the Class II molar relationship. However, during treatment phase 2 (Class II correction), patients within the peak group demonstrated significantly higher mean apical base, mandibular and molar changes, and an increased rate of change compared with those in the postpeak group. No significant differences were observed during treatment phase 3 (detail/finishing).

Conclusions: Following an initial worsening of the Class II molar relationship as a result of straight-wire appliance effects, Forsus appliance treatment initiated during cervical vertebral maturation status (CS) 3–4 elicits more effective and efficient correction of Class II molar relationships than when initiated during CS 5–6. Data support that these effects are due mainly to maxillary skeletal and dentoalveolar restraint during a period of more rapid mandibular growth. (*Angle Orthod.* 2015;85:60–68.)

Population	**Klasse-II-Anomalie** Class II patients, successfully treated with the Forsus appliance, were divided into peak and postpeak growth groups determined immediately prior to Forsus placement
Schweregrad	half-step molar Class II relationship
Einschluss-kriterien	• correction to Class I from at least a half-step molar Class II relationship at initial presentation, • Forsus treatment greater than 3 months, • completion of orthodontic treatment and diagnostic radiographs at all time points.
Ausschluss-kriterien	keine Angabe
Intervention Versuchsgruppe 1	**kieferorthopädische Behandlung** *Patients in the peak growth group included patients in cervical vertebral maturation status CS 3 and 4. Assessment of CS, as defined by a previous report8 was performed by the primary investigator and verified by the secondary investigator; differences were resolved to their mutual agreement. Treated from a Class II to Class I molar relationship with the MBT prescription and Forsus appliances (3M Unitek, Monrovia, Calif)* VERSUCHSGRUPPE: **Peak** N=28/28 / Alter = 12,2 ± 1,1 Jahre / ♂:♀ = 17:8 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung:.reguläre Behandlung

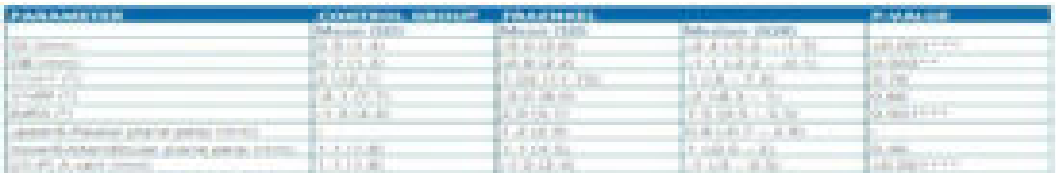
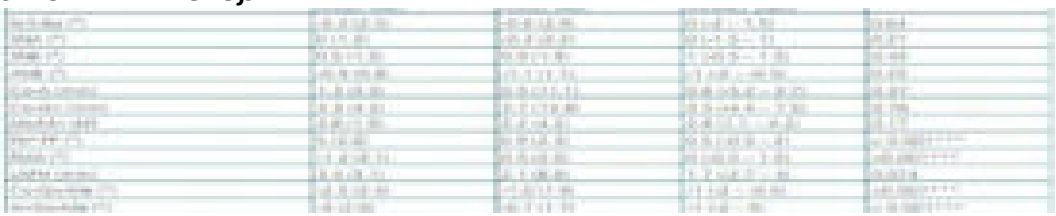
Kontrolle Kontrollgruppe	**kieferorthopädische Behandlung** *Patients in the postpeak group included patients in CS 5 and 6. Assessment of CS, as defined by a previous report8 was performed by the primary investigator and verified by the secondary investigator; differences were resolved to their mutual agreement. Treated from a Class II to Class I molar relationship with the MBT prescription and Forsus appliances (3M Unitek, Monrovia, Calif).* VERSUCHSGRUPPE: **postpeak** N=22/22 / Alter = 12,9 ± 1,4 Jahre / ♂:♀ = 3:19 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Maxillomandibular relationship (ANB, SN-MP, Molar Discrepancy)* SEKUNDÄRZIELGRÖßE: *Skeletal and dental changes (ABCH-Skeletal, Molar-Dental, Skeletal %)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Following an initial worsening of the Class II molar relationship as a result of straight-wire appliance effects, Forsus appliance treatment initiated during CS 3–4 elicits more effective and efficient correction of Class II molar relationships than when initiated during CS 5–6. The enhanced efficiency of skeletal and dental effects accompanying Class II correction with Forsus treatment during CS 3–4 (in comparison to CS 5–6) is due primarily to maxillary skeletal and dentoalveolar restraint during a period ofmore rapidmandibular growth.…
Zusammen-fassung der Ergebnisse	**GRUPPE PEAK VS. GRUPPE POSTPEAK** ***PRIMÄRZIELGRÖßE:*** *Measurements for initial ANB and MP-SN angles, as well as molar discrepancy at T0 and T1, are reported in Table 1. Comparison of the skeletal means revealed no statistical difference for either ANB or SN-MP angles. However, there were significant differences between the two groups in the severity of the Class II molar relationship at both T0 and T1.* ***SEKUNDÄRZIELGRÖßE:*** *As demonstrated in Table 3, the mean percentage of skeletal correction in the peak group was 43%, compared to 25% for the postpeak group, which compares favorably to previous studies.19 However, due to the wide variation of the skeletal response observed in both groups, this difference was not statistically significant (P 5 .10). However, the interesting observation in the present study is the nearly identical skeletal and dentoalveolar effects in the maxilla of both treatment groups during the Forsus treatment phase, even though the apical base change was significantly greater in the peak growth group. This finding is best explained by the increased amount of normal mandibular growth that is occurring during peak growth, more of which is taken advantage of to correct the Class II molar relationship when skeletal and dental maxillary restraint occurs during CS 3–4. In comparing both groups to untreated Class II patients from a previous study of similar design,14 both peak and postpeak groups demonstrated less mean maxillary growth during the Forsus phase (0.38 and 0.32 mm, respectively) in comparison to untreated controls (1.98 mm) during similar growth stages.*

Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durgeführte retrospektive Kohortenstudie mit reliabler Auswertung. Kalkultion der Gruppengrößen vorhanden. Keine Angaben zu Funding oder möglicher Interessenskonflikte. Keine Verblindung, nähere Angaben zum Patientenscreening, möglichen Störfaktoren oder von Konfidenzintervallen.*
Schluss-folgerung des Begutachters	methodische Qualität: ok
	Klinische Aussagekraft: Following an initial worsening of the Class II molar relationship as a result of straight-wire appliance effects, Forsus appliance treatment initiated during cervical vertebral maturation status (CS) 3–4 elicits more effective and efficient correction of Class II molar relationships than when initiated during CS 5–6. Data support that these effects are due mainly to maxillary skeletal and dentoalveolar restraint during a period of more rapid mandibular growth.
Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable ⊕**

Evidenztabelle Silvestrini-Biavati et al 2012

Early functional treatment in Class II division 1 subjects with mandibular retrognathia using Fränkel II appliance. A prospective controlled study

Population	**Klasse-II-Anomalie** caucasian Class II division 1 patients from Italy
Schweregrad	overjet < 5 mm, ANB <6°
Einschluss-kriterien	Class II malocclusion with a half cusp sagittal discrepancy at least; overjet < 5 mm, ANB <6°, absence of agenesis
Ausschluss-kriterien	keine Angabe
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *Fränkel II treatment. mean treatment duration 1y 11m* VERSUCHSGRUPPE: **Fränkel II** N=25/25 / Alter = 8y 11m (MIN:6y 6m, MAX: 11y 9m) / ♂:♀ = 15:10 • Gebissphase: frühes/spätes Wechselgebiss • KFO-Behandlung: Frühe/reguläre Behanldung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: untreated N=20/20 Alter = 9y 1m / ♂:♀ = 14:6 • Gebissphase: frühes/spätes Wechselgebiss • KFO-Behandlung: keine

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: *dentoalveolar changes (OJ, OB, 1^/1^, 1^/PP, IMPA, upper6-Palatal plane perp, lower6-Mandibular plane perp)* SEKUNDÄRZIELGRÖßE: *skeletal changes (N-S-Ba, SNA, SNB, ANB, Co-A, Co-Gn, Mx/Mn diff, FH^PP, FMA, LAF, Co-Go-Me, Ar-Go-Me)* TERTIÄRZIELGRÖßE: *facial changes (U1-Pt A vert, U lip protraction, L lip protraction, A´to Nperp, Pg´to Nperp)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Overjet 3 mm improvement, overbite 0.08 mm reduction 2. ANB 1.1° reduction, Mx/md Diff 3,20mm reduction, due to a reduced Co-A growth together with an improved mandibular Co-Gn growht 3. A and Pg improvement vs untreated group
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS GRUPPE Fränkel II** ***PRIMÄRZIELGRÖßE***  ***SEKUNDÄRZIELGRÖßE***  ***TERTIÄRZIELGRÖßE*** 
Angaben auffälliger positiver und/oder negativer Aspekte	*Kohortenstudie mit gutem Studiendesign. Auswertung durch einen verblindeter Statistiker. Keine Powerkalkulation. Keine Angabe zum Funding oder möglichen Interessenskonflikten der Autoren. Keine Angaben zu möglichen Störgrößen oder Konfidenzintervallen. Tabellen in schlechter Qualität.*
Schluss-folgerung des Begutachters	methodische Qualität: ok
	Klinische Aussagekraft: Fränkel II Behandlung hat positive Auswirkungen auf overbite und overjet

Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable ⊕**

Evidenztabelle So 1996

Effects of reverse headgear treatment on sagittal correction in girls born with unilateral complete cleft lip and cleft palate—skeletal and dental changes

Lisa Lai-ying So, BDS, MDS, FRCD(Canada)*
Hong Kong

Patients with cleft lip and cleft palate often develop maxillary retrognathism. This is due to the combined effects of the congenital deformity and surgical repairs. Early protraction of the maxilla with extraoral forces helps to achieve more balanced skeletal harmony and favorable occlusion for future growth to occur. The purpose of the present study is to investigate the proportion of the skeletal and dental changes contributing to the improvement in a group of Southern Chinese girls born with unilateral complete cleft lip and cleft palate treated by the reverse headgear. This study only focused on treating a homogeneous sample group, i.e., only girls with unilateral complete cleft lip and cleft palate. This design was deliberate so as to avoid having boys and girls with various types of cleft all pooled together for analyses as seen in most of the previous reports. In addition, comparison was made with girls matched in having a similar deformity, presenting a similar skeletal structure and maturity status to reveal the genuine treatment effect. The 9.7 months of reverse headgear treatment improved the sagittal jaw relationship ($p < 0.01$) and overjet ($p < 0.01$), which was effected by about two-thirds skeletal and one-third dental changes. (Am J Orthod Dentofac Orthop 1996;109:140-7.)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** - Patients, female with UCLP and skeletal Class III malocclusion; China
Schweregrad	Keine Angaben
Einschluss-kriterien	(1) Female; (2) UCLP; (3) Skeletal Class III
Ausschluss-kriterien	Not fulfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **HG UCLP:** The intraoral component was an appliance fixed onto the maxillary dental arch. It consisted of bands cemented on the maxillary first deciduous molars or premolars and the first permanent molars. The bands were soldered together by 1.15 mm stainless steel round wires. Two hooks were soldered and extended from the first permanent molars to the region of the first deciduous molars or premolars. Extraoral elastics applying 450 to 500 gm of force per side was applied from the hooks to the extraoral component, the reverse headgear, at an angle of 10 ° downward to the occlusal plane. Anchorage came from the forehead and chin. The elastic traction was to be worn 12 to 14 hours daily. VERSUCHSGRUPPE 1 **HG UCLP** N= 10 (Anfang) / N=10 (Ende) / Alter = 10,57 ± 1,31 years / ♂:♀ = 0:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **Untreated Class III UCLP:** A control sample, consisting of ten untreated Class III children obtained from Ohio State University and Uni- versity of Hong Kong Growth Studies, was used as a comparison group. These subjects were matched by age and sex to the treated sample. KONTROLLGRUPPE 1: **Untreated Class III UCLP** N=? (Anfang) / N= ?(Ende) / Alter = = ? ± ? years / ♂:♀ = 0:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: Angular** 1. S-N-ss-position of the maxilla. 2. S-N-sm -- position of the mandible. 3. ss-N-sm- sagittal jaw relationship.
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The 9.7 months of reverse headgear treatment produced - **significantly improved skeletal and dental changes** in the sagittal plane during the mixed dentition stage **of Southern Chinese girls born with unilateral complete cleft lip and cleft palate.** - **Maxillary base protraction and posterior mandibular incisor movement** each contributed to about 30%, whereas downward and backward mandibular rotation accounted for 25% of the overjet correction. - **Minimal change was found for both maxillary and mandibular molar positions**

Zusammen-fassung der Ergebnisse	**GRUPPE HG UCLP VS. GRUPPE untreated Class III UCLP** T0 (pre-treatment) : 10,57, 1,31 years, HG UCLP; ?, ? years untreated Class III UCLP(Control) T1 (post-treatment): 11,37 years, HG UCLP; ?, ? years untreated Class III UCLP (Control) **Skeletal: Angular** 1. S-N-ss-position of the maxilla. 2. S-N-sm -- position of the mandible. 3. ss-N-sm- sagittal jaw relationship *Test group (n = 59) / Control group (n = 101) / Group difference "treatment effect"* *Variables (mm or degree)* — Mean / SD / Mean / SD / Mean / p value 4. *Angular changes* 1. Maxillary position (S-N-ss (d)) 2. Mandibular position (S-N-sm (d)) 3. Sagittal jaw relationship (ss-N-sm (d)) **Dental: Overjet** *Test group (n = 59) / Control group (n = 101) / Group difference "treatment effect"* *Variables (mm or degree)* — Mean / SD / Mean / SD / Mean / p value 5. Overjet (ol(H.p (d) minus ll(H.p (d)) — 4.25 / 2.79 / −8.25 / 2.87 / 6.48 / < 0.01

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Äquivalenz von Versuchs- und Kontrollgruppen nicht gegeben. Baseline characteristics (skeletal, dental) sind angegeben und statistisch verglichen. Es bestehen signifikante Unterscheide zwischen Versuchs- und Kontrollgruppe hinsichtlich dentaler Merkmale (Overjet, Winkel der maxillären Schneidezähne) Power/ Sample Size Berechnungen wurden nicht durchgeführt. Die Auswertung war nicht verblindet. Retrospektive Studie mit hohem Risiko für Bias (kleine Gruppengröße, keine vollständigen Daten zur Kontrollgruppe, keine Äquivalenz hinsichtlich relevanter Merkmale zwischen den Gruppen), daher mit sehr deutlichen Schwächen in der Durchführung. Die klinische Relevanz ist entsprechend sehr stark eingeschränkt. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Äquivalenz von Versuchs- und Kontrollgruppen nicht gegeben. Die Kontrollgruppe ist unzureichend beschreiben.. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Retrospektive Studie mit hohem Risiko für Bias (kleine Gruppengröße, keine vollständigen Daten zur Kontrollgruppe, keine Äquivalenz hinsichtlich relevanter Merkmale zwischen den Gruppen), daher mit sehr deutlichen Schwächen in der Durchführung. Die klinische Relevanz ist entsprechend sehr stark eingeschränkt
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Sollenius et al. 2019

Randomized controlled trial

Three-dimensional evaluation of forced unilateral posterior crossbite correction in the mixed dentition: a randomized controlled trial

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Summary

Objectives: The objectives of this study were to assess the three-dimensional (3D) treatment changes (palatal surface area and volume) of forced unilateral posterior crossbite correction using either quad-helix or removable expansion plate appliances in the mixed dentition, and to compare the treatment changes with the three-dimensional changes occurring in age-matched untreated unilateral posterior crossbite patients as well as in subjects with normal occlusion and with no or mild orthodontic treatment need.

Trial design: Six-arm parallel group multicentre randomized controlled trial.

Materials and methods: One-hundred and thirty-five patients with unilateral posterior crossbite with functional shift were recruited. The patients were randomized by an independent person not involved in the trial. The randomization used blocks of 25, and the patients were randomized into the following five groups: quad-helix treatments in specialist orthodontic clinics (QHS), quad-helix treatments in general dentistry (QHG), removable expansion plate treatments in specialist orthodontic clinics (EPS), removable expansion plate treatments in general dentistry (EPG), and untreated crossbite (UC). Twenty-five patients with normal occlusion who served as normal controls were also included in the trial. Blinding of the outcome assessor and data analyst was accomplished. Data on all children were evaluated on an intention-to-treat basis, regarding 3D palatal surface area, palatal projection area, and palatal shell volume; two-dimensional linear measurements were registered at the same time.

Results: After treatment, the surface and projection area and shell volume increased in the four treatment groups (QHS, QHG, EPS, and EPG). QHS increased significantly more than EPG for the surface and projection area. The QHS and EPS had significantly higher mean difference for shell volume.

Limitations: The trial considers a short-term evaluation.

Conclusion: After treatment, there were no significant differences between the four treatment groups and the normal group, which implies that the surface and projection area together with the shell volume for the four treatment groups and the normal group were equivalent.

Trial registration: The trial was registered with https://www.researchweb.org/is/sverige, registration number: 220761.

Population *Setting* *Komorbiditäten*	**Transversale Anomalie** • Patients from 10 general dental health clinics at the Public Dental Health Service, Halland County Council, Sweden.
Schweregrad	Unilateral crossbite

Einschluss-kriterien *Bei Review: PICOS*	• Consecutive children, boys and girls • Mixed dentition (between 8 and 10 years of age) • Unilateral posterior crossbite including the first permanent molar and with a functional shift of more than 1 mm • Class I occlusion
Ausschluss-kriterien	• Children with sucking habits or ceased sucking habits during the year before the trial was started • Children who had previously undergone orthodontic treatment • Children who had severe crowding of teeth (extraction of teeth necessary) • Children with craniofacial syndromes
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The patients were randomized into the following groups: **Group QHS (quad-helix treatments in specialist orthodontic clinics)** N=28 (Anfang) / N=28 (Ende) / Alter = 9,3 ± 1,09 Jahre / ♂:♀ = 11:17 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv) **Group QHG (quadhelix treatments in general dentistry)** N=27 (Anfang) / N=127 (Ende) / Alter = 9,5 ± 1,04 Jahre / ♂:♀ = 14:13 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv) **Group EPS (Expansion Plate treatments in specialist orthodontic clinics)** N=27 (Anfang) / N=27 (Ende) / Alter = 8,7 ± 0,78 Jahre / ♂:♀ = 15:12 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv) **Group EPG (Expansion Plate treatments in general dentistry)** N=28 (Anfang) / N=28 (Ende) / Alter = 9,2 ± 1,11 Jahre / ♂:♀ = 11:17 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv)

Kontrolle Kontrollgruppe	**Keine Kieferorthopädische Therapie** KONTROLLGRUPPE 1: **UC (untreated crossbite)** N=25 (Anfang) / N=25 (Ende) / Alter = 8,5 ± 0,57 Jahre / ♂:♀ = 16:9 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung KONTROLLGRUPPE 2: **NC (normal occlusion)** N=25 (Anfang) / N=25 (Ende) / Alter = 9,3 ± 1,06 Jahre / ♂:♀ = 17:8 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Palatal surface area, projection area and shell volume (intraoral scan) SEKUNDÄRZIELGRÖßE: Linear measurements of maxillary and mandibular intercanine and intermolar epansion (The shortest intercanine linear distance at the gingival levels and the cusp tips of the teeth/shortest intermolar linear distance at the gingival levels and the mesiobuccal cusp tips of the teeth) TERTIÄRZIELGRÖßE: Treatment time (time in months to correct the crossbite to normal occlusion) QUARTÄRZIELGRÖßE: Success rate of crossbite correction (yes/no)
Studientyp	**RCT**
Schluss-folgerungen der Autoren	• Children with UPC with functional shift in the mixed dentition revealed before treatment significantly smaller palatal surface and projection area as well as smaller palatal shell volume than normal control children. • UPC correction resulted in a normalization of the palatal structures in terms of palatal area and volume. • QH treatments in orthodontic specialist clinics but also in general dentistry as well as removable expansion plate treatments in specialist orthodontic clinics revealed a significant increase of palatal area and volume. • The natural growth changes during the one-year trial were small.

Zusammen-fassung der Ergebnisse	**QHS vs. QHG vs. EPS vs. EPG vs. UC vs. NC** ***PRIMÄRZIELGRÖßE*** *(Palatal surface area, projection area and shell volume)* At baseline or before treatment, all five crossbite groups had significantly less palatal surface and projection area as well as palatal shell volume compared to the normal group (Table 2). No significant differences between the five crossbite groups were found regarding surface or projection area or shell volume (Table 2). After treatment, the surface and projection area and shell volume increased in the four treatment groups (QHS, QHG, EPS, and EPG) (Table 3). ***SEKUNDÄRZIELGRÖßE*** *(Linear measurements of maxillary and mandibular intercanine and intermolar expansion)* At baseline, there were significantly smaller maxillary intermolar and intercanine distances except for distances between the intercanine cusp tips when the five crossbite groups were compared to the normal group; however, no significant differences were found between the crossbite groups (Table 4). After treatment, the intermolar and intercanine distances in the maxilla significantly increase within all four treatment groups (Table 4). The increase was mostly pronounced in the QHS and QHG groups, which exceeded some of the values of the normal group (Table 4). Between the groups, the maxillary intermolar and intercanine expansion was significantly larger in the QHS than in the QHG, EPS, and EPG groups whereas all four treatment groups showed greater expansion than in the untreated control and normal group especially on the molars (Table 5). Small or negligible and insignificant changes were found in the mandible regarding the intermolar and intercanine distances. ***TERTIÄRZIELGRÖßE*** *(Treatment time)* The mean treatment time to correct the crossbite, including retention of 3 months, was 7.5 months (SD = 1.45, range 6.0–10.5) for QHS, 8.2 months (SD = 2.23, range 6.0–12.0) for QHG, 11.4 months (SD = 3.40, range 7.5–20.0) for EPS, and 12.0 months (SD = 3.63, range 6.0–21.0) for EPG. ***QUARTÄRZIELGRÖßE*** (*Success rate of crossbite correction)* In the QHS group, 28 of 28 children were successfully corrected whereas in the QHG group 23 of 27 children (*P* = 0.051) were successfully corrected. The expansion plate treatments were less successful, that is, 18 of 27 in the EPS group and 18 of 28 in the EPG group. Consequently, QH treatment in orthodontic specialistclinics was significantly more successful compared with expansion plate treatments in orthodontic specialist or general dentist clinics, (*P* = 0.001 and *P* = 0.000).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl:* As Primožič et al. are the only authors who have evaluated 3D palatal vault changes in assessing treatment of constricted maxilla in growing subjects, we used their sample size calculation as a base for clinical relevant changes. With the assumption of means in variances for different groups taken from Primožič et al., and using multiple testing adjustment suggested by Dunnett and Tamhane (19), with standard parameters of 80% power and α 0.05, a number of 23 children per group was needed, and as we expected some dropouts to occur, the required sample size was estimated to be 25 in each of the groups. *Funding:* supported by the European Orthodontic Society Research grant (2015), Region Halland, Sweden. *Interessenkonflikte:* The authors declare that they have no competing interests Bias (SIGN): Children and trial personnel could not be blinded due to the character of treatment, but blinding was performed of the outcome evaluator and the person who analysed the data. Hence, the evaluator was unaware of the group to which the child had been allocated or whether the data were from baseline, follow-up, or after treatment.
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt sehr gut
	Klinische Aussagekraft: sehr hoch
Evidenz-level (SIGN)	**1++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality ⊕⊕**

Evidenztabelle Spalj, Tranesen et al 2017

Comparison of Activator-Headgear and Twin Block Treatment Approaches in Class II Division 1 Malocclusion

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Academic Editor: Simona Tecco

The purpose was to compare the treatment effects of functional appliances activator-headgear (AH) and Twin Block (TB) on skeletal, dental, and soft-tissue structures in class II division 1 malocclusion with normal growth changes in untreated subjects. The sample included 50 subjects (56% females) aged 8–13 years with class II division 1 malocclusion treated with either AH ($n = 25$) or TB ($n = 25$) appliances. Pre- and posttreatment lateral cephalograms were evaluated and compared to 50 untreated class II division 1 cases matched by age, gender, ANB angle, and skeletal maturity. A paired sample, independent samples tests and discriminant analysis were performed for intra- and intergroup analysis. Treatment with both appliances resulted in significant reduction of skeletal and soft-tissue facial convexity, the overjet, and the prominence of the upper lip in comparison to untreated individuals ($p < 0.001$). Retroclination of maxillary incisors and proclination of mandibular incisors were seen, the latter being significantly more evident in the TB group ($p < 0.05$). Increase of effective mandibular length was more pronounced in the TB group. In conclusion, both AH and TB appliances contributed successfully to the correction of class II division 1 malocclusion when compared to the untreated subjects with predominantly dentoalveolar changes.

Population	**Klasse-II-Anomalie** The sample included subjects with class II division 1 malocclusion treated in the period of 2000–2015 at theDepartment ofOrthodontics in Oslo,Norway and Rijeka, Croatia
Schweregrad	overjet (OJ) >5 mm
Einschluss-kriterien	Inclusion criteria were distal molar occlusion, overjet (OJ) >5 mm, and having pre- and posttreatment lateral cephalograms. According to the cervical vertebral maturation method [12], the included subjects were in the prepeak stages (CS1–CS3) of skeletal maturation before treatment and CS3–CS5 after treatment.
Ausschluss-kriterien	keine Angabe

Intervention	**kieferorthopädische Behandlung** *The AH appliance had all maxillary teeth covered with acrylic and included labial spring for the torque control of the incisors [13]. High pull headgear was always used simultaneously with the appliance. The patients were recommended to use the appliances for 12–14 hours per day. mean observation period: 15,4 ± 5,5* VERSUCHSGRUPPE: **activator headgear (AH)** N=25/25 / Alter = 10 (MIN:8, MAX: 12) / ♂:♀ = 12:13 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Intervention	**kieferorthopädische Behandlung** *TB appliance [14] with addition ofmaxillary labial bow to aid the anterior retention andmake the maxillary incisors retroclined was used in the othe rgroup. The expansion screw was incorporated in the maxillary plate and activated one quarter-turn each week for an average period of sixmonths. The patients were recommended to use the appliances for 12–14 hours per day. mean observation period: 14,2 ± 4,8* VERSUCHSGRUPPE: **Twin Block (TB)** N=25/25 / Alter = 11 (MIN:9, MAX: 13) / ♂:♀ = 10:15 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=50/50 / Alter = 11 (MIN:8, MAX: 13) / ♂:♀ = 22:28 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Skeletal and dental changes (NSBa, SNA, SNB ANB, A-NPg, NL/NSL, MP/NSL, MP/NL, FA/Nba, UFH, LFH, UFH/LFH, Co-A, Co-Gn, MaxManddiff, -1/MP, +1/NSL, -1/A-Pg angle, +1/A-Pg angle, -1/A-Pg distance, +1/A-Pg distance, Gl´-Sn-Pg´, Cm-Sn-Ls, Li-E, Ls-E, Li-S, Ls-S, OJ)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	Both AH and TB appliances contributed successfully to the correction of class II division 1 malocclusion when compared to the untreated growing class II subjects producing predominantly dentoalveolar effects. TB appliance leads to more pronounced protrusion and proclination of the mandibular incisors than the AH group. Treatment with TB results in some supplementary mandibular length growth while AH exerted some tendency to more control of the vertical dimension of the lower anterior facial height. Normal growth pattern in untreated class II subjects comprises forward and downward growth displacement of the maxilla and the mandible without major changes in basal sagittal relation between the jaws. Clinical relevance of these findings is that early treatment may correct or at least ameliorate class II division I malocclusion which is not self-corrective.
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE activator headgear/twin block** ***PRIMÄRZIELGRÖßE*** *Treatment with the TB appliance resulted in increased mandibular incisor proclination and protrusion compared to the AH appliance ($p < 0.05$; Table 5). Treatment with both functional appliances resulted in significant reduction of the ANB angle when compared to the untreated population ($p < 0.001$; Table 5). It was mainly due to the increase in the SNB angle and maxillomandibular differential length (difference between effective mandibular length (Co-Gn) and the effective midface length (Co-A);$p < 0.001$). Both appliances significantly reduced the convexity of the hard and soft facial tissues in comparison to the untreated population ($p < 0.001$). Additionally, retroclination of the maxillary incisors was noticed in both treatment groups and was slightly but insignificantly more pronounced in the AH group. Proclination of the mandibular incisors was significantlymore pronounced in the TB group ($p < 0.05$).As a consequence, OJ and the prominence of the upper lip were significantly reduced in comparison to the untreated subjects ($p < 0.001$).*
Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführte Kohortenstudie, Informationen zu Powerkalkulation, Funding und Interessenskonflikten vorhanden. Keine Angaben zur Verblindung, Patientenscreening, möglichen Störgrößen oder Konfidenzintervallen.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Increase of effective mandibular length was more pronounced in the TB group. In conclusion, both AH and TB appliances contributed successfully to the correction of class II division 1 malocclusion when compared to the untreated subjects with predominantly dentoalveolar changes
Evidenz-level (SIGN)	**2+**
Qualität (SIGN)	**Acceptable ⊕**

Evidenztabelle Tai et al. 2011

Original Article

3-Dimensional cone-beam computed tomography analysis of transverse changes with Schwarz appliances on both jaws

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ABSTRACT

Objective: To evaluate transverse changes from Schwarz appliances on both jaws in young, growing patients using cone-beam computed tomography (CBCT).

Materials and Methods: All subjects had Angle Class I molar relationships and crowding. They were randomly divided into two groups: 30 expanded and 30 control subjects. Three-dimensional CBCT software was used to evaluate and compare treatment effects between the groups. To test for any significant differences between groups at T0 and T1, an independent *t*-test and paired *t*-tests were used.

Results: The interbuccal dentoalveolar width (BDAW), interpalatal dentoalveolar width (PDAW), and interlingual dentoalveolar width (LDAW) values showed significant changes when measured from a point 3 mm coronal to the cementoenamel junction (CEJ) to 8 mm apical to the CEJ. When compared with mandibular interdentoalveolar width differences (BDAW-LDAW), significant differences ($P < .05$) were observed. The soft tissue width of the maxillary and mandibular teeth and alveolar bone showed no significant changes ($P > .05$), even with dentoalveolar arch expansion in both jaws.

Conclusions: This study indicates that Schwarz appliances primarily affect the dentoalveolar complex and have varying effects on mandibular and maxillary alveolar bone width. Also, soft tissue is not affected in the area of expansion in this research. (*Angle Orthod* 2011;81:670–677.)

KEY WORDS: Three-dimensional (3D) CBCT; Multiplanar reconstruction (MPR) image analysis; Superimposition; Iterative closest point (ICP) method; Schwarz appliances

Population *Setting* *Komorbiditäten*	**Zahnengstand** • Young growing patients
Schweregrad	Keine Angaben
Einschluss-kriterien *Bei Review: PICOS*	1. Angle Class I 2. Crowding 3. Normal vertical dimensions
Ausschluss-kriterien	1. Posterior crossbite
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The expanded group used a Schwarz expansion appliance on the maxillary and mandibular dentitions to relieve anterior crowding. Maxillary dental arches were also expanded in all expansion group patients using Schwarz appliances to maintain the buccolingual relationships of occlusal contact in posterior teeth during expansion. The appliance was activated by rotating its screws weekly (0.175 mm at 90u). Expansion plates were adjusted when the appliance disturbed an erupting tooth or did not fit in the dental arch. A new appliance was fabricated when the screw reached its limit. After 6–12 months of expansion, the screw of the Schwarz appliance was fixed with composite (cured) and used as a retainer. Patients wore the expansion appliances at night. VERSUCHSGRUPPE: **Expansion appliance** N=30 (Anfang) / N=30 (Ende) / Alter = 8 Jahre 3 Monate / ♂:♀ = 15:15 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv)
Kontrolle Kontrollgruppe	**Keine Kieferorthopädische Therapie** KONTROLLGRUPPE: **nonexpanded group** N=30 (Anfang) / N=30 (Ende) / Alter = 7 Jahre 11 Monate / ♂:♀ = 15:15 • Gebissphase: frühes Wechselgebiss, spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Maxillary and Mandibular First Molar Net Changes SEKUNDÄRZIELGRÖßE: Maxillary and Mandibular Soft Tissue Net Changes TERTIÄRZIELGRÖßE: Soft Tissue Changes Surface Data
Studientyp	**RCT**

Schluss-folgerungen der Autoren	1. MPR image measurements demonstrated that Schwarz appliances expand maxillary and mandibular alveolar processes at the first molars, the deciduous second molars, the deciduous first molars, and deciduous canines, respectively. No significant difference was found in the surface point of soft tissue that corresponded, respectively, after 6.3 mm of slow expansion. 2. Mandibular bone width was not expanded significantly by the Schwarz appliance; however, maxillary bone width changes were observed. This means that other options would be necessary to achieve mandibular bone width expansion. 3. The distance between the right and left exocanthion, endocanthion, alar base, and lip commissure were not expanded by the Schwarz appliance.
Zusammen-fassung der Ergebnisse	**GRUPPE Expansion appliance VS. GRUPPE nonexpanded group** ***PRIMÄRZIELGRÖßE*** In the expanded group, the values of the maxillary first molars in interpalatal dentoalveolar width (PDAW), interbuccal dentoalveolar width (BDAW) and BDAW-PDAW expanded significantly (P < .05) compared to the control group. The values of BDAW and LDAW in the mandibular first molars in the expanded group expanded significantly (P < .05) compared with the control group except for BDAW-interlingual dentoalveolar width (LDAW). ***SEKUNDÄRZIELGRÖßE*** The interfacial width (soft tissue) of T0/T1 values was measured at the crown and 3 mm and 6 mm apical to the CEJ level, respectively. The soft tissue width was not measured at the CEJ and 8 mm apical to the CEJ because it was presumed there would not be a significant difference (P > .05) from the other soft tissue measurement points. In the soft tissue measurements at the maxilla and mandible, there were no significant changes either in the expanded or control group (P > .05) (Table 2). ***TERTIÄRZIELGRÖßE*** The inter-exocanthion length, inter-endocanthion length, interalar base length, and interlip commissure were measured. No significant differences (P > .05) were observed between the groups with regard to the soft tissue (Table 3). There were no significant transverse changes of soft tissues after an average of 9 months of expansion (0.175 mm 3 4 weeks 5 0.7 mm; 0.7 mm 3 9 months 5 6.3 mm).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Power der Studie/Patientenzahl: unklar* *Keine Angaben zu Dauer der Studie* *Funding: no Information* *Interessenkonflikte: no Information* *Eine genauere Beschreibung der Patientenrekrutierung und der Baseline wären wünschenswert. Außerdem wäre eine exaktere Beschreibung der Randomisierungs- und Verblindungsverfahren sinnvoll. Dennoch wurde die Studie gut und nachvollziehbar durchgeführt.* *BIAS:* - *Can’t say if an adequate concealment method is used.* - *Can’t say if the design keeps subjects and investigators ‘blind’ about treatment allocation.* - *Can’t say if results are comparable for all sites.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: akzeptabel • Die Schwarz-Apparatur führt im Wechselgebiss zu einer dentoalveolären transversalen Erweiterung in Maxilla und Mandibula • Unbehandelt kommt es im Wechselgebiss zu keinem transversalen Wachstum • Das umgebende Weichgewebe wird durch die Therapie mittels Schwarz-Apparatur nicht in seinen Dimensionen verändert.
Evidenz-level (SIGN)	**1+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Tepedino et al 2019

Original article

Soft-tissue changes after Class II malocclusion treatment using the Sander bite-jumping appliance: a retrospective study

Michele TEPEDINO[1]*, Maria V DELLA NOCE[1], Domenico CIAVARELLA[2], Massimo CORDARO[3], Claudio CHIMENTI[1]

ABSTRACT

BACKGROUND: The soft tissue profile outcome after functional treatment of Class II malocclusion is important for a patient’s aesthetic and psychosocial results. The soft tissue effects of the Sander bite-jumping appliance (BJA), which is the device that produces the greatest mandibular advancement according to a systematic review, have never been investigated. Therefore the aim of the present study was to assess the soft tissue effects of the BJA in comparison to matched untreated controls.

METHODS: A total of 19 patients treated with BJA during puberty were retrospectively recruited, and 15 untreated controls were retrieved from a previous growth study to match the treated group. Lateral cephalograms were used to evaluate the pre- and post-treatment differences in the ANB angle, the inclination of the upper and lower incisors, facial convexity, the nasolabial angle and the sagittal position of the skeletal and soft tissue at points A and B. Independent t-tests or Mann– Whitney U tests were used to detect differences between the two groups.

RESULTS: Statistically significant differences were found for the ANB angle, the inclination of the upper incisors and facial convexity.

CONCLUSIONS: Functional treatment of Class II patients with the Sander BJA during pubertywas effective at improving the profile and reducing the facial convexity angle in the short term.

Population	**Klasse-II-Anomalie** patients with class-2 malocclusions
Schweregrad	ANB angle greater than 4 degrees
Einschluss-kriterien	An age between 9 and 13 years old; cervical vertebral maturation (CVM)15 stage of CS3 at the start of treatment; skeletal Class II with an ANB angle greater than 4 degrees; bilateral full Class II molar relationship; high quality pre- and post-treatment lateral cephalograms with clearly evaluable soft tissues.
Ausschluss-kriterien	keine Angabe

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *The Sander BJA was constructed using an expansion screw with two robust stainless-steel 13 mm prongs embedded in the upper acrylic plate and a lower plate with an acrylic ramp. Coupled with the upper prongs, this formed an inclined plane angled at 60 degrees to the occlusal plane that forced the mandible in a forward position.16 The lower plate also had an expansion screw and was constructed with an acrylic cover for the lower incisors. Both plates had Adams and Ball clamps to increase retention as well as a labial bow (Figure 1 and 2). The wax bite was registered with an edge-to-edge incisor relationship unless the patient showed an overjet >10 mm, in which case the bite registration was taken with the mandible in the maximal forward position that the patient could maintain without discomfort. Patients were instructed to wear the appliance for 16 hours per day during the active treatment phase and overnight during the retention phase, which started after a super Class I molar relationship was achieved.* VERSUCHSGRUPPE: **Sander BJA** N=19/19 / Alter = MIN:9, MAX:13 / ♂:♀ = 10:9 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=15/15 / Alter = MIN:9, MAX:13 / ♂:♀ = 7:8 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/DysgnathieSubkategorie Outcome 1** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: *Soft tissue profile (*ANB, Fh-U1, IMPA, Col–Sn–Ls, N’–Sn–Pg’, TVL-A’, TVL-B’, TVL-A.
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Functional treatment with Sander BJA in skeletal Class II patients was effective at reducing the ANB angle and improving the soft tissue profile to reduce the facial convexity angle in the short term when compared to matched untreated controls.
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE Sander BJA** ***PRIMÄRZIELGRÖßE*** *The mean treatment time for the BJA group was of two years by mean, of which approximately one year involved active treatment and the remaining year involved retention, where patients only wore the appliance overnight. A similar observation interval was chosen for the control group. When comparing the BJA group with the control group, the variation between the two time intervals (ΔT = T1 – T0) was statistically significant for ANB, Fh-U1, N’–Sn–Pg’ and TVL-A’ (Table IV).*

Angaben auffälliger positiver und/oder negativer Aspekte	*Studiendesign und Durchführung gut. Powerkalkulation vorhanden. Studie war nicht vollständig auswertbar, da die Tabellen fehlten. Keine Angaben zum Funding, Interessenkonflikte waren nicht vorhanden. Der Auswerter war nicht verblindet. Keine näheren Angaben zum Patientenscreening oder von Konfidenzintervallen.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Funktionelle Behandlung von Klasse-II-Patienten mit der Sander bite-jumping appliance während der Pubertät verbesserte das Gesichtsprofils und verringerte den Konvexitätswinkel im Gesicht.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Thiruvenkatachari et al., 2014

Cochrane Library

Cochrane Database of Systematic Reviews

[Intervention Review]

Orthodontic treatment for prominent upper front teeth (Class II malocclusion) in children

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ABSTRACT

Background

Prominent upper front teeth are a common problem affecting about a quarter of 12-year old children in the UK. The correction of this condition is one of the most common treatments performed by orthodontists. This condition develops when the child's permanent teeth erupt and children are often referred to an orthodontist for treatment with dental braces to reduce the prominence of the teeth. These teeth are more likely to be injured and their appearance can cause significant distress.

If a child is referred at a young age, the orthodontist is faced with the dilemma of whether to treat the patient early or to wait until the child is older and provide treatment in early adolescence.

Objectives

To assess the effects of orthodontic treatment for prominent upper front teeth when this treatment is initiated when the child is seven to 11 years old compared to when they are in early adolescence, or when treatment uses different types of orthodontic braces.

Search methods

We searched the following databases: Cochrane Oral Health Group's Trials Register (to 17 April 2013), CENTRAL (The Cochrane Library 2013, Issue 3), MEDLINE (OVID) (1946 to 17 April 2013) and EMBASE (OVID) (1980 to 17 April 2013). There were no restrictions regarding language or publication date.

Selection criteria

Randomised controlled trials of children and/or adolescents (age = 16 years) on early treatment (either one or two-phase) with any type of orthodontic braces (removable, fixed, functional) or head-braces compared with late treatment with any type of orthodontic braces or head-braces; or, on any type of orthodontic braces or head-braces compared with no treatment or another type of orthodontic brace or appliance (with treatment starting in children of similar ages in both groups) to correct prominent upper front teeth.

Data collection and analysis

Review authors screened the search results, extracted data and assessed risk of bias independently, used odds ratios (ORs) and 95% confidence intervals (CIs) for dichotomous outcomes, mean differences (MDs) and 95% CIs for continuous outcomes and a fixed-effect model for meta-analyses as there were fewer than four studies.

Main results

We included 17 studies based on data from 721 participants.

Three trials (n = 343) compared early (two-phase) treatment (7-11 years of age) with a functional appliance, with adolescent (one-phase) treatment. Statistically significant differences in overjet, ANB and PAR scores were found in favour of functional appliance when the first phase of early treatment was compared with observation in the children due to receive treatment in adolescence. However, at the end of treatment in both groups, there was no evidence of a difference in the overjet (MD 0.21, 95% CI -0.13 to 0.55, P = 0.18) (low quality evidence), final ANB (MD -0.02, 95% CI -0.47 to 0.43, P = 0.92), PAR score (MD 0.62, 95% CI -0.66 to 1.91, P = 0.34) or self concept score (MD 0.83, CI -2.31 to 3.97, P = 0.60). However, two-phase treatment with functional appliance showed a statistically significant reduction in the incidence of incisal trauma (OR 0.59, 95% CI 0.35 to 0.99, P = 0.04) (moderate quality evidence). The incidence of incisal trauma was clinically significant with 29% (54/185) of patients reporting new trauma incidence in the adolescent (one-phase) treatment group compared to only 20% (34/171) of patients receiving early (two-phase) treatment.

Two trials (n = 265), compared early (two-phase) treatment using headgear, with adolescent (one-phase) treatment. Statistically significant differences in overjet and ANB were found in favour of headgear when the first phase of early treatment was compared with observation in the children due to receive treatment in adolescence. However, at the end of treatment in both groups, there was no evidence of a difference in the overjet (MD 0.22, 95% CI -0.56 to 0.12, P = 0.20) (low quality evidence), final ANB (MD -0.27, 95% CI -0.80 to 0.26, P = 0.32) or PAR score (MD -1.55, 95% CI -3.70 to 0.60, P = 0.16). The incidence of incisal trauma was, however, statistically significantly reduced in the two-phase treatment group (OR 0.47, 95% CI 0.27 to 0.83, P = 0.009) (low quality evidence). The adolescent treatment group showed twice the incidence of incisal trauma (47/120) compared to the young children group (27/117).

Two trials (n = 281) compared different types of appliances (headgear and functional appliance) for early (two-phase) treatment. At the end of the first phase of treatment statistically significant differences, in favour of functional appliances, were shown with respect to final overjet only. At the end of phase two, there was no evidence of a difference between appliances with regard to overjet (MD -0.21, 95% CI -0.57 to 0.15, P = 0.26), final ANB (MD -0.17, 95% CI -0.67 to 0.34, P= 0.52), PAR score (MD -0.81, 95% CI -3.21 to 3.58, P = 0.25) or the incidence of incisal trauma (OR 0.79, 95% CI 0.43 to 1.44, P = 0.44).

Late orthodontic treatment for adolescents with functional appliances showed a statistically significant reduction in overjet of -5.22 mm (95% CI -6.51 to -3.93, P < 0.00001) and ANB of -2.37° (95% CI -3.01 to -1.74, P < 0.00001) when compared to no treatment (very low quality evidence).

There was no evidence of a difference in overjet when Twin Block was compared to other appliances (MD 0.01, 95% CI -0.45 to 0.48, P = 0.95). However, a statistically significant reduction in ANB (-0.62°, 95% CI -1.17 to -0.08, P = 0.02) was shown in favour of Twin Block. There was no evidence of a difference in any reported outcome when Twin Block was compared with modifications of Twin Block.

There was insufficient evidence to determine the effects of Activator, FORSUS FRD EZ appliances, R-appliance or ABP.

Authors' conclusions

The evidence suggests that providing early orthodontic treatment for children with prominent upper front teeth is more effective in reducing the incidence of incisal trauma than providing one course of orthodontic treatment when the child is in early adolescence. There appears to be no other advantages for providing treatment early when compared to treatment in adolescence.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • Children or adolescents (age 16 years or less) or both receiving orthodontic treatment to correct prominent upper front teeth (Class II malocclusion).
Schweregrad	Nicht angegeben

Einschluss-kriterien *Bei Review: PICOS*	• Population: Children or adolescents (age 16 years or less) or both receiving orthodontic treatment to correct prominent upper front teeth (Class II malocclusion). • Intervention: 1. **Early treatment** (either one or two-phase) with any type of orthodontic braces (removable, fixed, functional) or head-braces compared with. Early treatments were defined as those commencing in children aged between seven and 11 years of age. 2. Any type of **orthodontic braces** (removable, fixed, functional**) or head-braces** • Comparison: 1. late treatment with any type of orthodontic braces (removable, fixed, functional) or head-braces 2. **no treatment** (or another type of orthodontic brace or appliance – NOT relevant). For this comparison, treatment should have been started in children of similar ages in both groups • Outcome: PRIMÄRZIELGRÖßE: Prominence of the upper front teeth (overjet measured in millimetres or by any index of malocclusion) SEKUNDÄRZIELGRÖßE: Relationship between upper and lower jaws (ANB), self esteem, patient satisfaction, any injury to the upper front teeth, jaw joint problems, number of attendances required to complete treatment. PRIMÄR- & SEKUNDÄRZIELGRÖßE WURDE FÜR JE VERGLEICHE (s. Interverntion & Comparison) ANALYSIERT WEITERE ZIELGRÖßE: Harms: Health of the gums, damage to the teeth (e.g. tooth decay) • Study type: randomised controlled trials
Ausschluss-kriterien	1. participants with a cleft lip or palate or both, or other craniofacial deformity/syndrome 2. patients who had previously received surgical treatment for their Class II malocclusion
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE: **1. Early (two-phase) intervention, 2. Late treatment with functional appliances** N=?? (Anfang) / N=?? (Ende) / Alter = 8-13 Jahre / ♂:♀ = ?:? • Gebissphase: frühes bis spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: Frühbehandlung (interzeptiv), reguläre Behandlung

Kontrolle Kontrollgruppe	**1. keine kieferorthopädische Therapie** **2. kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** KONTROLLGRUPPE: **1. adolescent (one-phase) treatment, 2. no treatment** N=?? (Anfang) / N=?? (Ende) / Alter = 8-13 Jahre / ♂:♀ = ?:? • Gebissphase: frühes bis spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung, keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Okklusion, Kaufunktion, Funktion** • **Traumaprophylaxe (dentales Frontzahntrauma)** • **mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung** • **Reduktion eines weiteren Therapiebedarfs** PRIMÄRZIELGRÖßE: Prominence of the upper front teeth (overjet measured in millimetres or by any index of malocclusion) SEKUNDÄRZIELGRÖßE: Relationship between upper and lower jaws (ANB), self esteem, patient satisfaction, any injury to the upper front teeth, jaw joint problems, number of attendances required to complete treatment. PRIMÄR- & SEKUNDÄRZIELGRÖßE WURDE FÜR JE VERGLEICHE (s. Interverntion & Comparison) ANALYSIERT WEITERE ZIELGRÖßE: Harms: Health of the gums, damage to the teeth (e.g. tooth decay)
Studientyp	**Systematisches Review mit Meta-Analyse** Inkludierte Studien in Bezug auf PICO: RCTs N=17, aber LL-relevant nur **N = 6** Gesamt-Teilnehmerzahl in Bezug auf PICO: N=721

Schluss-folgerungen der Autoren	**Implications for practice** Orthodontic treatment for **young children**, followed by a later phase of treatment when the child is in early adolescence, **appear to significantly reduce the incidence of incisal trauma as compared to treatment that is provided in one phase when the child is in early adolescence**. There are no other advantages for providing a twophase treatment compared to one-phase in early adolescence. When **functional appliance** treatment is provided in **early adolescence** it appears that there are **minor beneficial changes in skeletal pattern**, however, these are probably not clinically significant. Similarly, the choice of functional appliance when compared to the Twin Block does not result in any advantageous effects. **Implications for research** Consideration needs to be given to forming a consensus on the type of measures that are used in orthodontic trials, this is particularly relevant for cephalometric measurement and analysis. In addition, studies should be carried out at the same time points and reported according to the Consolidated Standards of Reporting Trials (CONSORT) guidelines.

Zusammen-fassung der Ergebnisse	**Early (two-phase) intervention VERSUS adolescent (one-phase) treatment** ***Subgruppenanalysen: functional appliance, headgear*** ***Zeitpunkt der Vergleiches: Outcomes at the end of phase one and two*** **Prominence of the upper front teeth (overjet measured in millimetres or by any index of malocclusion):** **i. Outcomes at the end of phase one** **Treatment with functional appliance** The meta-analysis (Analysis 1.1) showed that there was a statistically **significant difference in final overjet of the functional appliance treatment group** compared with the observation group (mean difference (MD) -4.17 mm; 95% confidence interval (CI) -4.61 to -3.73, Chi2 = 117.02, 2 degrees of freedom (df), P value < 0.00001, I2 = 98%). **Treatment with headgear** Two trials, both at high risk of bias (n = 285), compared treatment for young children, using headgear, with adolescent (one-phase) treatment (Florida 1998; North Carolina 2004). The comparison of the effect of treatment with headgear at the end of phase one (early treatment group), compared with observation (adolescent treatment group), revealed **a statistically significant effect of headgear treatment on the overjet** (MD -1.07 mm; 95% CI -1.63 mm to -0.51 mm, Chi2 = 0.05, 1 df, P value = 0.0002, I2 = 0%) (Analysis 1.3). **ii. Outcomes at the end of phase two** **Treatment with functional appliance** When we evaluated the effects of a course of treatment at a young age with a functional appliance and at the end of all orthodontic treatment during adolescence, we found that there were **no statistically significant differences in the overjet** (MD 0.21 mm; 95% CI -0.10 mm to 0.51 mm, Chi2 = 5.23, 2 df, P value = 0.18, I2 = 62%) (Analysis 1.5), final ANB (MD -0.02°; 95% CI -0.47° to 0.43°, Chi2 = 2.62, 2 df , P value = 0.92, I2 = 24%) (Analysis 1.5), PAR score (MD 0.62; 95% CI -0.66 to 1.91, Chi2 = 6.43, 2 df, P value = 0.34, I2 = 69%) (Analysis 1.5), or self concept score (MD 0.83; 95% CI -2.31 to 3.97, P value = 0.60). However, the incidence of new incisal trauma showed statistically significant results in favour of functional appliance two-phase treatment (OR 0.59; 95% CI 0.35 to 0.99, Chi2 = 1.38, 2 df, P value = 0.04, I2 = 0%) (Analysis 1.6) compared with one-phase treatment during adolescence only. The incidence of new incisal trauma was clini cally significant with 29% (54/185) of patients reporting new trauma incidence in the adolescent treatment group compared to only 20% (34/172) of patients reporting incisal trauma in early treatment group. **Treatment with headgear when younger** There were **no statistically significant effects** of an early course of headgear treatment at a young age followed by treatment when adolescence with respect **to overjet** (MD -0.22 mm; 95% CI -0.56 mm to 0.12 mm, Chi2 = 1.27, 1 df, P value = 0.20, I2 = 21%) (Analysis 1.7)

Relationship between upper and lower jaws (ANB), self esteem, patient satisfaction, any injury to the upper front teeth, jaw joint problems, number of attendances required to complete treatment:

i. Outcomes at the end of phase one

Treatment with functional appliance

When we evaluated the effect of treatment on the **final ANB**, we found that there was a **statistically significant mean difference** between the treatment and control groups (MD -0.89°; 95% CI -1.38° to -0.40°, Chi2 = 9.17, 2 df, P value = 0.0004, I2 = 78%).

Early treatment also had a statistically significant effect on the **PAR score in favour of early treatment** (MD -11.16; 95% CI -12.86 to -9.46, Chi2 = 56.53, 2 df, P value < 0.00001, I2 = 96%) (Analysis 1.1).

Early treatment did **not show any significant difference in self concept score** (MD 3.63; 95% CI -0.40 to 7.66, P value = 0.08) (Analysis 1.1) and new incidence of incisor trauma (odds ratio (OR) 0.72; 95% CI 0.35 to 1.49, P value = 0.38) (Analysis 1.2) when compared with untreated control group patients.

Treatment with headgear

headgear resulted in a statistically significant **reduction of -0.72°** (95% CI -1.18° to -0.27°, Chi2 = 0.34, 1 df, P value = 0.002, I2 = 0%) **in final ANB** (Analysis 1.3). However, there was **no statistically significant difference in incisal trauma** (OR 0.82; 95% CI 0.41 to 1.64, Chi2 = 0.27, 1 df, P value = 0.57, I2 = 0%) between the two groups (Analysis 1.4).

ii. Outcomes at the end of phase two

Treatment with functional appliance

When we evaluated the effects of a course of treatment at a young age with a functional appliance and at the end of all orthodontic treatment during adolescence, we found that there were **no statistically significant differences in [...] final ANB (MD -0.02°; 95% CI -0.47° to 0.43°, Chi2 = 2.62, 2 df , P value = 0.92, I2 = 24%) (Analysis 1.5), PAR score (MD 0.62; 95% CI -0.66 to 1.91, Chi2 = 6.43, 2 df, P value = 0.34, I2 = 69%) (Analysis 1.5), or self concept score (MD 0.83; 95% CI -2.31 to 3.97, P value = 0.60).** However, the incidence of new **incisal trauma showed statistically significant results in favour of functional appliance two-phase treatment** (OR 0.59; 95% CI 0.35 to 0.99, Chi2 = 1.38, 2 df, P value = 0.04, I2 = 0%) (Analysis 1.6) compared with one-phase treatment during adolescence only. The incidence of new incisal trauma was clinically significant with 29% (54/185) of patients reporting new trauma incidence in the adolescent treatment group compared to only 20% (34/172) of patients reporting incisal trauma in early treatment group.

Treatment with headgear when younger

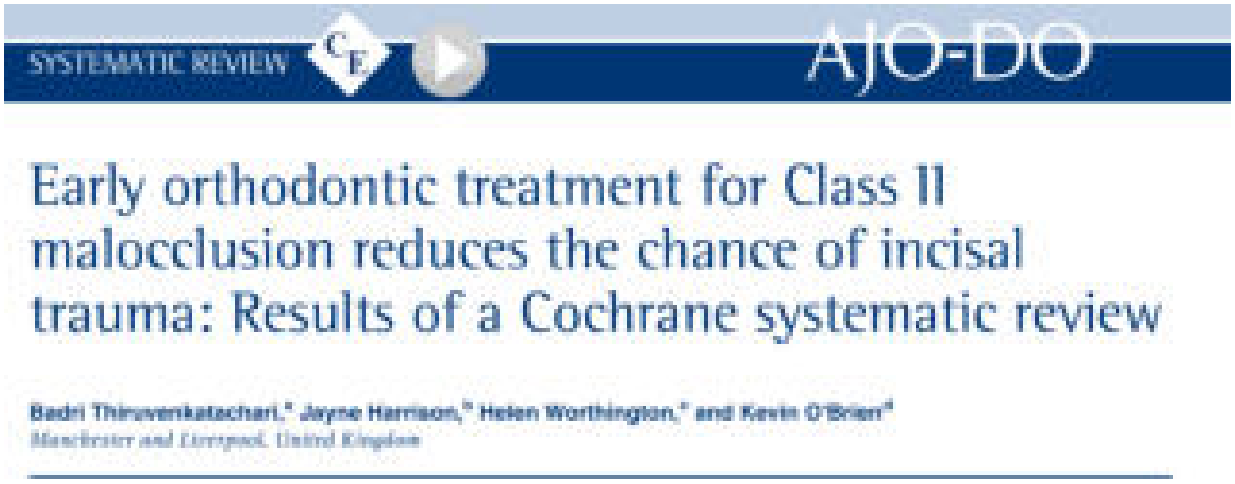
There were **no statistically significant effects** of an early course of headgear treatment at a young age followed by treatment when adolescence with respect **to [...] final ANB (MD -0.27°; 95% CI -0.80° to 0.26°, Chi2 = 0.10, 1 df, P value = 0.32, I2 = 0%) (Analysis 1.7), or PAR score (MD -1.55; 95% CI -3.70 to 0.60, Chi2 = 0.39, 1 df, P value = 0.16, I2 = 0%)** (Analysis 1.7) compared with treatment as usual. However, the **incidence of new incisal trauma showed a statistically significant reduction in the young children treatment group** (OR 0.47; 95% CI 0.27 to 0.83, Chi2 = 0.72, 1 df, P value = 0.009, I2 = 0%) (Analysis 1.8). **The adolescent treatment group showed twice the incidence of new incisal trauma** (47/120) as compared to the young children group who had headgear treatment (27/117).

	Late treatment with functional appliances VERSUS no treatment **Prominence of the upper front teeth (overjet measured in millimetres or by any index of malocclusion):** There was a **statistically significant reduction in overjet of -5.22 mm** (95% CI -6.51 to -3.93, P value < 0.00001) for the functional appliance group compared with an untreated control (Analysis 3.1). However, this is based on a single study at high risk of bias (Cura 1997). **Relationship between upper and lower jaws (ANB), self esteem, patient satisfaction, any injury to the upper front teeth, jaw joint problems, number of attendances required to complete treatment:** The evaluation of the effect of functional appliance on ANB revealed a **statistically significant reduction in ANB** of -2.37° (95% CI -3.01° to -1.74°, Chi2 = 1.90, 1 df, P value < 0.00001, I2 = 47%). This is based on two studies (Cura 1997; Mao 1997), both at high risk of bias (Analysis 3.1).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: PICOS präzise aber umfangreich, nur RCTs, Meta-Analyse nur für ähnliche Vergleiche und Zielgrößen* *Durchführung: detaillierte Literaturrecherche & Angaben zu eingeschlossenen Einzelstudien, Datenextraktion/ LIteratursichtung & RoB-Analyse durch zwei unabhängige Gutachter* *Auswertung: gute RoB-Analyse, Meta-Analyse basiert nur auf wenigen Einzelstudien* *Power der Studie/Patientenzahl: 17/721 (LL-relevante Studien: N = 6)* *Funding:* **Internal sources** • The Royal Liverpool and Broadgreen University Hospitals NHS Trust, UK. • School of Dentistry, The University of Manchester, UK. • Manchester Academic Health Sciences Centre (MAHSC), UK. The Cochrane Oral Health Group is supported by MAHSC and the NIHR Manchester Biomedical Research Centre. **External sources** • NHS National Primary Dental Care R&D programme PCD97-303, UK. • Cochrane Oral Health Group Global Alliance, UK. All reviews in the Cochrane Oral Health Group are supported by Global Alliance member organisations (British Association of Oral Surgeons, UK; British Orthodontic Society, UK; British Society of Paediatric Dentistry, UK; British Society of Periodontology, UK; Canadian Dental Hygienists Association, Canada; National Center for Dental Hygiene Research & Practice, USA; Mayo Clinic, USA; New York University College of Dentistry, USA; and Royal College of Surgeons of Edinburgh, UK) providing funding for the editorial process (http:// ohg.cochrane.org/). • National Institute for Health Research (NIHR), UK. CRG funding acknowledgement: The NIHR is the largest single funder of the Cochrane Oral Health Group. Disclaimer: The views and opinions expressed therein are those of the authors and do not necessarily reflect those of the NIHR, NHS or the Department of Health. *Interessenkonflikte:* Kevin O'Brien was involved in acquiring funding, running and reporting of the UK (11-14) 2003; UK (Mixed) 2009 and Banks 2004 trials; however, he was not involved in the quality assessment of these trials. Badri Thiruvenkatachari and Helen Worthington are among the authors of UK (Mixed) 2009; however, they were not involved in the quality assessment of this trial. Badri Thiruvenkatachari and Kevin O'Brien were involved in running and reporting the Thiruvenkatachari 2010 (Dynamax) study; however, they were not involved in the quality assessment of this trial. Jayne E Harrison: no interests to declare. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?** **3. Did the review authors explain their selection of the study designs for inclusion in the re** **12. If meta-analysis was performed, did the review authors assess the potential impact of I individual studies on the results of the meta-analysis or other evidence synthesis?** **13. Did the review authors account for RoB in individual studies when interpreting/ discuss results of the review?**

	15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?*Publikationsbias (Reviews):* In addition, the effect of including unpublished literature on the review's findings was also to be examined, but there were insufficient trials to undertake this.
Schluss-folgerung des Begutachters	methodische Qualität: Review und Einzelstudien gut
	Klinische Aussagekraft: Zum Einen scheint ein früher Behandlungsbeginn bei Kindern mit einer Klasse-II/1-Anomalie einen Vorteil durch ein geringeres Frontzahn-Trauma-Risiko aufzuweisen, während die skelettale und dentale Anomalie mit vergleichbaren Ergebnissen auch durch einen späteren Behandlungsbeginn im jugendlichen Alter korrigiert werden kann. Zum Anderen führt, im Vergleich zu keiner Behandlung, eine reguläre Behandlung mit funktionskieferorthopädischen Geräten im späten Wechselgebiss oder permanenten Gebiss bei Jugendlichen zu einer Verbesserung der Klasse-II/1-Anomalie
Evidenz-level (SIGN)	**1+**
Qualität (RoB, SIGN /AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle Thiruvenkatachari, B. et al., 2015



Zusammenfassung des Cochrane-Reviews "Orthodontic treatment for prominent upper front teeth (Class II malocclusion) in children (Review)" von Thiruvenkatachari, Harrison et al. 2013

siehe Thiruvenkatachari, Harrison et al. 2013

Evidenztabelle Tindlund, Rygh 1993

Maxillary Protraction: Different Effects on Facial Morphology in Unilateral and Bilateral Cleft Lip and Palate Patients

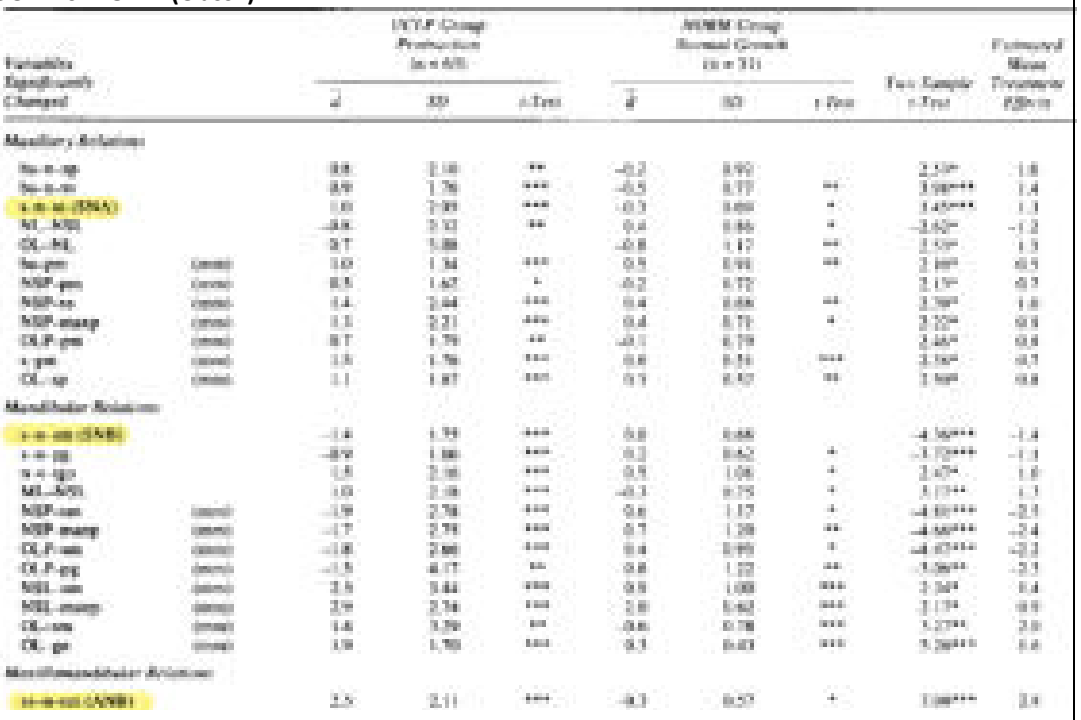
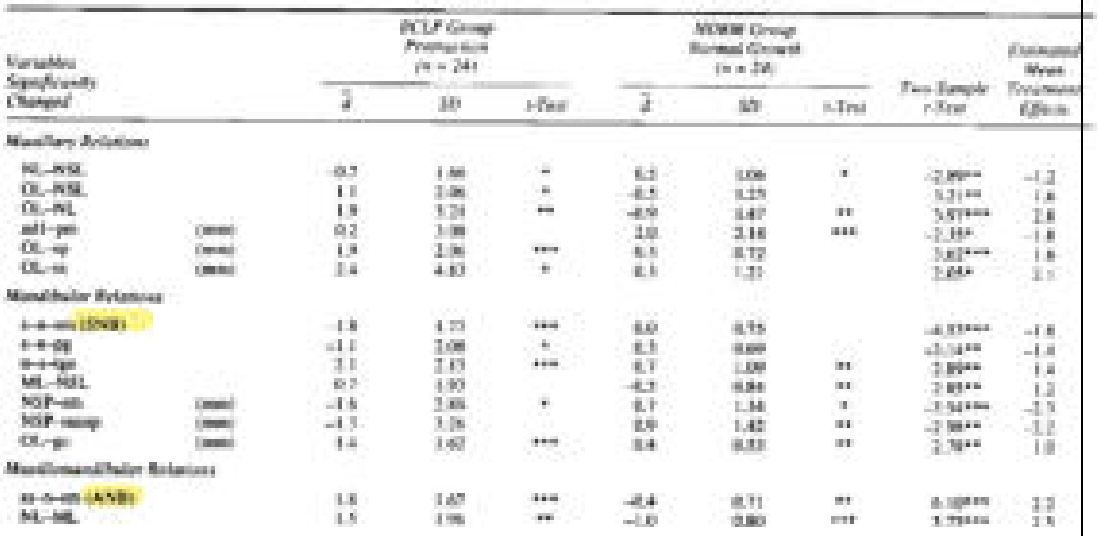
ROLF S. TINDLUND, D.D.S.
PER RYGH, D.D.S., DR. ODONT.

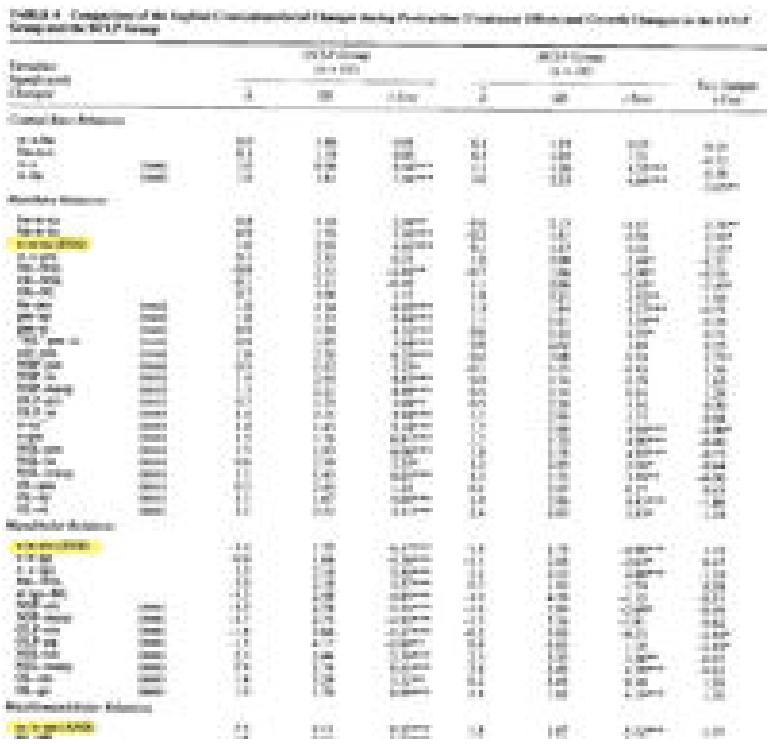
Since 1977 patients with anterior/posterior crossbites in the care of the Bergen CLP team have undergone an interceptive orthopedic protraction phase during the deciduous and mixed dentition period. Eighty-seven cases with complete clefts (63 unilateral and 24 bilateral) displaying anterior crossbite (negative overjet) were treated to normal occlusion. A fixed quad-helix appliance was used in combination with a facial mask. In the unilateral complete cleft lip and palate (UCLP) group, mean age at start of treatment was 6 years 10 months and mean duration was 12 months. In the bilateral complete cleft lip and palate (BCLP) group, mean age at start of treatment was 7 years and mean duration 15 months. The protraction force was 700 g. The sagittal changes during protraction in the UCLP and BCLP groups were compared, and related to the growth changes in a group of noncleft children at the same age. Dentofacial treatment effect was different in the UCLP and BCLP groups. Significant increase of maxillary prognathism (angle s–n–ss) was found only in the UCLP group, whereas the treatment effect in the BCLP group was mainly dentoalveolar. However, after protraction there was no longer a significant difference in maxillary prognathism between the two CLP groups, and the sagittal position of the upper molars was normalized in both groups. The upper incisors remained retroclined in both groups, significantly more in the BCLP group. Increase of the upper facial height (n–sp') and clockwise rotation of the occlusal line were significantly greater in the BCLP group. The computerized occlusal line was unsuitable as a reference standard for the evaluation of sagittal dentofacial treatment changes when the occlusal line was rotated during treatment.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** - Patients with CLP (UCLP, BCLP) and skeletal Class III malocclusion and anterior crossbite • Norway
Schweregrad	Keine Angaben
Einschluss-kriterien	Treated Group - CLP (UCLP, BCLP) - Skeletal Class III - Anterior crossbite Control group - Class I occlusion
Ausschluss-kriterien	Not fulfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **MP (FM ±Quad Helix) (UCLP, BCLP)**: A modified quad-helix appliance, soldered to bands on the maxillary primary canines and primary second molars, was used for transverse expansion of the maxilla as well as for anchorage during protraction. In cases with transverse deviations, these were corrected first (mean duration, 3 months; reactivations every 6 weeks). If no transverse expansion was needed, a plain lingual arch soldered to the four bands was used. The protraction was carried out by a facial mask. Two parallel elastics, were applied to the intraoral hooks in the cuspid area of the quad-helix. The direction of the forward force was 15 degrees downwards in rela tion to the occlusal plane. The force used was 700 grams (350 grams on each side). The face mask was used mainly at night, for 11 hours. The patients were seen every third month. All patients used a retainer with a fixed palatal arch until shedding of the primary teeth. VERSUCHSGRUPPE 1 **MP (FM ±Quad Helix) (UCLP)** N= 63 (Anfang) / N=63 (Ende) / Alter = 6,88 (4,5- 11,91) / ♂:♀ = 43:20 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung VERSUCHSGRUPPE 2 **MP (FM ±Quad Helix) (BCLP)** N= 24 (Anfang) / N=24 (Ende) / Alter = 7,0 (4,6- 10,91) / ♂:♀ = 19:5 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **Class I:** From the records of 812 noncleft children living in Bergen, a longitudinal series of cephalograms of 35 children was selected to match the CLP subjects by age and sex. KONTROLLGRUPPE 1: **Class I** N=31 (Anfang) / N=31 (Ende) / Alter = ? years / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** ▪ primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Skeletal: SNA, SNB, ANB**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Dentofacial treatment effect **was different in the UCLP and BCLP** groups. Significant **increase of maxillary prognathism (angle s-n-ss) was found only in the UCLP** group, whereas the **treatment effect in the BCLP group was mainly dentoalveolar**. However, after protraction there was no longer a significant difference in maxillary prognathism between the two CLP groups, and the sagittal position of the upper molars was normalized in both groups. The **upper incisors remained retroclined in both groups, significantly more in the BCLP group.** **Increase of the upper facial height (n-sp") and clockwise rotation of the occlusal line were significantly greater in the BCLP group.**

Zusammen-fassung der Ergebnisse	**GRUPPE MP (FM ±Quad Helix) (UCLP) VS. GRUPPE Class I** **GRUPPE MP (FM ±Quad Helix) (BCLP) VS. GRUPPE Class I** T0 (pretreatemnt): 6,83 (4,5- 11,91) years UCLP; 7,0 (4,6- 10,91) years BCLP; ? years NORM group T1 (post treatment): 7,83 years UCLP; 8,25 years BCLP; 6,83 years, ? years NORM group **Skeletal: SNA, SNB, ANB** **UCLP vs. NORM (Class I)**  **BCLP vs. NORM (Class I)** 

Zusammen-fassung der Ergebnisse	**UCLP vs. BCLP** 
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung <u>Funding</u> <u>Interessen-konflikte</u> <u>Bias (SIGN)</u>	Äquivalenz von Versuchs- und Kontrollgruppen nicht gegeben (Klasse III vs. Klasse I; CLP vs. Noncleft). Der Vergleich mit einer Klasse I Kontrollgruppe ist hier jedoch sinnvoll. Eine unbehandelte CLP Kontrollgruppe wäre darüber hinaus unethisch. Der Fokus der aktuellen Studie liegt auf dem Vergleich des Behandlungserfolgs bei UCLP und BCLP Patienten (weitere Vergleiche sind in den weiteren Publikationen des Autorenteams beschrieben worden. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Die Auswertung war nicht verblindet. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Äquivalenz von Versuchs- und Kontrollgruppen nicht gegeben (Klasse III vs. Klasse I). Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	<u>methodische Qualität: akzeptabel</u> <u>Klinische Aussagekraft:</u> Der Fokus der aktuellen Studie liegt auf dem Vergleich des Behandlungserfolgs bei UCLP und BCLP Patienten (weitere Vergleiche sind in den weiteren Publikationen des Autorenteams beschrieben worden.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Toffol, Pavoni et al. 2008

Review Article

Orthopedic Treatment Outcomes in Class III Malocclusion

A Systematic Review

Laura De Toffol[a]; Chiara Pavoni[a]; Tiziano Baccetti[b]; Lorenzo Franchi[b]; Paola Cozza[a]

ABSTRACT

Objective: To assess the scientific evidence on the effectiveness of early orthopedic treatment in Class III subjects.

Materials and Methods: A literature survey was performed by applying the Medline database (Entrez PubMed). The survey covered the period from January 1966 to December 2005 and used the Medical Subject Headings (MeSH). The following study types that reported data on the effects of Class III treatment with orthopedic appliances (facial mask, chincup, FR-3) on intermaxillary sagittal and vertical relationships were included: randomized clinical trials (RCTs), and prospective and retrospective longitudinal controlled clinical trials (CCTs) with untreated Class III controls.

Results: The search strategy resulted in 536 articles. After selection according to criteria for inclusion and exclusion, 19 articles qualified for the final review analysis. One RCT and 18 CCTs were retrieved.

Conclusion: The quality standard of the retrieved investigations ranged from low (four studies) to medium/high (five studies). Data derived from medium/high quality research described over 75% of success of orthopedic treatment of Class III malocclusion (RME and facial mask therapy) at a follow-up observation 5 years after the end of orthopedic treatment.

KEY WORDS: Systematic review; Class III malocclusion; Orthopedic treatment; Early treatment

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Class III patients treated with orthopedic appliances (facial mask, chincup, FR-3) Review: Meta-analyses, randomized clinical trials (RCTs), prospective and retrospective studies (CCTs) Articles in English Articles published from January 1966 to December 2006 Studies on growing patients Studies conducted on lateral cephalograms including measurements of total mandibular length, total maxillary length, intermaxillary vertical and sagittal relationship Untreated Class III control subjects Monozentrische Studien aus Europa, China und den USA.
Schweregrad	Keine Angabe

Einschluss-kriterien *Bei Review: PICOS*	Population: Class III patients treated with orthopedic appliances (facial mask, chincup, FR-3);Intervention: Treated with orthopedic appliances (facial mask, chincup, FR-3) to correct Class III malocclusions; Comparison: Untreated Class III controls, (+ early vs. late treatment); Outcome: PRIMÄRZIELGRÖßE: Effectiveness (of orthopedic appliances (facial mask, chincup, FR-3) to correct Class III malocclusions), Treatment success, Stability of treatment outcomes, Side effects SEKUNDÄRZIELGRÖßE: Timing; Follow-up: (6 months – 5,6 years)
Ausschluss-kriterien	Case reports, case series, descriptive studies, review articles, opinion articles, abstracts; Laboratory studies; Studies on adults; Studies about the association between Class III malocclusion and craniofacial malformations; Epidemiologic studies; Studies on growth prediction; Studies concerning the comparison between different malocclusions; Studies about the association between Class III malocclusion and TMJ diseases; Studies without an untreated control group or with a normal control group; Studies on dental casts or without cephalometric analysis; Treatment combined with extractions; Surgically assisted treatment; Success of therapy as a criterion for case selection
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Class III patients treated with orthopedic appliances (facial mask, chincup, FR-3)** • N= ? (Anfang) / N= 695 (Ende) / Alter = 8,2 ± 1,8 / ♂:♀ =268:427 (Alter (early): 7,4 ± 1,7; (late): 9,8 ± 1,9) ▪ Gebissphase: frühes/ spätes Wechselgebiss ▪ KFO Behandlung: frühe Behandlung, reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** **und** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/** KONTROLLGRUPPE: **Untreated Class III ODER treated with orthopedic appliances (facial mask, chincup, FR-3) with another timing (early vs. late)** • N= ?(Anfang) / N= 603 (Ende) / Alter = 8,2 ± 1,8 ♂:♀ =175:428 (Alter (early): 6,3 ± 2,0; (late): 9,3 ± 0,5) • Gebissphase: frühes/ spätes Wechselgebiss • KFO-Behandlung: frühe Behandlung, reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** ▪ primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: Effectiveness (of orthopedic appliances (facial mask, chincup, FR-3) to correct Class III malocclusions), Treatment success, Stability of treatment outcomes, Side effects SEKUNDÄRZIELGRÖßE: Timing Follow-up: (6 months – 5,6 years) Keine quantitativen Analysen PRIMÄRZIELGRÖßE: Effectiveness (of orthopedic appliances (facial mask, chincup, FR-3) to correct Class III malocclusions) Treatment success Stability of treatment outcomes Side effects **Effectiveness** Treatment success A 100% success rate was reported in five studies85% in one study,28 and a 76% rate in another study.34 The other articles did not declare the success rate. Stability of treatment outcomes Six studies gave information about the stability of treatment, reporting cephalometric results at a posttreatment observation. One study included a later cephalometric observation at about **1 year** from the end of active treatment. This study reported that **relapse tendency in earlytreatment subjects primarily affected the maxillary region**, whereas **late treatment subjects exhibited a significant rebound in mandibular sagittal position**. Three studies included a cephalometric observation about **3 years** from the end of active orthopedic treatment: two of these reported a lack of significant differences between treated and control groups, suggesting that the favorable treatment effects on the maxillomandibular relationship were maintained. However, the treatment effect of increased overjet was diminished, mainly due to proclination of the mandibular incisors. Successfully treated cases demonstrated a significantly greater change in overjet during treatment, suggesting that some overcorrection may be necessary for maintenance of a successful correction. One study reported no statistically significant skeletal or soft-tissue differences between the groups at the end of posttreatment observation, except for the increased overjet and overbite in the chincap subjects. Two articles evaluated the posttreatment effects of an initial phase of orthopedic treatment followed by comprehensive edgewise therapy, with a follow-up observation at about 5 years from the end of orthopedic treatment. Favorable skeletal change observed post treatment was due almost entirely to the orthopedic correction: during the posttreatment period, craniofacial growth in treated subjects was similar to that of untreated class III controls. Thus, **aggressive overcorrection at a skeletal level appears to be advisable and essential to the stability of the treatment outcome.** Side effects Ten articles **considered the modifications in the inclination of the upper and lower incisors as a dental compensation during skeletal movement**. In all these articles **a retrusion and linguoversion of the mandibular incisors, a protrusion and labioversion of the maxillary incisors, or a combination of these two dental movements was found**. Three articles did not report changes in the inclination of the incisors. No studies performed a cost-analysis.

Outcome	SEKUNDÄRZIELGRÖßE: Timing **Early vs late treatment** Age: Treated, early : 7,4; 1,7; late: 9,8; 1,9 Control, early : 6,25; 2,0; late: 9,25; 0,5 Timing Only one study26 declared the skeletal age of subjects at the beginning of treatment, but omitted the method used to evaluate it. One study34 considered only subjects that attained a skeletal maturity stag ing Cvs4, Cvs5, or Cvs6 at a long-term observation, considering the developmental staging of the cervica ertebrae proposed by Franchi et al. Other studies considered the **dental stage** at the beginning of treatment, varying from primary dentition, eruption stage of first molars and incisors, completed eruption of molars and incisors, and eruption stage of canines and/or premolars. **Treatment in deciduous dentition produces greater skeletal changes than those produced in the mixed dentition stage; moreover, when therapy begins in the early mixed dentition, it seems to induce more favorable changes in the craniofacial skeleton, compared with the same treatment started in the late mixed dentition**. One study compared treatment outcomes in two different chronologic age groups without finding any significant difference in the orthodontic and orthopedic effects.
Studientyp	**Systematisches Review** Systematisches Review: N= 19 (1 RCT, 18 kontrollierte Kohortenstudien, prospektiv and retrospective))
Schluss-folgerungen der Autoren	Therefore, even in the presence of data derived from medium/high quality research that described over **76% of success of orthopedic treatment of Class III malocclusion (RME and facial mask therapy)** at a follow-up observation **5 years** after the end of orthopedic treatment, **high quality investigations are still needed to perform a definitive assessment of effectiveness of Class III treatment at the skeletal level**.
Zusammen-fassung der Ergebnisse	**GRUPPE Class III patients treated with orthopedic appliances (facial mask, chincup, FR-3) VS. GRUPPE Untreated Class III ODER treated with orthopedic appliances (facial mask, chincup, FR-3) with another timing (early vs. late)** About **1 year** from the end of active treatment a study reported that **relapse tendency in earlytreatment subjects primarily affected the maxillary region**, whereas **late treatment subjects exhibited a significant rebound in mandibular sagittal position.** Favorable skeletal change observed post treatment was due almost entirely to the orthopedic correction: during the posttreatment period, craniofacial growth in treated subjects was similar to that of untreated class III controls. Thus, **aggressive overcorrection at a skeletal level appears to be advisable and essential to the stability of the treatment outcome. Studies considered the modifications in the inclination of the upper and lower incisors as a dental compensation during skeletal movement**. In all these articles **a retrusion and linguoversion of the mandibular incisors, a protrusion and labioversion of the maxillary incisors, or a combination of these two dental movements was found**. **Treatment in deciduous dentition produces greater skeletal changes than those produced in the mixed dentition stage; moreover, when therapy begins in the early mixed dentition, it seems to induce more favorable changes in the craniofacial skeleton, compared with the same treatment started in the late mixed dentition**.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Review mit einigen deutlichen Schwächen. Beginnend mit der unklaren Durchführung der Bias und Qualitätsbeurteilung. Obwohl überwiegend NRSI eingschlossen wurden, war ein Tool verwendet worden, dass eigentlich für RCTs entwickelt wurde (Antczak et al and Jadad et al). Entsprechend notwendige Modifikationen sind nicht kenntlich gemacht. Das verwendete Tool berücksichtigt nicht alle relevanten Gebiete zur Erfassung möglicher Bias. Die Qualitätsbewertung basiert auf derselben Skala. Nach dieser reicht die Spannbreite von niedrig bis moderat/ hoch, im Mittel liegt sie bei moderat. Es erfolgte keine quantitative Analyse. (Offensichtliche) Heterogenität wird nicht erklärt und/ oder diskutiert. Es fehlen Angaben zur Finanzierung sowie zu möglichen Interessenskonflikten. Recht umfassende Literaturübersicht (Stand 2006), die jedoch durch die fehlende quantitative Analyse (Meta-Analyse) und die nicht umfassende Bias und Qualitätsbewertung deutlich an Impact einbüßt. Die klinische Relevanz ist weiterhin dadurch eingeschränkt, dass auf bewertende Zusammenfassung verzichtet wurde und lediglich die Einzelstudien beleuchtet werden.
Schluss-folgerung des Begutachters	methodische Qualität: Review: niedrig; Einzelstudien (Reviews): moderat- gut, im Mittel moderat- (laut Review)
	Klinische Aussagekraft: Recht umfassende Literaturübersicht (Stand 2006), die jedoch durch die fehlende quantitative Analyse (Meta-Analyse) und die nicht umfassende Bias und Qualitätsbewertung deutlich an Impact einbüßt. Die klinische Relevanz ist weiterhin dadurch eingeschränkt, dass auf bewertende Zusammenfassung verzichtet wurde und lediglich die Einzelstudien beleuchtet werden.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, /AMSTAR II)**	**Moderat ⊕⊕**

Evidenztabelle Tollaro, Baccetti et al. 1996

Craniofacial changes induced by early functional treatment of Class III malocclusion

Isabella Tollaro, MD, DDS,[a] Tiziano Baccetti, DDS,[b] and Lorenzo Franchi, DDS[c]
Florence, Italy

To evaluate the effects of a functional appliance (removable mandibular retractor) on the craniofacial skeleton in children with Class III malocclusions, a longitudinal cephalometric study was performed. A sample of 30 children with treated Class III malocclusions (18 boys, 12 girls, mean age at the first observation 5.64 ± 1.01 years, mean age at the second observation 8.43 ± 1.73 years) was compared to a sample of 30 children with untreated Class III malocclusions (13 boys, 17 girls, mean age at first observation 6.06 ± 1.14 years, mean age at the second observation 8.45 ± 1.79 years) used as controls. The treated group matched the control group as to sex, age at the first observation, age at the second observation, observation period, Class III occlusal signs, and also as to angular craniofacial dimensions at the first observation. A cephalometric analysis based on a stable basicranial reference system was applied. The main significant findings in the treated group were an anterior morphogenetic rotation of the mandible as a result of an upward-forward direction of condylar growth, a more vertical orientation of the ramus, and a reduced gonial angle; reduced mandibular protrusion and total length; increased maxillary protrusion; increased maxillary dentoalveolar protrusion and reduced mandibular dentoalveolar protrusion. No significant changes in the vertical craniofacial relationships and in cranial base angulation were observed. The role of an early correction of Class III occlusal relationship in the establishment of a more favorable craniofacial growth pattern was discussed. (Am J Orthod Dentofac Orthop 1996;109:310-8.)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Patients with Class III malocclusion and anterior crossbite; Italy
Schweregrad	Keine Angaben
Einschluss-kriterien	(1) anterior crossbite; (2) Class III deciduous canine relationship; and (3) mesial step deciduous molar relationship or Class III permanent molar relationship; (4) posrural rest position anterior to the oeclusal position
Ausschluss-kriterien	Not fullfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **RMR:** All treated children wore a functional appliance (removable mandibular retractor) at least 14 hours a day (nighttime included) until the first evidence of a corrected anterior crossbite, which occurred within a few months from the beginning of treatment. Thereafter the children wore the same appliance nighttime only until completion of the observation period VERSUCHSGRUPPE 1 **RMR** N= 30 (Anfang) / N=30 (Ende) / Alter = 5,64 ± 1,01 years / ♂:♀ = 18:12 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **Untreated Class III (Control)**: A control group of 30 children with untreated Class III malocclusions (13 boys, 17 girls), mean age at first observation 6.06 ± 1.14 years, mean age at the second observation 8.45 ± 1.79 years KONTROLLGRUPPE 1: **Untreated Class III (Control)** N=30 (Anfang) / N=30 (Ende) / Alter = 6,06 ± 1,79 years / ♂:♀ = 13:17 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: **Craniofacial changes**
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The findings of the present longitudinal cephalometricstudy on craniofacial skeletal changes induced by early functional treatment of Class IIImalocclusion with removable mandibular retractor may be summarized as follows: **anterior morphogenetic rotation of the mandibledue to upward-forward direction of condylar growth,** leading to reduced mandibular protrusion and total length; more **favorable sagittal growth of the maxilla**; and **no significant modifications in the vertical craniofacial relationships and in cranial base angulation**.

Zusammen-fassung der Ergebnisse	**GRUPPE RMR VS. GRUPPE Untreated Class III (Control)** T0 (pre-treatment) : 5,64, 1,01 years, RMR; 6,06, 1,14 years untreated Class III (Control) T1 (post-treatment): 8,43, 1,73 years, RMR; 8,45, 1,79 years untreated Class III (Control) **Craniofacial changes** A-VertT (mm) Pr-VertT (mm) Id-VertT (mm) B-VertT (mm) Pg-VertT (mm) Go-VertT (mm) Co-Pg (mm) Co-Go (mm) Go-Pg (mm) Ba-T-VertT (degrees) Ar-T-VertT (degrees) ML-SBL (degrees) NL-SBL (degrees) NL-ML (degrees) Ar-Go-Me (degrees) ArGo-VertT (degrees) CondAx-VertT (degrees) CondAx-ML (degrees) Among the linear measurements for the assessment of sagittal relationships, A-VertT ($p < 0.01$), Pr-VertT ($p < 0.01$), Go-VertT ($p < 0.001$) exhibited significantly larger increments in treated group; B-VertT ($p < 0.01$), Id-VertT ($p < 0.01$), Pg-VertT ($p < 0.05$) exhibited significantly smaller increments in treated group. As to linear measurements for the assessment of mandibular dimensions, the total length of the mandible (Co-Pg) showed significantly smaller increments in treated group ($p < 0.05$), whereas no significant differences were assessed for mandibular ramus and body lengths (Co-Go, Go-Pg). No significant differences were also found for cranial base angular measurements. Among the measurements for the assessment of vertical relationships, the gonial angle (At-Go-Me) was the only parameter that showed significant differences between the two groups. The gonial angle appeared to be significantly reduced in treated group ($p < 0.001$). All the angular measurements for the assessment of mandibular ramus and condyle inclinations showed significant differences between treated and control groups. A significant reduction of all the three examined angles (ArGo-VertT, CondAx-VertT, CondAx-ML) was assessed in the treated group ($p < o.oo1$).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Äquivalenz von Versuchs- und Kontrollgruppen wahrscheinlich gegeben. Baseline characteristics verfügbar, jedoch nicht statistisch verglichen. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Die Auswertung war nicht verblindet. Retrospektive Studie mit ordentlicher Durchführung. Das geringe Behandlungsalter der Patienten führt zu klinischer Relevanz. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Äquivalenz von Versuchs- und Kontrollgruppen wahrscheinlich gegeben.. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Retrospektive Studie mit ordentlicher Durchführung. Das geringe Behandlungsalter der Patienten führt zu klinischer Relevanz.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**acceptable (+)**

Evidenztabelle Torre and Alacron 2012

Journal section: Clinical and Experimental Dentistry
Publication Type: Research

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Changes in nasal air flow and school grades after rapid maxillary expansion in oral breathing children

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Abstract

Objective: To analyze the changes in nasal air flow and school grades after rapid maxillary expansion (RME) in oral breathing children with maxillary constriction.

Material and Methods: Forty-four oral breathing children (mean age 10.57 y) underwent orthodontic RME with a Hyrax screw. Forty-four age-matched children (mean age 10.64 y) with nasal physiological breathing and adequate transverse maxillary dimensions served as the control group. The maxillary widths, nasal air flow assessed via peak nasal inspiratory flow (PNIF), and school grades were recorded at baseline, and 6 months and one year following RME.

Results: After RME, there were significant increases in all the maxillary widths in the study group. PNIF was reduced in the study group (80.91 ± 13.13 l/min) compared to the control group (94.50 ± 9.89 l/min) ($P < 0.000$) at the beginning of the study. Six months after RME, a significant improvement of PNIF was observed in the study group (36.40 ± 22.61). School grades were lower in the study group (85.52 ± 5.74) than in the control group (89.77 ± 4.44) ($P < 0.05$) at the baseline, but it increased six months after RME (2.77 ± 3.90) ($P < 0.000$) and one year later (5.82 ± 15.23) ($P < 0.05$).

Conclusions: Nasal air flow improved in oral breathing children six months and one year after RME. School grades also improved, but not high enough to be academically significant.

Key words: Maxillary constriction, oral breathing, nasal air flow, rapid maxillary expansion, school grades.

Population *Setting* *Komorbiditäten*	**Transversale Anomalie** • University of Granada

Schweregrad	Beidseitiger oder Einseitiger Kreuzbiss; Mundatmung
Einschluss-kriterien *Bei Review: PICOS*	All children involved in the study were of similar origin, had similar socioeconomic and cultural conditions and came from the same residential area. Mundatmer-Gruppe: • a history of oral breathing, confirmed by their parents and the medical history • On clinical examination these patients showed lip inefficiency at rest • dental crowding in the upper arch, ‘‘adenoidal facies’’ and transverse maxillary constriction, • a uni- or bilateral posterior crossbite • Evaluation of the breathing pattern showed a diaphragmatic mode of inhalation with underexpansion of the thorax and a reduced mobility of the nostrils suggesting a reduced patency of the upper airway. • Oral breathing was shown by water vapor condensed on the surface of a mirror placed outside the mouth. • These results were expected, as only oral breathing children with maxillary constriction and posterior crossbite were included in the study. Kontroll-Gruppe: • physiological nasal breathing • adequate transverse dimensions of the maxilla • recruited from the same clinic
Ausschluss-kriterien	• cleft lip and palate or • craniofacial anomalies • previous or current orthodontic treatment • chronic medical illness causing frequent absences from school of more than 5 days in a term • a very poor socioeconomic status with reliance on monthly welfare support, that could affect the children’s school grades

Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** The children in the study group were treated with a Hyrax palatal expander (Dentaurum®, Germany) as the only treatment. All appliances were manufactured, cemented and activated by the same operator (HT) according to the following protocol: following an initial activation of two-fourth turns (0.4 mm), the parents were instructed to activate the screw one-fourth turn (0.2 mm) twice per day, until overcorrection of the transverse relationship of 3 mm was seen (on average 18 ± 2 days). Patients were monitored weekly. The palatal expander was then stabilized and kept in situ for retention for 6 months. VERSUCHSGRUPPE**: Oral breathing Group** N=44 (Anfang) / N=44 (Ende) / Alter = 10,57 ± 1,93 Jahre / ♂:♀ = 22:22 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**Keine Kieferorthopädische Therapie** All children involved in the study were of similar origin, had similar socioeconomic and cultural conditions and came from the same residential area. (Caucasian) KONTROLLGRUPPE : **Physiological nasal breathing and adequate transverse dimensions of the maxilla Group** N=22 (Anfang) / N=22 (Ende) / Alter = 10.64 ± 1,64 Jahre / ♂:♀ = 22:22 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: Keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** **und** **medizinischer Schaden, Nebenwirkungen** **bzw. Zunahme der Anomalie /Malokklusion/Dysgnathie** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Dental variables: intercanine-, interpremolar-, intermolar distances SEKUNDÄRZIELGRÖßE: Nasal air flow evaluation TERTIÄRZIELGRÖßE: school grades
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	In this study, we measured nasal air flow and school grades in a group of oral breathing children with maxillary constriction and posterior crossbite before and after RME treatment to elucidate the possible relationships among maxillary constriction, nasal air flow deficiency and school grades. The children affected by this malocclusion had significantly lower dental-traverse maxillary dimensions, nasal air flow rates and school grades compared with the control children. Six months after the end of RME treatment, all the variables increased in the treated children. These results remained stable one year later, demonstrating the advantages of RME in children with these problems.
Zusammen-fassung der Ergebnisse	**GRUPPE oral breathing group VS. GRUPPE physiological nasal breathing and adequate transverse dimensions of the maxilla group** Dental variables The mean intra-observer error ranged from 0.25 to 0.29 mm. The coefficient of reliability ranged from 95 to 99%. These findings indicate that the errors were minimal and unlikely to bias the results. T-tests showed that there were statistically significant differences in all of the dental variables between the two groups (P < 0.000), reflecting smaller intercanine (4.45 ± 2.93 mm), inter-first premolar (7.78 ± 4.48 mm), inter-second premolar (6.30 ± 4.50 mm) and inter-first molar (6.34 ± 4.34 mm) widths in the study group children. Six months after RME, there was a significant increase in all the maxillary widths measured in the study group in comparison to the control group (T1-T0), and this increase was maintained one year later (T2-T0). Nasal air flow The intra-class correlation coefficient was 0.91, and the 95% limits of agreement were ±27 l/min, showing that the PNIF measurements were reproducible. Oral breathing children exhibited significantly lower nasal air flow (60.91 ± 13.13 l/min) than the control children (94.50 ± 9.89 l/min) at the beginning of the study (T0) (P < 0.000). Six months after RME, a significant improvement in PNIF was observed in the study group (36.43 ± 22.61) in reference to the control group (1.64 ± 4.68). At T1 and one year later (T2) there were no differences in PNIF between the two groups. School grades Before treatment, the average school grades were significantly lower in the study group (85.52 ± 5.74) than in the control group (89.77 ± 4.44). In the study group, school grades increased six months after RME (2.77 ± 3.90) (P < 0.001) and one year later (5.02 ± 15.23) (P < 0.05). The difference between the groups from the beginning of the study to one year later (T2-T0) was also significant (5.54 ± 3.00). Pearson correlation showed a weak association between PNIF and school grades changes during the T2-T0 period (r = 0.38, P < 0.05).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign:* Measurements in a standard, valid and reliable way *Power der Studie/Patientenzahl: Keine Poweranalyse durchgeführt* *Funding:* Keine Angaben *Interessenkonflikte:* Keine Angaben Bias (SIGN): • The same exclusion criteria are not used used for both cases and controls • confounding is mentioned, but not discussed in detail
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt gut
	Klinische Aussagekraft: Klare klinische Aussagekraft, dass die beschriebene GNE Therapie (RME) zu einer Verbesserung der intercaninen, interpremolaren und intermolaren Distanz sowie zu einer verbesserten Nasenpassage und zu besseren Schulnoten führt.
Evidenz-level (SIGN)	**2+**
Qualität **(RoB, SIGN /AMSTAR II)**	**Acceptable ⊕**

Evidenztabelle Tortop, Kaygisiz et al. 2014

Original Article

Modified tandem traction bow appliance compared with facemask therapy in treating Class III malocclusions

Tuba Tortop[a]; Emine Kaygısız[b]; Deniz Gencer[c]; Sema Yuksel[d]; Zeynep Atalay[e]

ABSTRACT

Objective: To compare the effects of the modified tandem traction bow appliance (MTTBA) and the facemask in treating patients with Class III malocclusion.

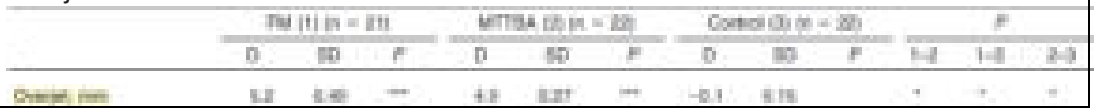
Materials and Methods: The material consisted of the pre-post treatment/pre-post observation lateral cephalograms of 65 subjects with skeletal and dental Class III malocclusion. In the first group 21 patients (mean age: 10 years, 6 months) were treated with a Delaire-type facemask (FM). In the second group 22 patients treated (mean age: 10 years) with MTTBA. The remaining 22 children (mean age: 9 years, 7 months) were observed without treatment for 11 months.

Results: Increase in SNA, N-FH – A, and ANB angles were significantly greater in the treatment groups compared to the control group. However, ANB angle showed a significantly greater increase in the FM group (2.8 ± 0.30°) than in the MTTBA group (2.0 ± 0.18°). The overjet and molar relation increased significantly in both treatment groups, but in the FM group (5.2 ± 0.40 mm) increase in overjet was significantly greater than in the MTTBA group (4.0 ± 0.27 mm). Mesial movement of upper molar and incisor were found to be greater in the FM group compared to the modified TTBA group.

Conclusions: Both appliances were found to be effective in the treatment of Class III malocclusion. Their skeletal and dental effects showed differences due to their design. (*Angle Orthod.* 2014;84:642–648.)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Patients with skeletal Class III malocclusion, a negative overjet and an SN/GoGn angle between 26° and 38° • Turkey
Schweregrad	Keine Angaben
Einschluss-kriterien	- Angle Class III malocclusion with a negative overjet and - an optimum SN/GoGn angle (between 26° and 38°).
Ausschluss-kriterien	Congenital syndromes

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **FM Del**: Delaire-type FM and a removable upper appliance. A total force of 600 g was applied, and the patients were instructed to wear their appliances approximately 16 hours a day. The removable upper appliance had two Adams clasps at the molars, two ball clasps, a labial bow, and two hooks at the anterior region for extraoral elastics. The average treatment time was 10.5 months VERSUCHSGRUPPE 1: **FM Del** N= 21 (Anfang) / N=21 (Ende) / Alter = 10,5, 1,3 / ♂:♀ = 13:8 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung **MTTBA**: MTTBA, which comprised an upper splint, a lower splint, and a traction bow. Construction bites were taken without sagittal activation and with a 5–6-mm vertical opening at the molar region. A modified headgear facebow was used as the traction bow and it was applied to the activator tubes, which were embedded in the lower splint. Two elastics that exerted a force of 400–500 g on one side were worn between the labial hooks of the upper splint and the traction bow. The patients were instructed to wear the appliance approximately 14–16 hours a day. The average treatment time was 12 months VERSUCHSGRUPPE 2: **MTTBA** N= 22 (Anfang) / N=22 (Ende) / Alter = 10,0, 1,3 / ♂:♀ = 14:8 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **und** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/** KONTROLLGRUPPE 1: **untreated Class III** N=22 (Anfang) / N=22 (Ende) / Alter = 9,6, 1,25 / ♂:♀ = 12:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB, SEKUNDÄRZIELGRÖßE: Dental: Overjet
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**Kohortenstudie
Schluss-folgerungen der Autoren	- Though the changes in ANB, overjet, and molar relation showed that **both treatment approaches were effective in the treatment of Class III malocclusio**n, greater increases in ANB and overjet during FM treatment was observed. - Skeletal improvement occurred because of the **maxillary protrusion** combined with the **mandibular rotation**. - While protrusion of the upper incisor and mesial movement of the upper molar were greater in the FM group, uprighting of the lower molar was found to be greater in the MTTBA group
Zusammen-fassung der Ergebnisse	**GRUPPE FM Del VS. GRUPPE untreated Class III** **GRUPPE MTTBA VS. GRUPPE untreated Class III** T1 (pre-treatment): mean age 10,5 years, FM Del; 10,0 years, MTTBA, 9,6 years untreated Class III T2 (post treatment/ observation): mean age 11,8 years, FM Del; 11,3 years, MTTBA, 10,5 years untreated Class III Skeletal SNA, SNB, ANB  Dental Overjet 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe wurde überprüft. Signifikante Unterschiede bestehen, sind aber nicht maßgeblich für die Untersuchung. Hinsichtlich skeletaler Merkmale ist die Äquivalenz gegeben.Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt. Trotz einer Anzahl von methodischen Schwächen dieser retrospektiven Studie ist das Gesamtdesign der Studie noch akzeptabel. Die klinische Relevanz, ist ausreichend. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN):* Die Äquivalenz von Versuch- und Kontrollgruppe ist weitestgehend gegeben. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Eine Verblindung fand nicht statt
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Trotz einer Anzahl von methodischen Schwächen dieser retrospektiven Studie ist das Gesamtdesign der Studie noch akzeptabel. Die klinische Relevanz, ist ausreichend.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle Toth, McNamara 1999

ORIGINAL ARTICLE

Treatment effects produced by the Twin-block appliance and the FR-2 appliance of Fränkel compared with an untreated Class II sample

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This retrospective cephalometric study compares the treatment effects produced in 40 patients treated with the Twin-block appliance to those seen in a matched sample of 40 children treated with the FR-2 appliance of Fränkel and to changes undergone in 40 untreated Class II controls from *The University of Michigan Elementary and Secondary School Growth Study*. The average starting ages for the Twin-block, Fränkel, and control groups were 10 years 5 months, 10 years 2 months, and 9 years 11 months, respectively. The T_2 to T_1 observation period was adjusted to an average of 16 months for all groups. Significant decreases in overbite and overjet were observed at the end of treatment in the Twin-block and Fränkel groups. Compared with the untreated subjects, statistically significant increases in mandibular length were observed in both treated groups. The Twin-block patients achieved an additional 3.0 mm of mandibular length, whereas the Fränkel group increased 1.9 mm more than did the controls. No significant restriction of midfacial growth was observed in either functional appliance group relative to controls. A significant increase in lower anterior facial height was evident in both treatment groups. Vertical increase in the Twin-block patients was significantly greater than in the FR-2 group. In general, more extensive dentoalveolar adaptation was observed with the tooth-borne Twin-block appliance than with the more tissue-borne FR-2 of Fränkel. The Twin-block and FR-2 samples both showed significant retroclination and extrusion (eruption) of the maxillary incisors. The Twin-block patients also exhibited distal movement of the upper molars; however, there was no extrusion. Slight lower incisor proclination was noted in both treatment groups, and lower molar extrusion was found to be significantly greater in the Twin-block group compared with the other 2 samples. No horizontal differences were detected in the lower molars among groups. The present study suggests, therefore, that Class II correction with the Twin-block appliance is achieved through normal growth in addition to mandibular skeletal and dentoalveolar changes. Class II correction with the FR-2 is more skeletal in nature, with less dentoalveolar changes noted. (Am J Orthod Dentofacial Orthop 1999;116:597-609)

Population	**Klasse-II-Anomalie** This retrospective cephalometric study compares the treatment effects produced in 40 patients treated with the Twin-block appliance to those seen in a matched sample of 40 children treated with the FR-2 appliance of Fränkel and to changes undergone in 40 untreated Class II controls from The University of Michigan Elementary and Secondary School Growth Study.
Schweregrad	keine Angabe
Einschluss-kriterien	Class II molar relationship at the beginning of the study; their cephalometric records had been obtained within the specified intervals.
Ausschluss-kriterien	Poor film quality…; additional orthodontic treatment or extractions of permanent teeth during the period therapy; *additional for FR-2:* Poor cooperation and patients with severe retroclination of the upper incisors…

Intervention	**kieferorthopädische Behandlung** *Most of the Twin-block appliances used in this study were of the design originally developed by Clark. This version of the appliance is composed of maxillary and mandibular appliances that fit tightly against the teeth, alveolus, and adjacent supporting structures (Figs 2 and 3). Delta clasps18 were used bilaterally to anchor the maxillary appliance to the first permanent molars; 0.030 inch ball clasps (or arrow clasps) typically were placed in the interproximal areas anteriorly. The precise clasp configuration depended on the type (deciduous or permanent) and number of teeth present at the time of appliance construction. In the lower arch, Clark18 has recommended the use of a series of ball clasps that lie in the interproximal areas between the canines and lower incisors (Fig 3A). For a few of the appliances used in the study, the design was modified by placing a labial bow anterior to the lower incisors with labial acrylic similar to that of a lower spring retainer as designed by Barrer25 (Fig 3B). In contrast to the fabrication of a spring retainer, however, the positions of the lower incisors were not altered in the work model before appliance construction. For those patients undergoing Twin-block treatment with mild-to-moderate overjets at the beginning of treatment, the appliances were constructed from bite registrations taken with the incisors in an end-to-end position. In instances in which the pretreatment overjet exceeded 6 to 7 mm, the bite registration protocol varied. In about half of the large-overjet patients, the bite registration was obtained with the mandible initially postured forward 4 to 6 mm, with the appliance reactivated after a few months so that the incisors ultimately were in an end-to-end position. In the remaining patients with large overjets, the Twin-block appliance was constructed with the incisors in an end-to-end position initially. Typically the bite registration was taken to allow 5 to 7 mm of vertical opening in the region of the posterior bite blocks. A proposed benefit of the Twin-block appliance is the ability to control vertical development of the molars and premolars through selective removal of acrylic during treatment. In patients with a short lower anterior facial height or an accentuated curve of Spee, the acrylic on the posterior portion of the maxillary bite block was trimmed according to the recommendations of Clark18 in order to promote eruption of the posterior dentition.* VERSUCHSGRUPPE: **Twin-block** N=40/40 / Alter = 10y5m / ♂:♀ = 18:22 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: Reguläre Behandlung
Intervention	**kieferorthopädische Behandlung** *The FR-2 appliances worn by patients examined here were fabricated according to the principles of Fränkel26,27 and McNamara and Huge.28 The mandible was brought forward in a “step-by-step” manner (3 to 5 mm at each advancement), leaving sufficient vertical opening for adequate occlusal clearance of the crossover wires that extended to the lower lingual shield. Excessive bite opening was avoided. Subsequent reactivations of the appliance were accomplished by cutting the vestibular shields and advancing the lower anterior portion of the appliance until the incisors were in an end-to-end relationship.28* VERSUCHSGRUPPE: **FR-2** N=40/40 / Alter = 10y2m / ♂:♀ = 21:19 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **control** N=40/40 / Alter = 9y11m / ♂:♀ = 20:20 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Maxillary skeletal measures (SNA, Na perp to pt A, Co to ANS, Co to pt A)* SEKUNDÄRZIELGRÖßE: *Mandibular skeletal measures (SNB, Na perp to pog, Articulare to Gn, Go to Pog, Co to Gn)* TERTIÄRZIELGRÖßE: *Maxillomandibular measures (ANB, WITS, Articulare to PTM, Facial plane angle, Max/md differential)* QUARTÄRZIELGRÖßE: *Vertical measures (FH to occl plane, FH to pal plane, FH to mand plane, Facial axis angle, Na to ANS, ANS to Me, Condylion to Go)* QUINTÄRZIELGRÖßE: *Maxillary dentoalveolar measures (Pt A vertical,Upper 1 to SN, Upper 6 vertical, Upper 6 horizontal, Upper 1 vertical, Upper 1 horizontal)* SEXTÄRZIELGRÖßE: *Mandibular dentoalveolar measures. (Lower 1 to N-B, IMPA, FMIA, lower 6 vertical, Lower 6 horizontal, Lower 1 vertical, Lower 1 horizontal)* SEPTIMÄRZIELGRÖßE: *Interdental (Overbite, Overjet)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The present study suggests, therefore, that Class II correction can be achieved with either appliance system evaluated here. The FR-2 appliance appears to have primarily a skeletal effect, whereas the Twinblock appliance produces both skeletal and dentoalveolar adaptations, both favorable and unfavorable, at least over the short term. It should be noted, however, that this investigation evaluated treatment effects by way of lateral cephalograms only, and thus transverse and neuromuscular effects of treatment were not evaluated.

Zusammen-fassung der Ergebnisse	**GRUPPE Twin-Block/FR-2 VS. GRUPPE untreated** ***PRIMÄRZIELGRÖßE*** *Compared with the untreated children, however, there were small but statistically significant decreases in the distance from nasion perpendicular to Point A in both treatment groups. No measures of midfacial length showed sig nificant changes, although condylion to point A was slightly smaller in both treatment groups in comparison to controls. In addition, superimposition on the cranial base did not reveal significant differences among groups in maxillary skeletal change. Overall, the maxillary skeletal effects of both functional appliance treatments were minimal.* ***SEKUNDÄRZIELGRÖßE*** *Mean mandibular length as measured from condylion to gnathion increased 2.7 mm in the control group, 4.6 mm in the FR-2 group, and 5.7 mm in the Twin-block group (Table V). These statistically significant differences among groups also are evident in the articularegnathion measurement. The SNB angle increased significantly in the Twin-block patients (1.6°) compared both with the control subjects (0.3°) and FR-2 patients (0.7°). There was a significant difference in all 6 measures of mandibular skeletal change between the Twinblock and control samples, whereas FR-2 treatment produced significant differences in 3 of the 6 mandibular skeletal measures as compared with the controls. Overall, Twin-block therapy produced a larger effect on the growth and position of the mandible than did FR-2 treatment.* ***TERTIÄRZIELGRÖßE*** *In all 4 measures of maxillomandibular relationships considered, Twinblock treatment produced the largest change; a lack of treatment resulted in the smallest. The ANB angle was reduced by 1.8° in the Twin-block patients, 1.1° in the FR-2 patients, and remained unchanged in the control patients. Similarly, the Wits appraisal decreased by 3.7 mm in the Twin-block sample and 2.2 mm in the FR-2 sample, whereas there was only a minor change (+0.3 mm) in the untreated sample. These differences were statistically significant (Table V).* ***QUARTÄRZIELGRÖßE*** *Relative to controls, both functional appliance treatments tended to produce increases in vertical facial measures. These increases were most pronounced in the Twin-block patients. The occlusal plane angle was increased significantly in both the Twin-block patients and FR-2 patients. The change in the mandibular plane angle in the Twin-block patients was significantly greater than in the other groups. Lower anterior facial height increased in all groups, but the change was greatest in the Twin-block sample and least in the control group. No significant differences among groups were observed in upper anterior facial height, facial axis angle, or palatal plane angle.* ***QUINTÄRZIELGRÖßE*** *Relative to the maxilla, the upper incisor moved anteriorly 0.2 mm in the control sample, whereas the Twin-block treatment resulted in a posterior tipping of the upper incisors (–0.8 mm). The relative sagittal position of the upper incisor remained unchanged in the Fränkel group (Table VI). The upper molars moved anteriorly 0.3 mm in the control subjects, whereas they moved slightly posteriorly (–0.1 mm) in the FR-2 patients and more posteriorly (–1.5 mm) in the Twin-block patients. Although forward molar movement was restricted in both treatment groups, only that seen in the Twin-block patients was statistically significant from control values. Vertically, neither appliance inhibited upper molar eruption. The upper incisors, on the other hand, were extruded in the Twin-block patients an average of 0.8 mm more than in the FR- 2 patients, and 0.6 mm more than in the controls (Table VI).*

	SEXTÄRZIELGRÖßE From the standpoint of a superimposition on the internal structures of the mandible (Table VI), the lower incisor moved forward 0.7 mm during Twin-block treatment and 0.3 mm during FR-2 treatment, whereas the lower incisors uprighted slightly without treatment. Relative to controls, there also was a statistically significant flaring of the lower incisors only in the Twin-block group; the IMPA angle increased by 2.8° in the Twinblock sample, 1.1° in the FR-2 sample, and 0.2° in the controls (Table V). No significant among-group differences in anteroposterior mandibular molar change were seen. The lower molars, however, erupted 2.9 mm in the Twinblock sample, 2.1 mm in the FR-2 sample, and 1.4 mm in the untreated controls (Table VI). The amount of lower molar extrusion in the Twin-block group was significant in comparison with the FR-2 group and to the untreated Class II controls. ***SEPTIMÄRZIELGRÖßE*** Whereas the change in interincisal angle did not differ significantly among the 3 samples, overbite and overjet decreased significantly in the treatment groups when compared with the control group (Table V). The overbite and overjet were reduced in the Twin-block patients 2.5 mm and 3.6 mm, in the FR-2 patients 1.3 and 3.1 mm, and increased 0.3 mm and 0.3 mm in the controls, respectively.
Angaben auffälliger positiver und/oder negativer Aspekte	*Gutes Studiendesign, reliable und valide Durchführung der Messungen. Keine Powerkalkulationen, dafür relativ hohe N-Zahlen pro Gruppe (n=40). Keine Angaben zum Funding oder zu möglichen Interessenskonflikten. Keine Verblindung bei Auswertung.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die vorliegende Studie legt nahe, dass die Korrektur der Klasse II mit dem Twin-Block-Gerät zusätzlich zum normalen Wachstum durch mandibuläre und dentoalveolare Veränderungen erreicht wird. Die Klasse-II-Korrektur mit dem FR-2 beruht eher auf skeletalen Veränderungen.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Tränkmann, Lisson et al. 2001

Zusammenfassung

Ziel dieser Studie war der Vergleich der unterschiedlichen Effekte bei Behandlung einer Angle-Klasse-III-Dysgnathie nur im Gebiss der ersten Dentition und bei Behandlungsbeginn im frühen Wechselgebiss. Für diese retrospektive Studie wurden 14 Patienten aus fünf Familien mit einer Angle-Klasse-III-Dysgnathie ausgewählt. Es wurden die Behandlungsverläufe, die Behandlungsapparatur, die Behandlungsdauer und das Behandlungsergebnis gegenübergestellt. Die skelettalen Veränderungen im Verlauf der kieferorthopädischen Behandlung wurden anhand von Fernröntgenseitenbildern, die vor, während und nach Abschluss der Behandlung angefertigt worden waren, beurteilt.

Bei Behandlung nur im Gebiss der ersten Dentition war der Behandlungsverlauf kontinuierlicher, es wurde nur eine einfache kieferorthopädische Behandlungsapparatur gebraucht, und die Behandlungsdauer (5,4 ± 2,1 Monate) war signifikant kürzer als bei Behandlungsbeginn im frühen Wechselgebiss (21,1 ± 9,7 Monate). Die Frühbehandlung nur im Gebiss der ersten Dentition ergab bessere dentoalveoläre Behandlungsergebnisse.

Schlüsselwörter: Angle-Klasse III · Behandlungsverlauf · Apparatur · Behandlungsdauer · Dentoalveoläres und skelettales Behandlungsergebnis

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Ziel dieser Studie war der Vergleich der unterschiedlichen Effekte bei Behandlung einer Angle-Klasse-III-Dysgnathie nur im Gebiss der ersten Dentition und bei Behandlungsbeginn im frühen Wechselgebiss. Bei 14 Patienten aus fünf Familien mit einer Angle-Klasse-III-Dysgnathie wurden die Behandlungsverläufe, die Behandlungsapparatur, die Behandlungsdauer und das Behandlungsergebnis gegenübergestellt. Die skelettalen Veränderungen im Verlauf der kieferorthopädischen Behandlung wurden anhand von Fernröntgenseitenbildern, die vor, während und nach Abschluss der Behandlung angefertigt worden waren, beurteilt.
Schweregrad	Kl.III-Dysgnathie
Einschluss-kriterien *Bei Review: PICOS*	Keine Angaben
Ausschluss-kriterien	Keine Angaben

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** Es wurden die Behandlungsverläufe (kontinuierlich, mit Unterbrechung und Abbruch infolge mangelhafter Mitarbeit), die Art der Behandlungsapparatur und die Behandlungsdauer miteinander verglichen. Als Behandlungsgeräte kamen nur herausnehmbare Apparaturen zum Einsatz (Tabelle 1 siehe unter Notizen). VERSUCHSGRUPPE: **Milchgebiss-Gruppe** • N=7 (Anfang) / N=7 (Ende) / Alter = ♂ 5,3.± 11,4 years / ♂:♀ = 4:3 • Gebissphase: Milchgebiss • KFO-Behandlung: frühe /Früh-Behandlung
Kontrolle Kontrollgruppe	**kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** KONTROLLGRUPPE: **frühes Wechselgebiss-Gruppe** N=7 (Anfang) / N=7 (Ende) / Alter: ♂ 9.75 ± 1.5 years / ♂:♀ = 5:2 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** ▪ primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) ▪ Reduktion eines weiteren Therapiebedarfs Primärzielgröße: Behandlungsverläufe Sekundärzielgröße: Behandlungsapparaturen Tertiärzielgröße: Behandlungsdauer Quartärzielgröße: Klinisch erfasste dentoalveoläre Behandlungsergebnisse Quintärzielgröße: Röntgenologisch erkannte skelettale und dentoalveoläre Behandlungsergebnisse
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Der frühere Behandlungsbeginn im Gebiss der ersten Dentition bei Angle-Klasse-III-Dysgnathien ergibt eine bessere Mitarbeit des Patienten, einen kleineren Apparateaufwand,eine signifikant kürzere Behandlungszeit und einbesseres dentoalveoläres Behandlungsergebnis. Die Frühbehandlung von Angle-Klasse-III-Dysgnathien im Gebiss der ersten Dentition ist somit ein wichtiges präventives Instrument, welches eine frühzeitige Umstellung der Funktion und des Kieferwachstums in physiologische Bahnen ermöglicht. Die größere skelettale Manifestation dieser Dysgnathien im Wechselgebiss und im Gebiss der zweiten Dentition kann verhindert werden.

Zusammenfassung der Ergebnisse	**GRUPPE Milchgebiss-Gruppe VS. GRUPPE frühes Wechselgebiss-Gruppe** **Behandlungsverläufe** Bei kieferorthopädischer Behandlung nur im Gebiss der Ersten Dentition waren die Behandlungsverläufe kontinuierlicher als bei Behandlungsbeginn im frühen Wechselgebiss. Nur bei einem Patienten wurde die Behandlung im Gebiss der ersten Dentition unterbrochen, bei drei Patienten im frühen Wechselgebiss. **Behandlungsapparaturen** Es war bei Behandlung nur im Gebiss der ersten Dentition jeweils nur eine einfache Behandlungsapparatur notwendig (Abbildung 2), während bei Behandlungsbeginn im frühen Wechselgebiss in allen Fällen mehrere kieferorthopädische Behandlungsapparaturen erforderlich wurden (Tabelle 1, Abbildung 3). Bei zwei Patienten war bei Behandlungsbeginn im frühen Wechselgebiss die Reduktion der Zahnzahl indiziert (Abbildung 3). **Behandlungsdauer** Ein signifikanter Unterschied besteht in der Behandlungsdauer. Während bei der Behandlung im Gebiss der ersten Dentition die durchschnittliche Behandlungsdauer 5,4 ± 2,1 Monate betragen hat, waren es bei Behandlungsbeginn im frühen Wechselgebiss 21,1 ± 9,7 Monate. Bei keinem der Patienten wurde zu einem späteren Zeitpunkt nochmals therapeutisch interveniert. **Klinisch erfasste dentoalveoläre Behandlungsergebnisse** Die eugnathe sagittale Frontzahnstufe und die Neutralokklusion konnten außer bei einer Patientin (Kopfbissbeziehung, Mesialokklusion) in allen übrigen Fällen erreicht werden. Die dentoalveolären Ergebnisse bei Behandlung nur im Gebiss der ersten Dentition waren besser mit korrespondierenden Stützzonen des Ober- und Unterkiefers. Nur in zwei Fällen waren die Stützzonen inkongruent, einmal waren die Stützzonen des Oberkiefers kleiner, einmal größer. Bei Behandlungsbeginn im frühen Wechselgebiss waren nur bei drei Patienten nach Abschluss der Behandlung die Stützzonen des Ober- und Unterkiefers korrespondierend, bei drei Patienten waren die Stützzonen des Oberkiefers zu klein und in einem Fall größer als die des Unterkiefers. **Röntgenologisch erkannte skelettale und dentoalveoläre Behandlungsergebnisse** Die Auswertung der Fernröntgenseitenbilder zeigte bei Behandlung nur im Gebiss der ersten Dentition eine signifikante Reduktion des Gonionwinkels in Richtung einer Angle-Klasse I. Außerdem wurden die Schneidezähne des Ober- und Unterkiefers signifikant protrudiert. Sie waren aber nach Behandlungsabschluss im Vergleich zu den Hannoveraner Mittelwerten nach Sölzer [7] für die Angle-Klasse I noch immer gering retrudiert (Tabelle 2, Abbildung 2). Der Behandlungsbeginn im frühen Wechselgebiss führte zu einer signifikanten Reduktion des Basenwinkels und des Gonionwinkels in Richtung einer Angle-Klasse I. Auch hier kam es zu einer Protrusion der retrudierten Ober- und Unterkieferschneidezähne (Tabelle 3, Abbildung 3). Der Vergleich der erreichten skelettalen Veränderung bei Behandlung nur im Gebiss der ersten Dentition und Behandlungsbeginn im frühen Wechselgebiss ließ größere apparative skelettale Veränderungen bei Behandlungsbeginn im frühen Wechselgebiss erkennen (Tabelle 4, vergleiche Abbildung 2 mit Abbildung 3). Bei der longitudinalen Betrachtung der Patientendaten beider Gruppen waren folgende signifikante skelettale unddentoalveoläre Veränderungen im Verlauf der Gebissentwicklung festzustellen: Vom Gebiss der ersten Dentition zum frühen Wechselgebiss gab es keine skelettalen Veränderungen. Vom frühen Wechselgebiss zum späten Wechselgebiss hatten sich der Basenwinkel (28,6° ± 3,4° zu 27,4° ± 4,5°) ($p < 0,05$), der Gonionwinkel (128,0° ± 4,1° zu 127,2° ± 1,5°) ($p < 0,05$) und die Neigung der Oberkieferschneidezähne (78,1° ± 12,3° zu 67,9° ± 5,4°) ($p < 0,05$) in Richtung einer Reduktion verändert. Vom späten Wechselgebiss zum Gebiss der zweiten Dentition wurden der SNA- (77,8° ± 4,5° zu 79,2° ± 4,4°) ($p < 0,05$), SNB- (76,5° ± 4,2° zu 77,4° ± 4,3°) ($p < 0,01$) und ANB-Winkel (1,3° ± 1,0° zu 1,8° ± 1,3°) ($p < 0,05$) größer, während der Gonionwinkel (127,2° ± 1,5° zu 123,3° ± 5,0°) ($p < 0,05$) weiterhin kleiner und die Unterkieferschneidezähne (89,9° ± 6,7° zu 87,2° ± 4,4°) ($p < 0,05$) protrudierter wurden.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Studie mit hoher methodischer Qualität; gewisse Schwächen sind: ➔ Es ist nicht vollkommen klar, warum keiner der Patienten trotz Inkongruenz der Stützzonen beider Kieferbasen keine weitere Therapie im späteren Verlauf benötigte. Die klin. Relevanz der Ergebnisse bzgl. des Outcomes „Therapiedauer“ sind somit nicht eindeutig bewertbar. ➔ Besonders bzgl. der klin. und röntgenologischen Veränderungen hat die Studie jedoch eine hohe Aussagekraft zu sehen.
Schluss-folgerung des Begutachters	methodische Qualität: sehr gut
	Klinische Aussagekraft: bzgl. der skelett. und klein. Parameter hoch, bzgl. der Therapiedauer, der Behandlungsgeräte aufgrund fehlender Poweranalyse
Evidenz-level (SIGN)	**2+**
Qualität	**+**

Evidenztabelle Trenouth 2000

ORIGINAL ARTICLE

Cephalometric evaluation of the Twin-block appliance in the treatment of Class II Division 1 malocclusion with matched normative growth data

M. J. Trenouth, BSc, BDS, MDS, PhD, FDS, DDO, DOrth
Preston, England

Cephalometric radiographs were taken before and after treatment with the Twin-block appliance on 30 consecutive patients with Class II Division 1 malocclusions. A control group was generated from published normative data such that each treated case was matched individually for age, sex, and treatment time. The cephalometric change during treatment was compared to the natural growth change in the matched control group using a Mann-Whitney U-test for statistical significance. The treatment effect was also calculated by subtracting the natural growth change from the treatment change. This was then compared to twice the method error to see if the treatment change was clinically significant. There was both a statistically and clinically significant reduction in overjet, angle ANB, increase in angle SNB, and mandibular length together with a reduction in upper incisor angle. None of the other cephalometric parameters measured showed a significant change. (Am J Orthod Dentofacial Orthop 2000;117:54-9)

Population	**Klasse-II-Anomalie** Patients with Class II division 1 malocclusions
Schweregrad	overjet>6 mm
Einschluss-kriterien	• overjet>6 mm, • ANB angle >4°, • Availability of before and after cephalometric radiographs.
Ausschluss-kriterien	None of the cases selected had congenital syndromes or obvious asymmetry nor had any prior appliance therapy. .
Intervention	**kieferorthopädische Behandlung** *They were all treated with a standardized technique described by me31 that consisted of 3 phases. First, semi-rapid maxillary expansion and alignment of the upper arch was performed. Second, correction of Class II relationships was carried out using a modification of the Twin-block functional appliance introduced by Clark32 but with steeper bite blocks and excluding the extra-oral traction and intermaxillary elastics. Third, retention was instigated with an upper removable appliance with a very steep anterior bite plane.* VERSUCHSGRUPPE: **Twin-block** N= 30 / N=?? (Ende) / Alter = 12y6m (MIN: 9y8m, MAX:17y7m) / ♂:♀ = 14:16 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle	**keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **untreated** N=?/? / age and sex matched / keine genauen Angaben • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/DysgnathieSubkategorie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Changes in cephalometric parameters during treatment (SNA, SNB, ANB, MM, UI, LI, II, OJ, NSAr, SarGo, ArgoMe, Ar-A, Ar-B, Ar-Po, Co-A, Co-B, Co-Po)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The Twin-block appliance reduced the Class II dental base relationship to a degree that was both statistically and clinically significant. 2. The correction of the Class II dental base relationship was greater than that reported for the Andresen and Fränkel appliances and comparable to that reported for the Herbst appliance. 3. The dental base relationship was not reduced completely to Class I values but there was some dentoalveolar compensation largely due to upper incisor retraction. 4. The improved response of the Twin-block (and Herbst) appliances over other functional appliances was considered to be due to the fact that they are worn 24 hours a day.
Zusammen-fassung der Ergebnisse	**GRUPPE twin-block VS. GRUPPE untreated** ***PRIMÄRZIELGRÖßE*** *Using the Mann Whitney U-test, the change during treatment in the Twin-block group was compared to the natural growth change in the matched control group derived from normative data. The treatment effect was calculated by subtracting the natural growth from the treatment change. This was then compared to twice the method error (ME) to see if the treatment change was clinically significant (Table II). The overjet was reduced during treatment by over 7 mm and this was significant (P > .001), and the treatment effect was greater than 2ME. The angle ANB showed a statistical significant reduction (P > .001) again with a treatment effect greater than 2ME, which was mainly due to a statisti cally significant increase in angle SNB. There was a small but statistically significant reduction in angle SNA, but the treatment effect was less than 2ME. These findings were substantiated by length measurements with no significant maxillary change (Ar-A, Co- A) over control growth data but statistically and clinically significant increase in mandibular length (Ar-B, Co-B, Ar-Po, Co-Po). The upper incisor angulation was significantly reduced with the interincisal angle correspondingly increased, both treatment effects greater than 2ME. There was no significant change in the lower incisor angulation. The MM angle remained virtually unchanged during treatment but decreased in the control group and the difference was statistically significant, but the treatment effect was less than 2ME. A similar situation arises with angle ArGoMe. There was no significant change in angles NSAr or SArGo.*

Angaben auffälliger positiver und/oder negativer Aspekte	*Gutes Studiendesign und reliable, valide Durchführung und Auswertung. Keine Powerkalkulation, keine genauen Angaben zur Kontrollstudie. Keine Angaben zum Funding oder zu Interessenkonflikten.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Twin-Block-Apparatur reduzierte die Klasse II Anomalie klinisch signifikant.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Trenouth 2002

Proportional changes in cephalometric distances during Twin Block appliance therapy

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SUMMARY The aim of the study was to evaluate the cephalometric changes produced by the Twin Block appliance. Lateral cephalometric radiographs were taken before and after Twin Block appliance treatment on 30 consecutive patients (14 male, 16 female, mean age 12 years 6 months). Published normative data tables were used to produce control data, which were individually matched to the test group for age, sex, and treatment time. Alteration in shape was assessed by measuring percentage change in linear dimensions as opposed to change in cephalometric angles used in previous investigations. The differential average percentage change was calculated by subtracting the control value from the Twin Block value.

Clinically significant changes (2 per cent and greater) were found in lower anterior (6.6 per cent) and posterior (4.6 per cent) face heights, upper incisor to maxillary plane (4.9 per cent), i.e. upper incisor retraction, and increase in mandibular length (Co–B 3.3 per cent, Co–Po 2.6 per cent, Ar–B 3.5 per cent, Ar–Po 2.2 per cent).

Population	**Klasse-II-Anomalie** Patients with Class II division 1 malocclusions
Schweregrad	overjet>6 mm
Einschluss-kriterien	• overjet>6 mm, • ANB angle >4°, • Availability of before and after cephalometric radiographs.
Ausschluss-kriterien	None of the cases selected had congenital syndromes or obvious asymmetry nor had any prior appliance therapy. .
Intervention	**kieferorthopädische Behandlung** *All the patients were treated by the author using a standardized technique described previously (Trenouth, 1989). This consisted of three phases: first, semi-rapid maxillary expansion and alignment of the upper arch after Mew (1977); secondly, correction of the Class II relationship using a modification of the Twin Block functional appliance introduced by Clark (1982), but with steeper bite blocks and excluding the extra-oral traction and intramaxillary elastics; thirdly, retention with an upper removable appliance with a very steep inclined anterior bit plane.* VERSUCHSGRUPPE: **Twin-block** N= 30 / N=?? (Ende) / Alter = 12y6m (MIN: 9y8m, MAX:17y7m) / ♂:♀ = 14:16 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle	**keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **untreated** N = ??/?? / age and sex matched, keine genauen Angaben • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/DysgnathieSubkategorie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Proportional changes in cephalometric distances *(*ANS-Me, UI-(ANS-PNS), AR-Go, Ar-B, Co-B, Co-Po, Ar-Po, Go-Me, N-ANS, LI-(Go-Me), S-N, Co-A, Ar-A, S-AR*)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The Twin Block appliance produced a combination of mandibular skeletal and maxillary dentoalveolar responses. The Class II relationship was corrected by anterior bodily movement of the mandible with elongation in the region of the condyle and ramus, together with posterior tipping of the upper incisors. Differential average percentage change in linear distances provides an alternativ emehtod to angular changes as a measure of altertion in shape. Both methods produce comparabel results.
Zusammen-fassung der Ergebnisse	**GRUPPE twin-block VS. GRUPPE untreated** ***PRIMÄRZIELGRÖßE*** *The results for actual and percentag change in cephalometric distances are shown in Table 4. The values for the percentage change for the control data (column 3) were a median of 3.3 per cent, range 4.2 per cent. The values for percentage change for the Twin Block patients (column 4) showed a greater variation, median 5.6 per cent, range 8.5 per cent. The differential average percentage change was calculated (column 5) by subtracting the control value (column 3) from the Twin Block value (column 4). For the differential average percentage change, the median was 1.8 per cent, range 7.3 per cent. Clearly some cephalometric distances show a substantial differential aberage percentage change, whilst other distances show little or no change. An arbitrary level of 2 per cent and above was chosen to be considered as clinically significant. The greatest differential aberag percentag change occurred in lower anterior face height (ANS-Me), 6.6 per cent, with substanitial change in lower posterior face height (Ar-Go), 4.6 per cent. The next greatest differential percentage change was in UI-(ANS-PNS), 4.9 per cent, reflecting dento-alveolar retraction of the upper incisors, this distance increasing as they tipped back. Substanitial differential percentage changes also occurred in overall mandibular length measured as 3.3 per cent (Co-B), 2.6 per cent (Co-Po), 3.5 per cent (Ar-B), and 2.2 per cent (Ar-Po). However, mandibular body length (Go-Me) did not show any substantial differential percentage change (1.3 per cent), nor did maxillary length (Co-A = 0.4 per cent) (Ar-A=0.1 per cent). The cranial base paramentes reamined stable (N-ANS=1.1 per cent; S-N=0.5 per cent, S-AR = 0.0 per cent), as did lower incisor position (LI-Go-Me=-0.7 per cent)*
Angaben auffälliger positiver und/oder negativer Aspekte	*Gutes Studiendesign und reliable, valide Durchführung und Auswertung. Keine Powerkalkulation, keine genauen Angaben zur Kontrollstudie. Keine Angaben zum Funding oder zu Interessenkonflikten.* *Die gleiche Studienpopulation wie 2000. Hier nur Prozentuale Änderung und andere Paramenter ausgewertet.*

Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Twin-Block-Apparatur erzeugte eine Kombination von dentoalveolären Reaktionen des Unterkieferskeletts und des Oberkiefers. Die prozentuale Änderung der linearen Abstände bietet eine Alternative als Maß für die Änderung.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Trenouth 2006

Michael J. Trenouth, BSc, BDS, MDS, PhD, FDS, DDO, DOrth[1]

CENTROID ANALYSIS OF TWIN-BLOCK APPLIANCE TREATMENT FOR CLASS II DIVISION 1 MALOCCLUSION

Aim: Centroid points were used as a stable baseline to assess treatment changes in twin-block appliance therapy because of their reduced variance. Method: Cephalometric radiographs were taken before and after treatment with the twin-block appliance on 30 consecutive patients with Class II Division 1 malocclusions. A control group was generated from standard Bolton outlines, with each treated case matched individually for age and treatment time. The center of area of the whole skull, cranium, face, and upper and lower face outlines was calculated. Angular and linear measurements were made for standard cephalometric points relative to the less variable centroid reference points. The results were compared to the natural growth change in the matched control group using a Mann-Whitney U test for statistical significance. Results: The treatment effect was also calculated by subtracting the natural growth change from the treatment change. This was then compared to twice the method error to see if the treatment change was clinically significant. There was both a statistically and clinically significant improvement in the dental base relationship due to a forward mandibular skeletal response and maxillary dentoalveolar retraction of the maxillary incisors. Conclusion: Centroid analysis provided more stable reference points, giving a clearer picture of twin-block appliance outcome. World J Orthod 2006;7:159–164.

Population	**Klasse-II-Anomalie** Patients with Class II division 1 malocclusions
Schweregrad	overjet>6 mm
Einschluss-kriterien	overjet>6 mm, ANB angle >4°, availability of before and after cephalometric radiographs.
Ausschluss-kriterien	None of the cases selected had congenital syndromes or obvious asymmetry nor had any prior appliance therapy. .

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *All the patients were treated by the author using a standardized technique described previously (Trenouth, 1989). This consisted of three phases: first, semi-rapid maxillary expansion and alignment of the upper arch after Mew (1977); secondly, correction of the Class II relationship using a modification of the Twin Block functional appliance introduced by Clark (1982), but with steeper bite blocks and excluding the extra-oral traction and intramaxillary elastics; thirdly, retention with an upper removable appliance with a very steep inclined anterior bit plane.* VERSUCHSGRUPPE: **Twin-block** N= 30 / N=?? (Ende) / Alter = 12y6m (MIN: 9y8m, MAX:17y7m) / ♂:♀ = 14:16 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Behandlung** KONTROLLGRUPPE: **control** N = ??/?? / age and sex matched, Bolton standards • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/DysgnathieSubkategorie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Distance measurements from the craniofacial centroid *(*CFC-B, CFC-UIE, CFC-LIE, CFC-LIA, CFC-Me and CFC-LFC*)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Centroid points are less variable than anatomic points, and therefore make superior reference baselines. 2. The twin-block appliance produced dentoalveolar retraction of the maxillary incisors. This involved tipping about the apex and posterior movement of the incisal edge. 3. The twin-block appliance produced improvement in the dental base relationship by bodily forward movement of the mandible and mandibular incisors.

Zusammen-fassung der Ergebnisse	**GRUPPE twin-block VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** *For the angular measurements to the craniofacial centroid plane (see Table 4), FCL, A-B, and UIE-UIA all showed significant differences from the control group, with treatment effect greater than twice the method error. None of the other parameters showed any clinically significant changes. For distance measurements from the craniofacial centroid (see Table 5), CFC-B, CFC-UIE, CFC-LIE, CFC-LIA, CFC-Me, and CFC-LFC showed statistically significant and clinically significant changes over the control data. The A-B angle decreased relative to the craniofacial centroid plane (treatment effect, -4.3 degrees), demonstrationg an improvement in the dental base relationship. While this angular change indicated an improvement in the relative positions of A to B, it does not indicate whether this is due to movement of A or B or a combinatin of both, distance measurements are necessary to locate the exact position of the change. The improvement in the dental base relatinship was due to a clinically significant increase in CFC-B (treatment effect, 2.95 mm), indicationg a forward movement of the mandible with noch change occurring in the maxilla (CFC-A). This effect was confirmed by the angle FCL to the craniofacial centroid plane (treatment effect, 1.61 mm) indicating forward movement of the upper face centroid. Further evidence of forward mandibular movement relative to craniofacial centroid is the clinically significant increase in CFC-LIE (treatment effect, 2.91 mm) and CFC-Me (treatment effect, 1.85 mm). The only other clinically significant change was in maxillarry incisor angulation, UIE-UIA to craniofacial centroid plane angle (treatment effect, +12.9 degrees), indicating retraction of the incisal edge rather than the apex; CFC-UIA was unchanged.*
Angaben auffälliger positiver und/oder negativer Aspekte	*Gutes Studiendesign und reliable, valide Durchführung und Auswertung. Keine Powerkalkulation, keine genauen Angaben zur Kontrollstudie. Keine Angaben zum Funding oder zu Interessenkonflikten.* *Die gleiche Studienpopulation wie 2000. Hier andere Paramenter ausgewertet. Keine Vollständige Auswertung der Studie möglich, da die Tabellen im pdf file fehlten. Andere Kontrollgruppe?*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Gleiche Aussage wie 2000 und 2002.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Trenouth, Mew et al. 2001

A Cephalometric Evaluation of the Biobloc Technique Using Matched Normative Data

Eine kephalometrische Bewertung der Bioblock-Technik unter Verwendung von normativen Daten

Michael John Trenouth*, John R. C. Mew*, Wyland W. Gibbs*

Abstract

Patients and Method: The outcome of Bioblock treatment was evaluated on 35 patients, 13 male, 22 female, with Class II, Division 1 malocclusions. Cephalometric radiographs were taken before and after treatment. A control group was generated from published normative data in such a way that each treated case was matched individually for age, sex and treatment time. The cephalometric change during treatment was compared to the natural growth change in the matched control group using a Mann-Whitney U-test. The treatment effect was calculated by subtracting the natural growth change from the treatment change. This was then compared to twice the method error to see if the treatment change was clinically significant.

Results: There was both a statistically and a clinically significant reduction in overjet ($p < 0.001$), overbite ($p < 0.001$) and angle ANB ($p = 0.001$) with an increase in angle SNB ($p = 0.001$). None of the other cephalometric parameters measured showed a significant change except for upper incisor proclination ($p = 0.05$) and ArGoMe angle ($p = 0.05$) but these were not clinically significant.

Key Words: Functional appliance · Bioblock technique · Cephalometric analysis · Outcome of treatment · Matched normative data

Zusammenfassung

Patienten und Methode: Anhand prä- und posttherapeutischer Schädelfernröntgenseitenbilder von insgesamt 35 Patienten (13 männliche, 22 weibliche) mit einer Anomalie der Klasse II/1 wurden Ergebnisse der Bioblock-Behandlung bewertet. Aus publizierten normativen Daten wurde eine Kontrollgruppe gebildet, in der jeweils ein Teilnehmer mit einem behandelten Fall hinsichtlich Alter, Geschlecht und Beobachtungszeitraum übereinstimmte. Die während der Behandlungszeit aufgetretenen Änderungen der kephalometrischen Werte wurden mittels eines Mann-Whitney-U-Tests mit den rein wachstumsbedingten Änderungen innerhalb der Kontrollgruppe verglichen. Der Nettobehandlungseffekt wurde berechnet, indem die durch natürlichen Wachstum hervorgerufenen Änderungen von denen, die während der Behandlung aufgetreten waren, subtrahiert wurden. Jeder Wert wurde dann mit dem zweifachen Wert des methodischen Fehlers verglichen, um festzustellen, ob die auf der Behandlung beruhenden Veränderungen von klinischer Bedeutung waren.

Ergebnisse: Eine Reduzierung der sagittalen Frontzahnstufe ($p < 0,001$) und des ANB-Winkels ($p = 0,001$) bei einer Vergrößerung des SNB-Winkels ($p < 0,001$) konnten statistisch und klinisch signifikant nachgewiesen werden. Außer der Achsenstellung der oberen Schneidezähne ($p = 0,05$) und des Winkels ArGoMe ($p = 0,05$), die aber klinisch nicht von Bedeutung waren, wies keiner der anderen beurteilten kephalometrischen Parameter eine signifikante Veränderung auf.

Population	**Klasse-II-Anomalie** The outcome of Biobloc treatment was evaluated on 35 patients, 13 male, 22 female, with Class II, Division 1 malocclusions.
Schweregrad	keine Angabe
Einschluss-kriterien	Class II, Division 1 malocclusion
Ausschluss-kriterien	None of the cases selected was suffering from congenital syndromes or obvious asymmetry nor had had any prior appliance therapy.

Intervention	**kieferorthopädische Behandlung** *Beschreibung der Intervention* VERSUCHSGRUPPE: **biobloc** N=35/35 / Alter = 10,67 ± 13,67 Jahre / ♂:♀ = 13:22 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **control** normative Kontrollgruppe analog zur Behandlungsgruppe gematched. Keine genauen Angaben gemacht. • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Change in cephalometric parameters during treatment (SNA, SNB, ANB, MM, UI, LI, II, OJ, OB, NSAr, SarGo, ArGoMe)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	The Biobloc appliance carries lingual projections which contact only the soft tissues, leaving the patient with no comfortable position other than the desired forwards posture. Thus the mandible is held forwards by reflex posturing and this appears to avoid the retractive effect on the maxilla. The greater skeletal response of the Biobloc appliance over other functional appliances can be explained by its unique design, in particular the mylohyoid locks projecting lingually.
Zusammen-fassung der Ergebnisse	**GRUPPE biobloc VS. GRUPPE control** ***PRIMÄRZIELGRÖßE*** *The treatment change in the Biobloc group was calculated and then compared to the natural growth change in the matched control group derived from normative data (see Table 3). The Mann-Whitney U-test was used to test for statistical significance. The treatment effect was calculated by subtracting the natural growth change from the treatment change. This was then compared to twice the method error to see if the treatment change was clinically significant (Table 3). The overjet was reduced on average by 5.85 mm, which was statistically significant ($p < 0.001$), and the treatment effect was greater than 2 ME. The overbite was significantly reduced by -1.75 mm ($p < 0.001$) but the treatment effect was marginally above 2 ME. Angle ANB showed a significant reduction (-4.19°, $p < 0.001$) with a treatment effect greater than 2 ME. This was entirely due to a statistically significant increase in angle SNB (+4.31°, $p < 0.001$) with treatment effect greater than 2 ME. Angle SNA showed no statistically or clinically significant change. There was a small but statistically significant increase in upper incisor angulation, UI (+2.11°, $p < 0.05$) but the treatment effect was less than 2 ME. Similarly, the decrease in angle ArGoMe was significantly less than the control data (-0.37°, $p < 0.05$) but the treatment effect was less than 2 ME. None of the other cephalometric parameters measured showed any statistically or clinically significant change.*

Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführte Studie, reliable Auswertung. Keine Angabe zum Funding oder zu möglichen Interessenkonflikten. Die Studie wurde nicht verblindet durchgeführt. Keine expliziten Angaben zur Kontrollgruppe.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Bioblock-Apparatur hat eine größere skelettale Wirkung als andere funktionskieferorthopädischen Geräten.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Tsiouli, Topouzelis et al 2017

Perceived facial changes of Class II Division 1 patients with convex profiles after functional orthopedic treatment followed by fixed orthodontic appliances

Kleopatra Tsiouli,[a] Nikolaos Topouzelis,[a] Moschos A. Papadopoulos,[a] and Nikolaos Gkantidis[b]
Thessaloniki, Greece, and Bern, Switzerland

Introduction: The aim of this research was to investigate the perceived facial changes in Class II Division 1 patients with convex profiles after functional orthopedic treatment followed by fixed orthodontic appliances. **Methods:** Pretreatment and posttreatment profile photographs of 12 Class II Division 1 patients treated with activators, 12 Class II Division 1 patients treated with Twin-block appliances, and 12 controls with normal profiles treated without functional appliances were presented in pairs to 10 orthodontists, 10 patients, 10 parents, and 10 laypersons. The raters assessed changes in facial appearance on a visual analog scale. Two-way multivariate analysis of variance was used to evaluate differences among group ratings. **Results:** Intrarater reliability was strong in most cases (intraclass correlation coefficients, >0.7). The internal consistency of the assessments was high (alpha, >0.87), both within and between groups. The raters consistently perceived more positive changes in the Class II Division 1 groups compared with the control group. However, this difference hardly exceeded 1/10th of the total visual analog scale length in its highest value and was mostly evident in the lower face and chin. No significant differences were found between the activator and the Twin-block groups. **Conclusions:** Although the raters perceived improvements of the facial profiles after functional orthopedic treatment followed by fixed orthodontic appliances, these were quite limited. Thus, orthodontists should be tentative when predicting significant improvement of a patient's profile with this treatment option. (Am J Orthod Dentofacial Orthop 2017;152:80-91)

Population	**Klasse-II-Anomalie** Class II Division 1 patients treated with activators, Class II Division 1 patients treated with Twin-block appliances controls with normal profiles treated without functional appliances. All patients/controlls were retrieved from the postgraduate clinic of the Department of Orthodontics of Aristotle University, Greek.
Schweregrad	Class II, more than half cusp in molars bilaterally

Einschluss-kriterien	• full initial and final diagnostic records (medical, dental, and orthodontic histories, panoramic and lateral cephalometric radiographs, dental casts, intraoral and extraoral photographs of good quality and without obvious positional or other errors), • Class II Division 1 malocclusion at the beginning of orthodontic treatment (Class II, more than half cusp in molars bilaterally), • convex profile defined by facial contour angles greater than 15° for males and greater than 17° for females11 at the initial lateral cephalometric radiograph, • mixed dentition at the beginning of orthodontic treatment, • complete treatment with functional (activator or Twin-block) and fixed orthodontic appliances, • nonextraction treatment (excluding third molars), • white origin, and • no craniofacial anomalies, syndromes, clefts, congenitally missing teeth (excluding third molars), severe facial asymmetries, or functional mandibular shift greater than 1 mm.
Ausschluss-kriterien	keine Angabe
Intervention	**kieferorthopädische Behandlung** *keine genauen Angaben* VERSUCHSGRUPPE: **Activator** N=12/12 / Alter = 9,8 (MIN:9,2; MAX:11,2) / ♂:♀ = 6:6 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Intervention	**kieferorthopädische Behandlung** *keine genauen Angaben* VERSUCHSGRUPPE: **Twin-block** N=12/12 / Alter = 10,6 (MIN:9,0; MAX:11,9) / ♂:♀ = 6:6 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=12/12 / Alter = 10,7 (MIN:8,9; MAX:12,9) / ♂:♀ = 6:6 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathieategorie** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: *Facial changes (Change in profile, lower face, upper lip, lower lip and chin)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. According to the raters' assessments, treatment with functional appliances (activator and Twin-block) followed by fixed orthodontic appliances led to slight improvements of patients' convex profile appearance, compared with normal profile patients who were treated without functional appliances. However, this difference was relatively small and clinically questionable. 2. No significant differences were found between patients treated with activator or Twin-block appliance. However, the Twin-block group differed significantly from the controls also in profile and upper lip changes, whereas this was not evident for the activator group. 3. No significant differences were evident among different groups of raters (orthodontists, patients, parents, and laypersons). 4. Raters tended to perceive positive changes from pretreatment to posttreatment mostly at the lower face and the chin regions, where functional treatment aims.
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE Activator/Twin-block** ***PRIMÄRZIELGRÖßE*** *The raters consistently assessed more positive changes in activator and Twin-block groups compared with the control group, and these findings were in most cases statistically significant. However, the magnitude of the difference hardly exceeded 1/10th of the total VAS length in its highest value and was mostly evident in the lower face and the chin. The Twin-block group differed significantly from the controls also in profile and upper lip changes, whereas this was not evident for the activator group (Table VI).*
Angaben auffälliger positiver und/oder negativer Aspekte	*Studiendesign wird ausführlich erklärt und die Valdität/Reliabiltität anhand von Graphen und Tabellen aufgezeigt. Keine Powerkalkulation wurde durchgeführt zudem ist die Fallzahl pro Gruppe mit N=12 relativ klein. Controlgruppe hatte andere Einschlusskriterien als Treatmentgruppe. Keine Angabe zum Funding. Keine Interessenkonflikte der Autoren vorhanden. Interventionsgruppen nicht genau beschrieben.*
Schluss-folgerung des Begutachters	methodische Qualität: wird gut erklärt (90% des Textes und der Graphen) Klinische Aussagekraft: Obwohl Verbesserungen der Gesichtsprofile nach einer funktionellen orthopädischen Behandlung mit anschließender festsitzender kieferorthopädischer Versorgung festgestellt wurden, waren diese recht begrenzt. Daher sollten Kieferorthopäden vorsichtig sein, wenn sie eine Verbesserung des Patientenprofils mit dieser Behandlungsoption vorhersagen.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Tulloch, Phillips et al 1997

The effect of early intervention on skeletal pattern in Class II malocclusion: A randomized clinical trial

J. F. Camilla Tulloch, BDS, FDS, D.Orth.,[a] Caleb Phillips, PhD, MPH,[b] Gary Koch, PhD,[c] and William R. Proffit, DDS, PhD[a]
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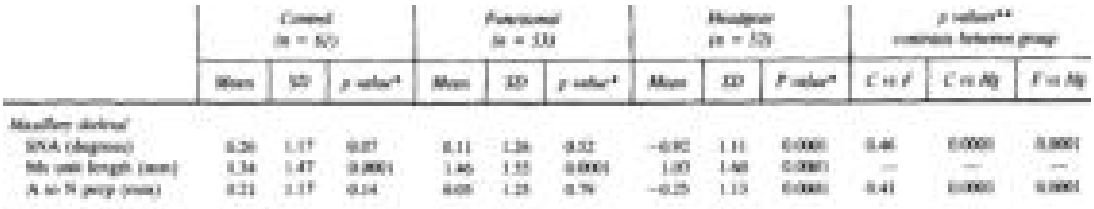
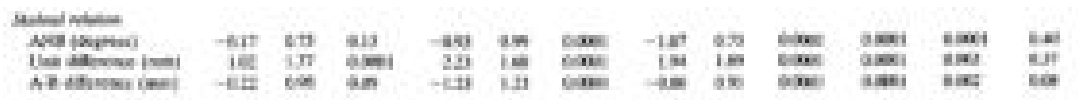
Early treatment for Class II malocclusion is frequently undertaken with the objective of correcting skeletal disproportion by altering the growth pattern. Because the majority of previous studies of growth modification for Class II malocclusion have been based on retrospective record reviews, the efficacy of such an approach has not been well established. In this controlled clinical trial, patients in the mixed dentition with overjet ≥ 7 mm were randomly assigned to either early treatment with headgear, or modified bionator, or to observation. All patients were observed for 15 months with no other appliances used during this phase of the trial. The three groups, who were equivalent initially, experienced statistically significant differences ($p < 0.01$) in skeletal change. There was considerable variation in the pattern of change within all three groups, with about 80% of the treated children responding favorably. Although patients in both early treatment groups had approximately the same reduction in Class II severity, as reflected by change in the ANB angle, the mechanism of this change was different. The headgear group showed restricted forward movement of the maxilla, and the functional appliance group showed a greater increase in mandibular length. The permanence of these skeletal changes and their impact on the subsequent treatment remains to be evaluated. (Am J Orthod Dentofac Orthop 1997;111:391-400.)

Population	**Klasse-II-Anomalien** patients in the mixed dentition were randomly assigned to either early treatment with headgear, or modified bionator, or to observation.
Schweregrad	with overjet _> 7 mm
Einschluss-kriterien	• Overjet -> 7 mm • All permanent incisors and first molars erupted • All permanent teeth (excluding third molars) developing as seen on panoramic radiograph • 1 year prepeak-height velocity as judged from the hand/wrist radiograph
Ausschluss-kriterien	• Congenital syndromes or defects • Obvious facial asymmetry • Extreme vertical disproportion • Prior orthodontic treatment including space maintainers or habit appliance

Intervention	**kieferorthopädische Behandlung** *A combination headgear was used with a supershort outer bow (ending approximately at the mesial of the molar tubes) and adjusted to deliver between 8 and 10 ounces to the headcap and with the neck strap force just sufficient to prevent buccal flaring of the upper molars.* VERSUCHSGRUPPE: **headgear** N=?? (Anfang) / N=52 (Ende) / Alter = 9,4 ± 1,0 Jahre / ♂:♀ = 31:21 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Intervention	**kieferorthopädische Behandlung** *The functional appliance was a modified bionator with the bite taken with 4 to 6 mm of protrusion and minimal vertical opening. Reactivation of the functional appliance, when necessary, was by construction of a new appliance* VERSUCHSGRUPPE: **functional** N=?? (Anfang) / N=53 / Alter = 9,4 ± 1,0 Jahre / ♂:♀ = 30:23 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=?? (Anfang) / N=61 (Ende) / Alter = 9,4 ± 1,2 Jahre / ♂:♀ = 35:26 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Maxillary skeletal (SNA, Mx unit length, A to N perp)* SEKUNDÄRZIELGRÖßE: *Mandibular skeletal (SNB, Md unit length, Pg to N perp)* TERTIÄRZIELGRÖßE: *Skeletal relationship (ANB, Unit difference, A-B difference)* QUARTÄRZIELGRÖßE: *Dental relationship (Overjet, Overbite, Interincisal angle)*
Studientyp	**Randomisiert-kontrollierte Interventionsstudie (RCT)**

Schluss-folgerungen der Autoren	1. The randomized clinical trial is an efficient way to study the impact of early orthodontic treatment. 2. Children with Class II malocclusion experience considerable variation in growth during the preadolescent period, both with and without treatment. 3. Early treatment with either headgear or functional appliance therapy can both reduce the severity of a Class II skeletal pattern. With either approach, there is about a 75% chance of improvement in the jaw relationship. 4. On average, headgear produces greater change in the maxilla, whereas functional appliance therapy produces greater mandibular change, but there is considerable variation in the effect with both appliance systems. 5. Whether these early changes will be sustained and will make a difference in the patients' subsequent management and treatment outcomes remains to be evaluated
Zusammen-fassung der Ergebnisse	**GRUPPE control VS. GRUPPE functional/headgear** ***PRIMÄRZIELGRÖßE***  ***SEKUNDÄRZIELGRÖßE***  ***TERTIÄRZIELGRÖßE***  ***QUARTÄRZIELGRÖßE*** 
Angaben auffälliger positiver / negativer Aspekte	*Gut durchgeführte RCT mit klarer Fragestellung. Funding durch das National Institute of Dental Research and by the Orthodontic Fund. Keine Angaben zu möglichen Interessenskonflikten. Klare Darstellung der Randomisierung*
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> sehr gut
	<u>Klinische Aussagekraft:</u> Die Headgear-Gruppe zeigte eine eingeschränkte Vorwärtsbewegung des Oberkiefers, die functional Gruppe zeigte eine größere Zunahme der Unterkieferlänge.
Evidenz-level (SIGN)	**1++**
Qualität	**High quality ⊕⊕**

Evidenztabelle Tulloch, Proffit et al 2004

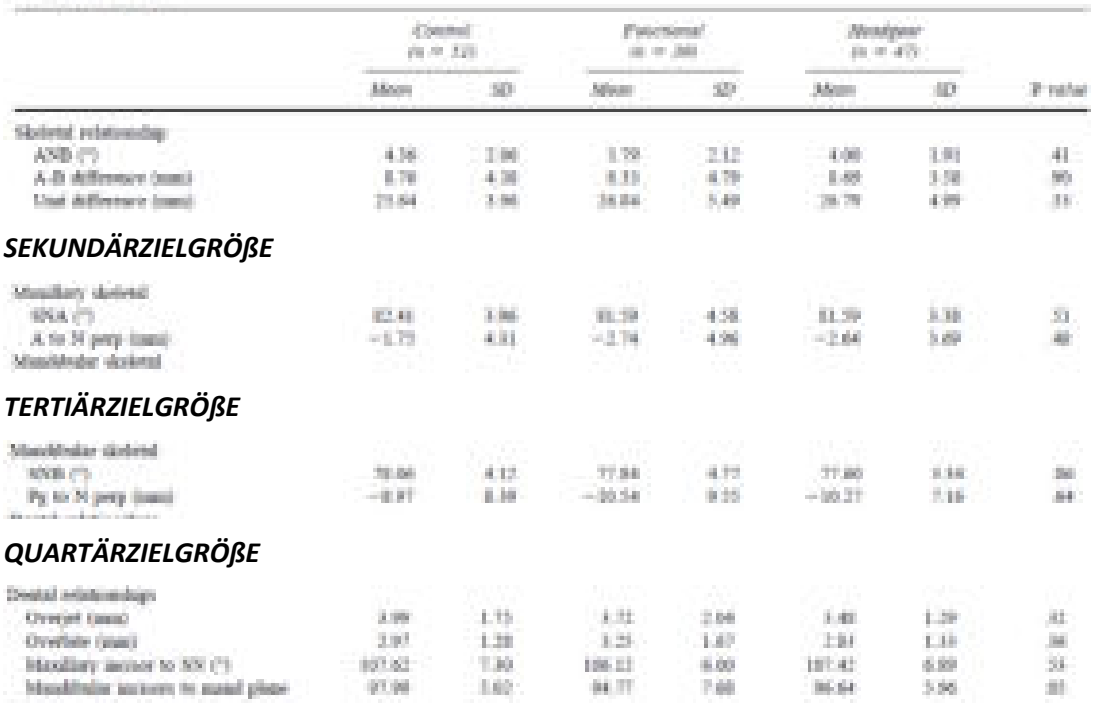
Outcomes in a 2-phase randomized clinical trial of early Class II treatment

J. F. Camilla Tulloch, BDS, FDS, DOrth,[a] William R. Proffit, DDS, PhD,[b] and Ceib Phillips, PhD, MPH[c]
Chapel Hill, NC

In a 2-phased, parallel, randomized trial of early (preadolescent) versus later (adolescent) treatment for children with severe (>7 mm overjet) Class II malocclusions who initially were developmentally at least a year before their peak pubertal growth, favorable growth changes were observed in about 75% of those receiving early treatment with either a headgear or a functional appliance. After a second phase of fixed appliance treatment for both the previously treated children and the untreated controls, however, early treatment had little effect on the subsequent treatment outcomes measured as skeletal change, alignment, and occlusion of the teeth, or length and complexity of treatment. The differences created between the treated children and untreated control group by phase 1 treatment before adolescence disappeared when both groups received comprehensive fixed appliance treatment during adolescence. This suggests that 2-phase treatment started before adolescence in the mixed dentition might be no more clinically effective than 1-phase treatment started during adolescence in the early permanent dentition. Early treatment also appears to be less efficient, in that it produced no reduction in the average time a child is in fixed appliances during a second stage of treatment, and it did not decrease the proportion of complex treatments involving extractions or orthognathic surgery. (Am J Orthod Dentofacial Orthop 2004;125:657-67)

Population	**Klasse-II-Anomalien** follow up der Studie von Tulloch, Phillips et al 1997
Schweregrad	with overjet _> 7 mm
Einschluss-kriterien *Bei Review: PICOS*	• Overjet -> 7 mm • All permanent incisors and first molars erupted • All permanent teeth (excluding third molars) developing as seen on panoramic radiograph • 1 year prepeak-height velocity as judged from the hand/wrist radiograph
Ausschluss-kriterien	• Congenital syndromes or defects • Obvious facial asymmetry • Extreme vertical disproportion • Prior orthodontic treatment including space maintainers or habit appliance

Intervention	**kieferorthopädische Behandlung** *A combination headgear was used with a supershort outer bow (ending approximately at the mesial of the molar tubes) and adjusted to deliver between 8 and 10 ounces to the headcap and with the neck strap force just sufficient to prevent buccal flaring of the upper molars.* VERSUCHSGRUPPE: **headgear** N=?? (Anfang) / N=47 (Ende) / Alter = 9,4 ± 1,0 Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Intervention	**kieferorthopädische Behandlung** *The functional appliance was a modified bionator with the bite taken with 4 to 6 mm of protrusion and minimal vertical opening. Reactivation of the functional appliance, when necessary, was by construction of a new appliance* VERSUCHSGRUPPE: **functional** N=?? (Anfang) / N=39 / Alter = 9,4 ± 1,0 Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **control** N=?? (Anfang) / N=51 (Ende) / Alter = 9,4 ± 1,2 Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Skeletal relationship (ANB, Unit difference, A-B difference)* SEKUNDÄRZIELGRÖßE: *Maxillary skeletal (SNA, Mx unit length, A to N perp)* TERTIÄRZIELGRÖßE: *Mandibular skeletal (SNB, Md unit length, Pg to N perp)* QUARTÄRZIELGRÖßE: *Dental relationship (Overjet, Overbite, Interincisal angle)* QUINTÄRZIELGRÖßE: *PAR Score (PAR Score, extraction rate, surgery rate)* SEXTÄRZIELGRÖßE: *time in fixed appliances (% of group)*
Studientyp	**Randomisiert-kontrollierte Interventionsstudie (RCT)**

Schluss-folgerungen der Autoren	The results of this and other similar trials indicate that early treatment should not be thought of as an efficient way to treat most Class II children. The decision for early treatment should be based on special indications for each child. In a sense, this trial illustrates the risk of relying on clinical impressions, because, in its early stages, we were so impressed with the progress of the children receiving early treatment that we discussed whether it was ethical to deny the control children the apparent benefit of early treatment. In fact, early treatment as a standard of care can be justified only if it will provide additional benefits to the patients. The special indications for early treatment will undoubtedly be clarified as further data become available and as conclusions based on data replace clinical opinions as the basis for determining treatment.
Zusammen-fassung der Ergebnisse	**GRUPPE control VS. GRUPPE functional/headgear** ***PRIMÄRZIELGRÖßE*** Table III. Descriptive statistics for primary outcome cephalometric measures for end of phase 2 for 3 early treatment groups  ***SEKUNDÄRZIELGRÖßE*** ***TERTIÄRZIELGRÖßE*** ***QUARTÄRZIELGRÖßE*** ***QUINTÄRZIELGRÖßE*** *PAR scores at the beginning of phase 1 and end of phase 2 are given in Table IV, and the percentages of children in each group achieving excellent, satisfactory, and less than satisfactory scores are shown in Figure 3. There was no difference in average score at the end of phase 2 (P = .35) or distribution of those achieving excellent, satisfactory, or less than satisfactory scores (P = .59), when comparing the children who had early treatment and those who did not. There was no statistically significant effect related to the orthodontist.* ***SEXTÄRZIELGRÖßE*** *The total length of phase 2 treatment time including interim treatment after phase 1 and the time spent in fixed appliance treatment excluding interim devices ares given in Table V. Comparing the total duration of treatment beyond phase 1, it appears that this was shorter for patients who had had early treatment during phase 1. However, the difference in treatment time including interim appliances between the groups only approached significance (P = .03). When the time in fixed appliances excluding interim treatment is compared (Fig 4), the average is almost identical for the 3 groups (P .20). There were significant sex and orthodontist effects for treatment times with and without interim appliances, with boys generally being treated longer in phase 2.*

Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführte RCT mit klarer Fragestellung. Funding durch das National Institute of Dental Research and by the Orthodontic Fund. Keine Angaben zu möglichen Interessenskonflikten. Klare Darstellung der Randomisierung*
Schluss-folgerung des Begutachters	methodische Qualität: sehr gut
	Klinische Aussagekraft: Eine frühzeitige Behandlung sollte nicht als wirksame Methode zur Behandlung der meisten Kinder mit Klasse II Anomalien angesehen werden. Die Entscheidung für eine frühzeitige Behandlung sollte auf speziellen Indikationen für jedes Kind beruhen
Evidenz-level (SIGN)	**1++**
Qualität	**High quality ⊕⊕**

Evidenztabelle Tumer, Gultan 1999

Comparison of the effects of monoblock and twin-block appliances on the skeletal and dentoalveolar structures

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Functional appliances, which are used in the early treatment period of skeletal Class II malocclusions, induce the forward displacement of the mandible by altering the postural activity of the muscles and causing some changes in both skeletal and dentoalveolar structures. The purpose of this investigation was to evaluate the differences between monoblock and twin-block appliances. Two treatment groups composed of 26 growing patients with skeletal and dental Class II, Division 1, malocclusions, were compared to an untreated control group of 13 patients with the same morphologic characteristics and growth rate. These groups were matched according to their age, sex, and vertical and sagittal skeletal cephalometric and dental characteristics. Monoblock was worn by the subjects for 16 hours/day, whereas twin-block was worn 24 hours/day, even while eating. Patients of the control group were followed without any intervention. Treatment effects were identified with a conventional cephalometric analysis. The findings of this study revealed that by using these different functional appliances, the stimulation of the growth of the lower jaw and the correction of Angle Class II relationship were achieved. In the twin-block group, the mandibular plane angle and gonial angle increased, although a decrease in the degree of overbite occurred. In the monoblock group, upper incisors demonstrated a greater degree of retrusion. However, within the twin-block group, the lower incisors showed a greater degree of proclination. (Am J Orthod Dentofacial Orthop 1999;115:460-8)

Population	**Klasse II Anomalien** This study consists of 39 cases with Angle Class II, Division 1
Schweregrad	ANB angles greater than 4°
Einschluss-kriterien	• malocclusions with ANB angles greater than 4°, • a component of mandibular deficiency, • a sagittal Class II skeletal type and an optimal mandibular plane angle. • These patients were at a level of maximum pubertal growth.
Ausschluss-kriterien	keine Angabe
Intervention	**kieferorthopädische Behandlung** *The patients were instructed to wear the monoblock for 16 hours/day* VERSUCHSGRUPPE: **monoblock** N=13/13 / Alter = 11,9 ± 1,23 Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Intervention	**kieferorthopädische Behandlung** *The patients were instructed to wear the twin-block for 24 hours/day* VERSUCHSGRUPPE: **twin-block** N=13/13 / Alter = 11,5 ± 0,99 Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=13/13 / Alter = 12,7 ± 1,09 Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Skeletal Changes *(N-S-Ar, S-N-A , SN/ANS-PNS , Co-ANS , A-N-B , N-A-Pg , ANS-PNS/Go-Gn , SNB , SN/Go-Gn , Ar-Go-M , Ar-Go , Co-Pg , Go-M , N-ANS , ANS-M , N-M, S-Go)* SEKUNDÄRZIELGRÖßE: Dentoalveolar Changes *(Overjet 9, Overbite , U6^ANS-PNS , U1^ANS-PNS , L6^Go-M , L1^Go-M , U6^Ptv , L6^Ptv, U1^Ptv, L1^Ptv, U1/SN, L1/Go-Gn, U1/L1)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. The stimulation of mandibular growth and the correction of the Angle Class II relationship were achieved. 2. Particularly in the twin-block group, the SNA and Co-ANS values decreased, mandibular plane angle and gonial angle increased, and a decrease in the degree of over-bite occurred. 3. Within both treatment groups, facial convexity and overjet decreased, a distal movement of the upper molars and the mesialization of the lower molars was observed. 4. In the monoblock group, upper incisors demonstrated a greater degree of retrusion and the interincisor angle increased. However, within the twin-block group the lower incisors showed a greater degree of protrusion.

Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE monoblock/twinblock** ***PRIMÄRZIELGRÖßE*** *Reduction in the anteroposterior apical base discrepancy via an angular assessment of ANB angle was observed in both treatment groups (Tables II and III). The distance of Co-ANS increased in all groups during the research period but showed the smallest amount of increase in the twin-block group (Table III). SNB angle increased in both of the treatment groups and showed significant differences compared with the controls (Table III). At the beginning of the treatment, the profiles of the monoblock group were straighter than twin-block group compared with the controls (Table I). At the end of the treatment, both of the treatment groups showed statistically the same degree of profile convexity compared with the control group. The facial convexity angle of both treatment groups increased, but this increase in the twin-block group was more pronounced (Tables II and III). The mandibular plane angle (SN/GoGn) increased only in the twin-block group during the study period. The increase in this group showed significant differences compared with the other groups (Table III). The gonial angle increased significantly only in the twin-block group. This increase showed a significant difference between the twin-block group and the control group (Table III). The effective mandibular length demonstrated a significant increase only in the treatment groups during the study period. The differences between monoblock and control group and the differences between twinblock and control group were found to be significant(Table III).* ***SEKUNDÄRZIELGRÖßE*** *At the end of the treatment, a significant decrease in the degree of overjet was seen within both treatment groups, whereas a significant decrease in the overbite was only seen in the twin-block group (Table III). The distance from the distal outline of the lower first molar to the pterygoid vertical line showed a significant increase in the treatment groups (Table III). Within both treatment groups, the distance between upper incisors and pterygoid vertical decreased, whereas the distance between lower incisors and pterygoid vertical demonstrated a significant amount of increase (Table III). Although the inclination of lower incisors showed an increase in both of the treatment groups, the only significant change was observed in the twin-block group. A significant decrease in the inclination of upper incisors was seen in both of the treatment groups (Table III). The interincisal angle showed a significant increase only in the monoblock group compared with the others (Table III).*
Angaben auffälliger positiver und/oder negativer Aspekte	*Gute durchgeführte Kohortenstudie. Allerdings keine Powerkalkulation und keine Verblindung. Keine Angabe von Geschlechterverteilungen innerhalb der Gruppen. Interventionen kaum beschrieben. Keine näheren Angaben zum Patientenscreening. Keine Angabe bon Konfidenzintervallen. Unterschiedliche Beobachtungszeiträume.*
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Ergebnisse der Studie zeigten, dass durch die Verwendung beider Apperaturen die Stimulierung des Unterkieferwachstums und die Korrektur der Klasse-II-Anomalie erreicht wurden
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Tuncer, Kaygisiz et al. 2009

Pharyngeal airway dimensions after chin cup treatment in Class III malocclusion subjects

B. BALOŞ TUNCER, E. KAYGISIZ, C. TUNCER & S. YÜKSEL *Department of Orthodontics, Faculty of Dentistry, Gazi University, Ankara, Turkey*

SUMMARY The objective of this study was to examine if chin cup therapy have any adverse effect on the sagittal pharyngeal dimensions in Class III malocclusion patients. Twenty patients (10 girls and 10 boys; mean age 10·11 ± 1·15 years) with skeletal Class III malocclusion, and an untreated control group (8 girls and 10 boys, mean age 9·89 ± 1·95 years) were evaluated. The chin cup appliance and an occlusal bite plate with 600 grams totally was used for 9·78 ± 0·93 months. Linear, angular and area measurements were evaluated on the cephalometric radiographs taken before and after observation and treatment periods. Treatment changes showed significant increases in maxillary forward position, effective length of the maxilla and the mandible, and vertical facial height measurements. The mandible showed a clockwise rotation revealed by the decrease in SNB and the increase in mandibular plane angles. Significant increase in the nasopharyngeal area was found when the treatment and control groups were compared. The nasopharyngeal airway area was affected by chin cup treatment, without any adverse effect on the pharyngeal airway dimensions in the short term.

KEYWORDS: pharyngeal airway dimension, class III malocclusion, chin cup therapy

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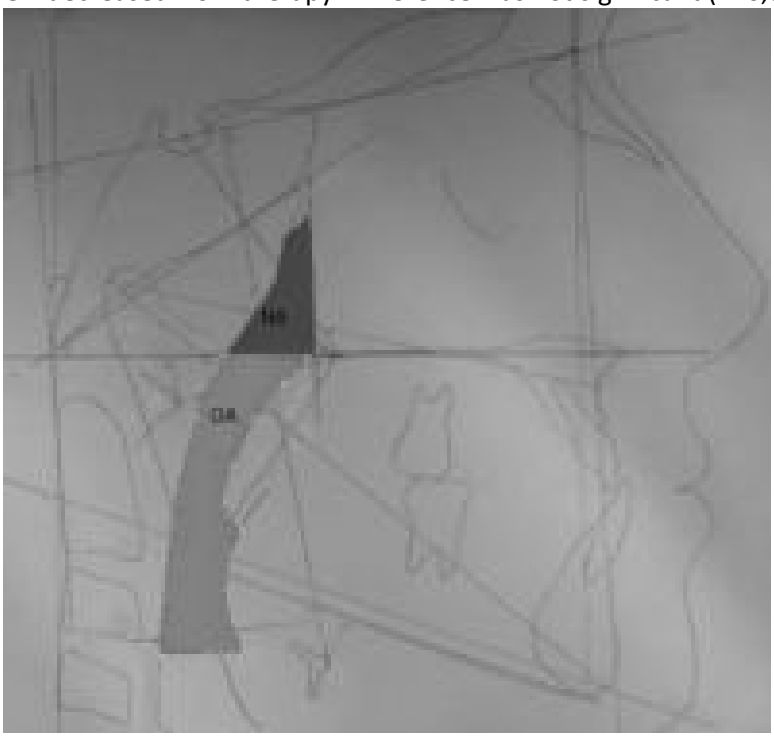
Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Children with skeletal and dental Class III malocclusion with mandibular prognathism without a forward functional displacement optimal mandibular plane angle, and no congenital anomalies in the medical history • Turkey
Schweregrad	Nicht spezifiziert
Einschluss-kriterien	Children with: skeletal and dental Class III malocclusion with mandibular prognathism; without a forward functional displacement; optimal mandibular plane angle, and no congenital anomalies in the medical history
Ausschluss-kriterien	congenital anomalies in the medical history

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **CC+ BP**: Chin cup and an occlusal bite plate on the lower arch with a minimum thickness sufficient to open the bite to an edge-to-edge incisal position, were selected. The magnitude of the force exerted by chin cup was 600 g totally. The patients were instructed to wear the appliance 14–16 h a days VERSUCHSGRUPPE 1: **CC+ BP** N= 20(Anfang) / N=20 (Ende) / Alter = 10,3 ± 1,1 / ♂:♀ = 10:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** N=18 (Anfang) / N=18 (Ende) / Alter = 9,9 ± 1,5 / ♂:♀ = 10:8 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** **und** **medizinischer Schaden, Nebenwirkungen** **bzw. Zunahme der Anomalie /Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen PRIMÄRZIELGRÖßE: Nasopharyngal area: Nasopharyngal Area (NA), Oropharnygal Area (OA) SEKUNDÄRZIELGRÖßE: Skeltal: SAN, SNB, ANB
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	**Significant increase in the nasopharyngeal area** was found when the treatment and control groups were compared. **The nasopharyngeal airway area was affected by chin cup treatment, without any adverse effect** on the pharyngeal airway dimensions in the short term. During chin cup treatment the mandible showed a **clockwise rotation revealed by the decrease in SNB**

Zusammen-fassung der Ergebnisse	**GRUPPE CC+ BP VS. GRUPPE untreated Class III** T1 (pre-treatment): mean age 10,3 years; CC+BP O1 (observation): mean age 9,9 years; Control) T2 (post-treatment): mean age 11,1 vears ; CC+BP O2 (observation): mean age 10,8; Control Nasopharyngal Area (NA) Oropharnygal Area (OA) *NA* NA: Difference T1-T2 (mean, SD) 9091, 183 ; O1-O2 (mean, SD) -1092, 159, P=0,036 CC+BP vs. Control OA OA: Difference T1-T2 (mean, SD) 22081, 4031 ; O1-O2 (mean, SD) 30312, 3470, P=0,396 CC+BP vs. Control NA measurement was increased in the treatment group with a significance of P=0,036 OA decreased from therapy. Difference was not significant (P=0,396)  SNA, SNB, ANB Measurements | Differences (T2-T1) | s.d. | Differences (O2-O1) | s.d. | P-value Skeletal morphology SNA (°) | 1·96 | 2·01 | 0·71 | 1·28 | 0·128 SNB (°) | −1·10 | 1·27 | 2·36 | 2·48 | 0·000 ANB (°) | 1·90 | 1·29 | −0·39 | 0·86 | 0·000

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe ist umfassend geprüft und die Unterscheide irrelevant für das Outcome. Die retrospektive Studie hat ein akzeptables Risiko für Selection Bias. Insgesamt akzeptable Studie. Die klinische Relevanz ist gegeben. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN): Prospektive Studie. Äquivalenz der Gruppen gegeben. Keine Power Berechnung durchgeführt.*
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft Insgesamt akzeptabel. Die klinische Relevanz ist gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable** (+)

Evidenztabelle Turkkahraman, Sayin 2006

Effects of activator and activator headgear treatment: comparison with untreated Class II subjects

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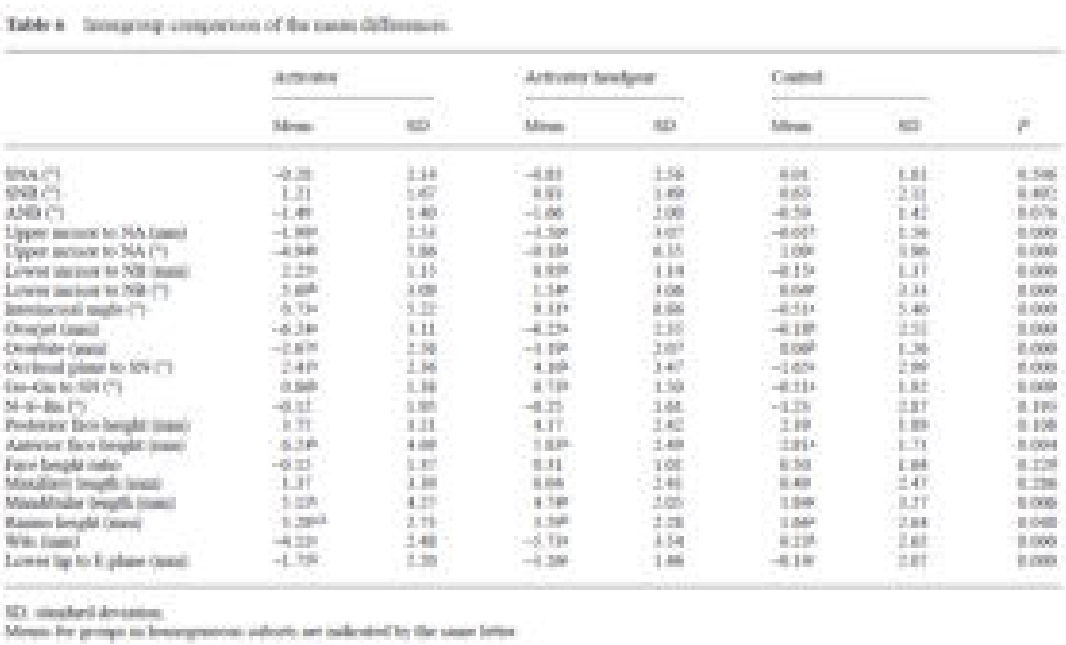
SUMMARY The aims of this study were to determine whether the activator and activator headgear encourage mandibular growth, and whether there is any superiority of one appliance over the other or if the resultant changes are due to normal growth. Forty-nine skeletal Class II division 1 patients were selected. Thirty-three (13 females, 20 males; mean age 12.52 ± 1.42 years) were treated with an Andresen activator and the remaining 16 (7 females, 9 males; mean age 13.04 ± 1.47 years) with an activator headgear combination. Twenty Class II subjects (9 females, 11 males; mean age 12.57 ± 1.11 years) who had previously refused treatment served as a control group. Cephalometric landmarks were marked and digitized by one author to avoid inter-observer variability. Nine angular and 12 linear measurements were established and measured using Vistadent™ AT software. A paired-sample t-test and an ANOVA test were used to statistically evaluate the findings.

The results revealed that both the activator and the activator headgear combination significantly ($P < 0.001$) encouraged mandibular growth, but had little restraining effect on the maxilla. The mandibular incisors were more controlled in the activator headgear combination group. The resultant skeletal, dentoalveolar and soft tissue changes differed significantly from those due to growth.

Population	**Klasse-II-Anomalie** skeletal Class II division 1 patients
Schweregrad	keine Angabe
Einschluss-kriterien	• no previous orthodontic treatment, • treatment with an activator or activator headgear combination, • no additional fixed appliances and • acceptable co-operation
Ausschluss-kriterien	keine Angabe
Intervention	**kieferorthopädische Behandlung** *Andresen activator. The patients were advised to wear the appliances for at least 16 hours per day.* VERSUCHSGRUPPE: **activator** N=33/33 / Alter = 12,52 ± 1,42 Jahre / ♂:♀ = 20:13 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Intervention	**kieferorthopädische Behandlung** *The activator appliance consisted of a bimaxillary block of acrylic with an upper labial bow (0.7 mm) and Adams' clasps on the maxillary molar teeth. The incisal third of the lower incisors were capped with acrylic to avoid extreme labial tipping. Headgear tubes were incorporated into the interocclusal acrylic in the premolar area. The construction bite was taken with the mandible protruded in an edge-toedge incisor relationship and the inter-occlusal space was increased to 5–7 mm. In patients with large overjets, two step activation was performed. High-pull extraoral forces of approximately 300 to 400 g per side were used. The patients were advised to wear the appliances for at least 16 hours per day.* VERSUCHSGRUPPE: **activator headgear** N=16/16 / Alter = 13,04 ± 1,47 Jahre / ♂:♀ = 9:7 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=20/20 / Alter = 12,57 ± 1,11 Jahre / ♂:♀ = 11:9 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie Subkategorie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Maxillary skeletal (SNA, Maxillary length)* SEKUNDÄRZIELGRÖßE: *Mandibular skeletal (SNB, Mandibular length, Ramus height)* TERTIÄRZIELGRÖßE: *Skeletal relationship (ANB, Wits, Go-Gn to SN, N-S-Ba, face height)* QUARTÄRZIELGRÖßE: *Dental relationship (Upper Incisor to NA, Lower incisor to NB Overjet, Overbite, Interincisal angle, Occlusal plane to NS)* QUINTÄRZIELGRÖßE: *Soft tissue changes (lower lip to E plane)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Both the activator and activator headgear combination encouraged signifi cant mandibular growth but had little restraining effect on maxillary growth. 2. Retroclination of the maxillary incisors and proclination of the mandibular incisors were inevitable results of using both appliances. However, the mandibular incisors were better controlled in the activator headgear combination group. 3. The resultant skeletal, dentoalveolar and soft tissue changes signifi cantly differed from those of normal growth.

Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE activator/activator headgear** 
Angaben auffälliger positiver und/oder negativer Aspekte	*Studiendesign und Durchführung gut. Keine Verblindung und Powerkalkulation. Die Auswertung ist unüberschaubar, da nicht klar gegliedert (siehe Tabelle 6). Keine Angaben zum Funding oder möglichen Interessenkonflikten. Große Unterschiede in der Gruppengröße und in der Beobachtungszeit zwischen Treatment und untreated-Gruppe.*
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> gut
	<u>Klinische Aussagekraft:</u> Die durch die Aktivatoren resultierenden Skelett-, Dentoalveolar- und Weichteilveränderungen unterschieden sich signifikant von denen aufgrund von Wachstums.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Ucem, Ucuncu et al. 2004

ORIGINAL ARTICLE

Comparison of double-plate appliance and facemask therapy in treating Class III malocclusions

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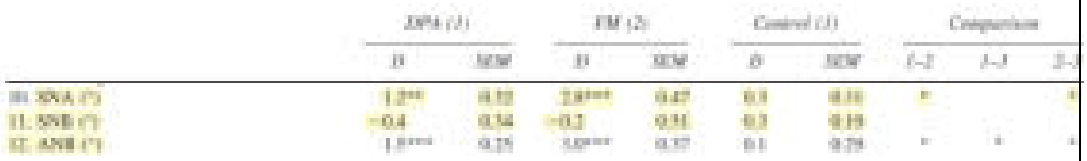
The aim of this study was to compare the effects of the double-plate appliance (DPA) and the facemask (FM) in treating skeletal Class III malocclusions. Data were based on the pretreatment and posttreatment lateral cephalograms of 28 subjects with skeletal and dental Class III malocclusions. In the first group (7 girls, 7 boys; mean age, 10 years 3 months), each subject wore a DPA with 2 Class III elastics, which exerted a force of 350-400 g day and night except for meals. In the second group (7 girls, 7 boys; mean age, 10 years 5 months), each subject wore a Delaire-type FM with a removable intraoral appliance with a total force of 600 g. The patients were instructed to wear the appliance approximately 14 hours a day. An untreated control group (6 girls, 8 boys; mean age, 9 years 8 months) was formed that matched the treatment groups according to sagittal skeletal and dental classifications. Thirteen angular and 14 linear measurements were evaluated. The increase in ANB angle and the decrease in maxillomandibular differential in the treated groups showed significant differences compared with the control group ($P < .05$). The increases in ANB and SNA angles in the FM group were significantly greater than in the DPA group ($P < .05$). The increases in lower facial height and Me-ANS in the FM group were significantly different compared with the other groups ($P < .05$). The overjet increased significantly in both treatment groups ($P < .001$), but, in the DPA group, overjet was significantly greater than in the FM group ($P < .05$). Protrusion of the maxillary incisors and retrusion of the mandibular incisors in the DPA group showed significant differences compared with the other groups ($P < .05$). (Am J Orthod Dentofacial Orthop 2004;126:672-9)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Children with skeletal and dental ClassIII malocclusion: maxillary retrusion or a combination of maxillary retrusion and mandibular protrusion Turkey
Schweregrad	Nicht spezifiziert
Einschluss-kriterien	Children with: Skeletal Class III malocclusions due to maxillary retrusion or a combination of maxillary retrusion and mandibular protrusion
Ausschluss-kriterien	- not fullfilling inclusion criteria

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **DPA, Double plate appliance:** Construction bites were taken without sagittal activation and with a 5-6 mm vertical opening at the molar region. The appliances had modified Adams clasps at the molar region and labial bows with hooks for Class III elastics. At the beginning of treatment and every 3 weeks during treatment, 2 mm was trimmed from the posterior region of the lower angulated acrylic block and the anterior region of the upper angulated acrylic block to facilitate free sliding. DPAs were worn day and night except for meals, with 2 Class III elastics that exerted a force of 350-400 g. **FM Del, Delaire type Facemask:** Delaire-type FM with a removable intraoral appliance was used with a total force of 600 g and the patients were instructed to wear it approximately 16 hours a day. The removable intraoral appliance had 2 Adams clasps at the molars, 2 ball clasps, a labial bow, and 2 hooks at the anterior region for extraoral elastics. VERSUCHSGRUPPE 1: **DPA** N= 14(Anfang) / N=14 (Ende) / Alter = 10,25 / ♂:♀ = 7:7 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung VERSUCHSGRUPPE 2: **FM, Del** N= 14(Anfang) / N=14 (Ende) / Alter = 10,4 / ♂:♀ = 7:7 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **und** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/** KONTROLLGRUPPE 1 : **Untreated Class III** N=14 (Anfang) / N=14 (Ende) / Alter = 9,7/ ♂:♀ = 8:6 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB SEKUNDÄRZIELGRÖßE: Dental: overjet
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	- Both appliances were effective in the dental and skeletal treatment of subjects with Class III malocclusions. - The increase in **overjet was significantly greater in the DPA** group compared with the FM group due to the changes of maxillary and mandibular incisor positions. - Sagittally, **skeletal changes were greater in the FM group**. The dental contribution to Class III treatment seemed to be greater in the DPA group, but, at the same time in this group, vertical dental and skeletal changes were more satisfying.
Zusammen-fassung der Ergebnisse	**GRUPPE DPA VS. GRUPPE Untreated Class III** **GRUPPE FM, Del VS. GRUPPE Untreated Class III** T1, O1 (pre-treatment): mean age 10,25 years, DPA; 10,4 years FM Del; 9,7 years, Control T2, O2 (post-treatment):): mean age 11,0 years, DPA; 11,2 years FM Del; 10,6 years, Control Skeletal SNA, SNB, ANB  Dental Overjet  *D*, mean differences; *SEM*, standard error of mean differences. $^{*}P < .05$. $^{**}P < .01$. $^{***}P < .001$.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe ist umfassend geprüft, allerdings bestehen vor Behandlungsbeginn bereits signifikante, relevante Unterschiede (Overjet) zwischen den beiden Versuchsgruppen. Die retrospektive Kohortenstudie Studie hat insgesamt aber ein akzeptables Risiko für Selection Bias. Insgesamt akzeptable Studie mit, aufgrund der fehlenden Sample Size/ Power Berechnung und der kleinen Gruppengrößen sowie der nicht vollständigen Äquivalenz der beiden Versuchsgruppen, jedoch eingeschränkter klinischer Relevanz. *Funding: keine Angabe* *Interessenkonflikte:* keine Angabe *Bias (SIGN): Insgesamt akzeptable Durchführung. Die Vergleichbarkeit der Untersuchungsgruppen wurde geprüft ist aber eingeschränkt.* Insgesamt akzeptable Studie mit, aufgrund der fehlenden Sample Size/ Power Berechnung und der kleinen Gruppengrößen sowie der nicht vollständigen Äquivalenz der beiden Versuchsgruppen, jedoch eingeschränkter klinischer Relevanz.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Eingeschränkt gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Akzeptabel (+)**

Evidenztabelle Ulger, Arun et al 2006

The role of cervical headgear and lower utility arch in the control of the vertical dimension

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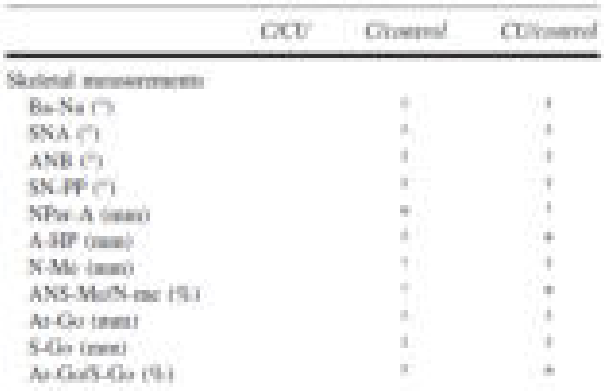
Introduction: This study was carried out to evaluate the treatment changes in skeletal and dental parameters in growing patients. **Methods:** The sample consisted of 24 subjects with Class II Division 1 malocclusion. Half of the patients were treated with cervical headgear alone (group C, n = 12), and the other half received a combination of cervical headgear and lower utility arch (group CU, n = 12). The treatment groups were compared with a matched untreated control group (n = 12). The mean ages of the subjects at the beginning of the study were 8.85 ± 1.19 years in group C, 9.23 ± 0.76 years in group CU, and 8.62 ± 0.78 years in the control group. The cervical headgear was used with an expanded inner bow and a 15° to 20° upward bend of the longer outer bow, worn 12 to 14 hours a day, with a force of 450 to 500 g per side. The lower utility arch was designed as described in the bioprogressive technique. Treatment changes were assessed on lateral cephalometric radiographs. **Results:** The cervical headgear produced Class II correction through maxillary orthopedic and orthodontic changes. Anterior face height increased more in the treatment groups than in the control group. The treatment groups also displayed statistically significant increases in ramus height. Due to these effects, mandibular plane orientation stayed relatively unchanged. There was no opening rotation of the mandible in the treatment groups. The lower utility arch produced intrusion and lingual tipping of the mandibular incisors and distal tipping without extrusion of the mandibular molars. The treatment groups showed significant anterior descents of the palatal plane. Maxillary molar total extrusion produced by cervical headgear treatment was an average of no more than 1 mm as compared with the control group. The utility arch did not appear to influence mandibular rotational response. (Am J Orthod Dentofacial Orthop 2006;130:492-501)

Population	**Klasse-II-Anomalien**
Schweregrad	excessive overjet
Einschluss-kriterien	The criteria for patient selection were: (1) skeletalClass II Division 1 malocclusion with normal maxillary base or tendency of maxillary prognathism, (2) normal or hyperdivergent vertical growth pattern, (3) prepubertal growth spurt, (4) excessive overjet, and (5) acceptable tooth alignment in the mandibular arch.
Ausschluss-kriterien	keine Angabe

Intervention	**kieferorthopädische Behandlung** *In group C the patients were treated with cervical headgear alone. All subjects received cervical headgear. The inner bows of the facebow were expanded 8 to 10 mm, and the outer bows were bent upward 15° to 20° to the inner bows. The force applied was 450 to 500 g per side. Patients were urged to wear the appliance 12 to 14 hours a day. The expansion of the inner bow, the upward bending of long outer bow, and the amount of traction force were checked and adjusted at every appointment. Average treatment time: 1,43 ± 0,13 years.* VERSUCHSGRUPPE: **cervical headgear (C)** N=12 / Alter = 8,85 ± 1,19 Jahre / ♂:♀ = 6:6 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: reguläre kieferorthopädische Behandlung
Intervention	**kieferorthopädische Behandlung** *In group CU the patients were treated with a combination of cervical headgear and lower utility arch. All subjects received cervical headgear. The inner bows of the facebow were expanded 8 to 10 mm, and the outer bows were bent upward 15° to 20° to the inner bows. The force applied was 450 to 500 g per side. Patients were urged to wear the appliance 12 to 14 hours a day. The expansion of the inner bow, the upward bending of long outer bow, and the amount of traction force were checked and adjusted at every appointment. The lower utility arch was used as described in the bioprogressive technique.5 According to Ricketts,5 the lower utility arch is prepared with 30° to 40° tip-backs and toe-in bends, and 30° to 40° buccal root torque on the distal ends. This appliance also required 5° to 10° labial root torque on the mandibular incisors, applied with an expanded arch form. Average treatment time: 1,48 ± 0,11 years.* VERSUCHSGRUPPE: **cervical headgear and lower utility arch (CU)** N=12 / Alter = 9,23 ± 0,76 Jahre / ♂:♀ = 5:7 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: reguläre kieferorthopädische Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated group** N=12 / Alter = 8,62 ± 0,78 Jahre / ♂:♀ = 4:8 • Gebissphase: frühes, spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Skeletal measurements (Ba-Na, SNA, ANB, SN-PP, NPer-A, A-HP, N-Me, ANS-Me/N-me, Ar-Go, S-Go, Ar-Go/S-Go)* SEKUNDÄRZIELGRÖßE: *dental measurements (Overjet, U6-XP, U6-XP, U6-YP, L6-XiPm, L1-XiPm, L1-XiPm, L6-ZP, L1-ZP)*
Studientyp	**Beobachtungsstudie (Kohorten- oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. Orthopedic cervical headgear wear produced Class II correction through maxillary orthopedic and orthodontic changes. 2. The treatment groups showed significant reductions in maxillary protrusion and significant increases in the anterior descent of the PP. 3. Increases in anterior face height had higher values in the treatment groups than in the control group. The treatment groups also had statistically significant rates of increase in ramus height. As a result, mandibular plane orientation was relatively unchanged. 4. Cervical headgear treatment caused maxillary molar extrusion less than 1 mm compared with the eruption during growth and development. Opening rotation of the mandible was lacking in both treatment groups. 5. The maxillary molars were moved distally and tipped mesially in both treatment groups. 6. The lower utility arch produced mandibular incisor intrusion, retrusion, and lingual tipping. The mandibular molars tipped distally without extrusion. The lower utility arch did not appear to influence the mandibular rotational response
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE C/CU** ***PRIMÄRZIELGRÖßE***  ***SEKUNDÄRZIELGRÖßE*** 
Angaben auffälliger positiver und/oder negativer Aspekte	*Gutes Studiendesign und Durchführung. Keine Kontrolle der Reliabilität der Messung, keine Verblindung der Auswerter (Detection bias). Keine Angabe der Teilnahmerate (Selection bias). Keine Angabe möglicher Störfaktoren.*
Schluss-	methodische Qualität: gut

folgerung des Begutachters	Klinische Aussagekraft: Headgears bewirken eine Korrektur der Klasse II Anomalie durch kieferorthopädische und kieferorthopädische Veränderungen-
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Ulusoy, Bavbek et al 2014

Evaluation of airway dimensions and changes in hyoid bone position following class II functional therapy with activator

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Abstract

Aim. The aim of this study was to evaluate the long-term effects of Class 2 functional treatment on airway dimensions and positional changes in hyoid bone and compare it with that of an untreated Class 2 control group. *Methods.* Lateral cephalograms of 16 patients (eight girls, eight boys, mean chronological age = 11.36 ± 0.77 years) who were treated with activator and 19 patients (11 girls, eight boys, mean chronological age = 12.14 ± 0.65 years) who served as control were used for linear, angular and area measurements regarding airway track and hyoid bone. *Statistics.* Intra-group comparisons were performed by paired *t*-test and Wilcoxon test, whereas independent *t*-test and Mann Whitney-*U* were used for inter-group comparisons. *Results.* During treatment (T2–T1), nasopharyngeal height and nasopharyngeal area increased ($p < 0.05$) and hyoid bone moved downward (H-SN; $p < 0.001$) and forward (H-C3; $p < 0.01$). During retention period (T3–T2), nasopharyngeal ($p < 0.01$) and oropharyngeal area increased ($p < 0.05$). H-SN ($p < 0.01$) and C3-H distances ($p < 0.05$) increased. Hyoid bone position exhibited significant changes (H-SN, $p < 0.001$; C3-H, $p < 0.01$). The increases in C3-H in long-term was more in the activator group than control ($p < 0.05$). *Conclusions.* In growing Class 2 patients with mandibular deficiency and airway track without obstructions, functional appliance treatment provided favorable effects on nasopharyngeal and oropharyngeal area throughout the retention period.

Population	**Klasse-II-Anomalien** This retrospective study consisted of lateral cephalograms of skeletal Class 2 subjects with mandibular retrognathia which were selected from the archives of Gazi University Department of Orthodontics.
Schweregrad	Increased overjet (>5 mm)
Einschluss-kriterien	(1) Skeletal (ANB >5°) and dental Class II malocclusion with retrognathic mandible (SNB <80°), (2) Increased overjet (>5 mm) with no functional shift or dual bite, (3) Optimal mandibular plane angle (SN/GoGn:32 ± 6°), (4) No congenital anomalies, (5) No medical history about a respiratory problem or an upper airway surgery, (6) Presence of good quality lateral cephalograms taken at natural head position (NHP) and hand and wrist radiographs at the beginning and at the end of treatment and observation periods, (7) Written informed consent forms, medical and dental records present, and (8) Treated only with activator, no combination with expansion, servical or occipital headgear.
Ausschluss-kriterien	keine Angabe

Intervention	**kieferorthopädische Behandlung** *The activator group was treated only with activator that was constructed with 5–7 mm sagittal and 4–5 mm vertical activation for an average of 11 ± 3.4 months. The patients were instructed to use the appliance for 16–18 hours per day and active treatment was ended when a Class I molar relationship and ideal overjet (2–3 mm) were achieved. After active treatment phase patients were enrolled in a retention phase with a mean follow up time of 29.75 ± 5.17 months. Retentions were performed by night-time wearing of the appliances.* VERSUCHSGRUPPE: **activator** N=16/16 / Alter = 11,36 ± 0,77 Jahre / ♂:♀ = 8:8 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=19/19 / Alter = 12,14 ± 0,65 Jahre / ♂:♀ = 8:11 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathieategorie** • **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *Nasopharynx (S-PNS, ad1-PNS, Ad2-PNS, Nasopharyngeal area)* SEKUNDÄRZIELGRÖßE: *Oropharynx (SPS, ve-Pve, MPS, IPS Oropharyngeal area)* TERTIÄRZIELGRÖßE: *Hyoid bone (H-SN, C3-H)* QUARTÄRZIELGRÖßE: *Head posture (SNCVT, SNOPT)* QUINTÄRZIELGRÖßE: *Skeletal morphology (SNA, SNB, ANB, CoA, CoGn, SNGoGn)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	(1) In growing Class 2 patients with mandibular deficiency without any airway obstructions, functional appliance treatment provided favorable effects on nasopharyngeal and oropharyngeal area throughout the retention period. (2) The anteriorly forced position of the mandible with functional appliance treatment caused positional changes in hyoid bone due to possible enhanced muscle activities.

Zusammenfassung der Ergebnisse

GRUPPE untreated VS. GRUPPE activator

PRIMÄRZIELGRÖßE

Table III. Comparison of the differences between the control and the treatment periods.

	Control group (t2-t1)		Activator group (T2-T1)		
	Mean	SD	Mean	SD	p
Nasopharynx					
S-PNS (mm)	1.09	1.66	0.97	1.19	NS
ad1-PNS (mm)	1.05	2.41	0.38	2.69	NS
ad2-PNS (mm)	1.63	1.83	0.87	2.52	NS
Nasopharyngeal area	198	841	558	763	NS

Table IV. Comparison of changes between the control and treatment periods.

	Control group (t2-t1)		Activator group (T2-T1)		
	Mean	SD	Mean	SD	p
Nasopharynx					
S-PNS (mm)	1.69	1.40	1.62	0.90	NS
ad1-PNS (mm)	1.05	2.41	1.59	1.67	NS
ad2-PNS (mm)	1.63	1.83	1.78	1.13	NS
Nasopharyngeal area	598	841	1278	603	NS

SEKUNDÄRZIELGRÖßE

Table III. Comparison of the differences between the control and the treatment periods.

	Control group (t2-t1)		Activator group (T2-T1)		
	Mean	SD	Mean	SD	p
Oropharynx					
SPS (mm)	0.09	1.85	0.47	2.48	NS
ss-Pns (mm)	−0.47	5.25	−0.22	5.21	NS
MPS (mm)	−0.53	5.04	−0.56	1.84	NS
IPS (mm)	0.11	1.41	−0.34	5.83	NS
Oropharyngeal area	697	1766	1079	2257	NS

Table IV. Comparison of changes between the control and treatment periods.

	Control group (t2-t1)		Activator group (T2-T1)		
	Mean	SD	Mean	SD	p
Oropharynx					
SPS (mm)	0.69	1.85	1.34	1.01	NS
ss-Pns (mm)	−0.47	5.25	1.18	0.86	NS
MPS (mm)	−0.53	5.04	0.65	1.00	NS
IPS (mm)	0.11	1.41	1.62	1.18	NS
Oropharyngeal area	807	1766	1196	782	NS

TERTIÄRZIELGRÖßE

Table III. Comparison of the differences between the control and the treatment periods.

	Control group (t2-t1)		Activator group (T2-T1)		
	Mean	SD	Mean	SD	p
Hyoid bone					
H-SN (mm)	5.37	5.62	3.66	3.52	NS
C3-H (mm)	1.68	1.60	1.81	2.59	NS

Table IV. Comparison of changes between the control and treatment periods.

	Control group (t2-t1)		Activator group (T2-T1)		
	Mean	SD	Mean	SD	p
Hyoid bone					
H-SN (mm)	5.37	5.62	6.40	3.09	NS
C3-H (mm)	1.68	1.60	3.96	1.09	*

Zusammenfassung der Ergebnisse	***QUATÄRZIELGRÖßE*** Table III. Comparison of the differences between the control and the treatment periods. Control group (T2-T1) — Activator group (T3-T1) Mean / SD / Mean / SD / p *Head posture* SNCVT (°) 0.74 4.94 0.69 4.58 NS SNOPT (°) 0.63 4.30 0.31 4.07 NS Table IV. Comparison of changes between the control and retention periods. Control group (T2-T1) — Activator group (T3-T1) Mean / SD / Mean / SD / p *Head posture* SNCVT (°) 0.74 4.94 0.81 5.03 NS SNOPT (°) 0.63 4.30 1.07 2.81 NS ***QUINTÄRZIELGRÖßE*** Table III. Comparison of the differences between the control and the treatment periods. Control group (T2-T1) — Activator group (T3-T1) Mean / SD / Mean / SD / p *Skeletal morphology* SNA (°) −0.47 1.34 −0.09 1.40 NS SNB (°) 0.00 1.33 1.03 2.14 NS ANB (°) −0.47 0.91 −1.13 1.64 NS CoA (mm) 3.16 2.61 2.91 5.29 NS CoGn (mm) 4.21 3.63 0.64 6.64 NS SNGoGn (°) 0.63 2.67 0.59 2.75 NS Table IV. Comparison of changes between the control and retention periods. Control group (T2-T1) — Activator group (T3-T1) Mean / SD / Mean / SD / p *Skeletal morphology* SNA (°) −0.47 1.34 −0.69 1.34 NS SNB (°) 0.00 1.33 1.93 1.32 ** ANB (°) −0.47 0.91 −2.31 0.74 *** CoA (mm) 3.16 2.61 2.81 1.58 NS CoGn (mm) 4.21 3.63 9.50 2.51 ** SNGoGn (°) 0.63 2.67 −0.25 1.66 NS
Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführte retrospektive Kohortenstudie. Keine Angabe zur Finanzierung. Keine Interssenskonflikte vorhanden. Selection bias (keine Angabe der Screeningfallzahlen), keine Verblindung, keine Angabe von möglichen Störgrößen, keine Konfidenzintervalle angegeben. Effekte nur nach Retentionsphase verglichen mit der Kontrolle, aber da keine Zeitgenaue Übereinstimmung mit den Röntgenaufnahmen!*
Schlussfolgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: Die Behandlung mit der Apparatur wirkte sich während der Retentionszeit günstig auf den Nasen- und Rachenraum aus.
Evidenzlevel (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Usumez, Uysal et al 2004

The Effects of Early Preorthodontic Trainer Treatment on Class II, Division 1 Patients

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Abstract: The aim of this study was to clarify the dentoskeletal treatment effects induced by a preorthodontic trainer appliance treatment on Class II, division 1 cases. Twenty patients (10 girls and 10 boys, mean age 9.6 ± 1.3 years) with a Class II, division 1 malocclusion were treated with preorthodontic trainer appliances (Myofunctional Research Co., Queensland, Australia). The patients were instructed to use the trainer every day for one hour and overnight while they slept. A control group of 20 patients (mean age 10.2 ± 0.8 years) with untreated Class II, division 1 malocclusions was used to eliminate possible growth effects. Lateral cephalograms were taken at the start and end of treatment. Final cephalograms were taken 13.1 ± 1.8 months after trainer application, compared with a mean of 11.2 ± 2.4 months later for the control group. The mean and standard deviations for cephalometric measurements were analyzed by paired-samples *t*-test and independent-samples *t*-tests. At the end of the study period, the trainer group subjects showed significant changes including anterior rotation and sagittal growth of the mandible, increased SNB and facial height, reduced ANB, increased lower incisor proclination, retroclination of upper incisors, and overjet reduction. However, only total facial height increase, lower incisor proclination, and overjet reduction were significantly higher when compared with the changes observed in the control group. This study demonstrates that the preorthodontic trainer application induces basically dentoalveolar changes that result in significant reduction of overjet and can be used with appropriate patient selection. (*Angle Orthod* 2004; 74:605–609.)

Population	**Klasse-II-Anomalie**
Schweregrad	overjet >4,5mm
Einschluss-kriterien	The ANB angles of all patients were greater than four degrees, and their overjets were greater than 4.5 mm. None of the children in the test or control group had a thumb-sucking habit
Ausschluss-kriterien	keine Angabe
Intervention	**kieferorthopädische Behandlung** *All were treated exclusively with the preorthodontic trainer appliance (Myofunctional Research Co., Queensland, Australia). The patients were instructed to use the trainer every day for one hour and overnight while they slept.* VERSUCHSGRUPPE: **preorthodontic trainer appliance** N=20/20 / Alter = 9,6 ± 1,3 Jahre / ♂:♀ = 10:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=20/20 / Alter = 10,2 ± 0,8 Jahre / ♂:♀ = 10:10 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathieategorie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *skeletal changes (SNA, SNB, ANB, Sn-GoGn, FH-MP, PP-MP, Gn-Go-Ar, Ar-S-N, Me-Go-S, OP-SN, MaxP Angle, Ramus height, Corpus length, N-Me, S-Go-GoAr-Go-Me, Co-Gn, Co-A, Go-PC)* SEKUNDÄRZIELGRÖßE: *dental changes (U1-NA, U1-SN, L1-NB, IMPA, Interincisal angle, overjet, overbite)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	At the end of the study period, in the trainer group, only the total facial height increase, lower incisor proclination, and overjet reduction were significantly higher compared with the changes observed in the control group. This study demonstrates that preorthodontic trainer application induces basically dentoalveolar changes that result in a significant reduction of overjet and can be used with appropriate patient selection.
Zusammen-fassung der Ergebnisse	**GRUPPE control VS. GRUPPE trainer** ***PRIMÄRZIELGRÖßE*** *The mean differences in the study group were compared with the mean differences in control group using the Student’s t-test for unpaired samples. The mean difference of the study group was larger than that of the control group for only facial height, N-Me (mm), (P> .001).* ***SEKUNDÄRZIELGRÖßE*** *The mean differences were significantly decreased more in the study group than in the control group for U1-SN (deg) and L1-NB (P >.05), IMPA (P > .01), and overjet (mm) (P > .001) (Table 1)**.***
Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführte retrospektive Studie. Messung reliabel und valide. Keine Angaben zur Verblindung oder zum Patientenscreening. Keine Angaben zur Finanzierung oder möglichen Interessenskonflikten. Keine Angaben zu möglichen Störgrößen oder von Konfidenzintervallen. Darstellung ungeschickt, da die einzige Tabelle auf zwei Seiten verteilt wurde.*
Schluss-folgerung des Begutachters	methodische Qualität: gut Klinische Aussagekraft: Diese Studie zeigt, dass die Anwendung eines präorthodontischen Trainers dentoalveoläre Veränderungen hervorruft, die zu einer Reduzierung des Overjet führen.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Vanlaecken, Martin et al 2006

Treatment effects of the edgewise Herbst appliance: A cephalometric and tomographic investigation

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Introduction: The crown Herbst appliance was introduced in the late 1980s because of shortcomings of the banded Herbst. In edgewise Herbst treatment, a fixed appliance is used with the crown Herbst to maximize the skeletal effects of treatment. Treatment response to the edgewise Herbst appliance has not been reported in the literature. Our objective was to investigate skeletal and dental changes in patients with Class II malocclusions treated with the edgewise Herbst appliance. **Methods:** Fifty-two consecutive patients were treated with the edgewise Herbst appliance; 32 (18 girls, 14 boys) met the criterion of 16 months out of Herbst treatment and were included in the study. Mean treatment time with this appliance was 8.0 ± 1.8 months. Patients in the mixed dentition received additional treatment with 2 × 4 appliances until proper overbite, overjet, and torque on the incisors and permanent first molars were achieved. Patients in the permanent dentition were treated with full appliances to finalize the occlusion. Cephalometric measurements were taken at pretreatment, posttreatment, and 16 months after removal of the Herbst appliance, and the results were compared with 32 untreated Class II subjects from the Bolton Brush Study, matched for sex, age, and cephalometric dentofacial morphology. Data were analyzed with ANOVA, Tukey-Kramer multiple comparison tests, and 2-tailed *t* tests. **Results:** After 8 months of Herbst treatment, incisal relationship was overcorrected to an end-to-end incisal relationship and improved 8.4 mm, compared with the control group. The maxilla moved backward 1.4 mm at Point A, and the mandible moved forward 1.7 mm. The maxillary incisors moved lingually 1.7 mm, and the mandibular incisors were proclined 3.6 mm. The molars were corrected to a Class III relationship with a change of 7.2 mm compared with the control group. The mandible moved downward and forward. However, the condyle showed only 0.2 mm forward movement in the fossa. Sixteen months after appliance removal, the molars had relapsed into a Class I relationship, for a net change of 2.4 mm compared with the control group. Net overjet gain was 2.7 mm. Net restraint of maxillary growth was 1.3 mm, and net forward movement of the mandible was 1.0 mm. The maxillary incisors had no net movement, and the mandibular incisors had a net forward movement of 0.3 mm. Overall, skeletal change contributed 85% of the net overjet correction. **Conclusions:** Class II treatment with the edgewise Herbst appliance is accompanied by both skeletal and dental changes. The changes are stable, with significant skeletal differences remaining 16 months after appliance removal. The forward and downward movement of the mandible with minimal changes in the position of the condyles in the fossae suggests a combination of condylar growth and remodeling of the glenoid fossa with treatment. (Am J Orthod Dentofacial Orthop 2006;130:582-93)

Population	**Klasse-II-Anomalie** Patients with malocclusions treated with the edgewise Herbst appliance or left untreated (Bolton-Brush Study) . Study took place in the USA.
Schweregrad	keine Angabe
Einschluss-kriterien	16 months out of Herbst treatment
Ausschluss-kriterien	keine Angaben

Intervention	**kieferorthopädische Behandlung** *The mean treatment time with the Herbst appliance was 8 years 0 months ± 1.8 months. The edgewise Herbst appliance consisted of stainless steel crowns on the maxillary and mandibular first molars. A -10° torque was built into the mandibular incisor brackets to prevent unnecessary forward tipping of the incisors. Double buccal tubes were placed on the maxillary stainless steel crowns to facilitate the use of auxiliary wires got for intruding the maxillary incisors. If there was sufficient root on the deciduous second molars, the crowns were placed on them, making it easier to place and remove the crowns after Herbst treatment in the mixed-dentition patients. Also, the axle of the maxillary molars would not distalize or impinge on the ascending ramus. The maxillary arch was tied back to the molar tubes to prevent space from opening between the molars and the second premolars. This procedure prevented the distal movement of the maxillary molars and the subsequent distalization of the mandible and seating of the condyle, thus decreasing the orthopedic effect because the condyle was not unloaded in the joint to allow the maximum orthopedic effect. A 2-mm half-round Remenium cantilever was placed between the first molar and the interproximal area of the canine and the first premolar in the mandibular arch. An axle was placed at the mesial end of the cantilever, and a .022 x 028-in archwire tube was placed below the axle.* VERSUCHSGRUPPE: **Herbst** N=32/32 / Alter = 10 ± 1 Jahre / ♂:♀ = 14:18 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=32/32 / Alter = ?? ± ?? Jahre / ♂:♀ = 16:16 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie ategorie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *sagittal changes (OLp-A pt, OLp-Pg,3OLp-Co, Co-A pt, Co-Gn, Co-Gn minus Co-A pt, Wits, Is/Olp, Ii/Olp, Overjet, Ms/Olp, Mi/Olp, Molar Rel)* SEKUNDÄRZIELGRÖßE: *vertical changes (Ols-A pt, ANS-Me, Is-NL, Ii-ML, Overbite, Msc-NL, Mic-ML)* TERTIÄRZIELGRÖßE: *Angular changes (SNA, SNB, ANB, SNL-NL, SNL-ML, SNL-Ols, Is/SNL, Ii/ML, Is/Ii)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	1. Correction of overjet and molar relationship by edgewise Herbst treatment was a combination of posterior movement of the maxilla and the maxillary teeth, increased horizontal component of condylar growth, anterior displacement of the mandible, and possibly remodeling of the glenoid fossa. 2. During the 16 months of post-Herbst treatment, part of the initial skeletal correction was lost without retention. However, the net effects of the treatment were found to be mostly skeletal, suggesting the advantage of edgewise treatment combined with Herbst treatment to maximize the skeletal outcome.
usammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE Herbst** ***PRIMÄRZIELGRÖßE*** *Changes in subjects in the treatment and control groups from T2-T1, T3-T2, and T3-T1 are compared in Tables III through V. Compared with the control group, treatment induced backward movement of the maxillary base (OLp-A pt) from T1 to T2 (1.4 mm) and forward movement (0.1 mm) during the follow-up period (T2-T3), with a net restraint of forward growth of 1.3 mm (T1-T3). The position of the condyle (OLp-Co) was found to move forward 0.1 mm with treatment, but there was no change during the follow-up period, with a net movement of 0.1 mm. The effective maxillary length (Co-A pt) was restrained 1.9 mm compared with the control group during treatment; there was an increase of 0.3 mm during the follow-up period, for a net restraint of 1.6 mm. Effective mandibular length (Co- Gn) increased 1.9 mm during treatment and decreased 0.9 mm during follow-up, for a net increase of 1.0 mm compared with the control group. The position of the maxilla relative to the mandible (Wits) decreased 6.9 mm during treatment and increased 2.8 mm during observation, for a net decrease of 4.1 mm. Dentally, the maxillary incisor (Is/OLp) showed backward movement of 3.1 mm after treatment compared with the control group and forward movement of 1.8 mm during the follow-up period, for a net forward movement of 1.3 mm. Treatment effects on the position of the mandibular incisor (Ii/OLp) showed forward movement of 5.3 mm with treatment and backward movement of 4.0 mm during follow-up, for a net forward movement of 1.3 mm. Overjet improved significantly, showing a decrease of 8.4 mm during treatment. There was a return of 5.8 mm of overjet during the follow-up period, with an overall decrease of 2.6 mm. The maxillary molars moved backward 3.4 mm compared with the control group during treatment and moved forward 2.2 mm during follow-up, for a net backward movement of 1.2 mm. The mandibular molars moved forward 3.8 mm and backward 3.0 mm during the follow-up, for a net forward movement of 0.8 mm. The molar relationship was altered significantly, with a change of 7.2 mm during treatment resulting from forward movement of the mandibular molars and backward movement of the maxillary molars. During the follow-up period, the molar relationship relapsed 4.7 mm, giving a net change of 2.0 mm.*

	SEKUNDÄRZIELGRÖßE *The vertical position of the maxilla (OLs-A pt.) showed downward movements of 2.5 mm compared with the controls during treatment and 0.2 mm during follow-up, for a net downward movement of 2.7 mm. The lower facial height (ANS-Me) increased 0.3 mm during treatment and decreased 0.5 mm during followup, for a net decrease of 0.2 mm. The palatal plane (SNL/NL) exhibited downward movement of 2.6° with treatment and upward movement of 0.7° during followup, for a net downward movement of 1.9°. The occlusal plane (SNL/OLs) had clockwise tipping of 4.9° during treatment and counterclockwise tipping of 3.2° during follow-up, for a net clockwise tipping of 1.7°. Dentally, the maxillary incisor (Is/NL) was intruded 0.4 mm during treatment and extruded 0.7 mm during follow-up, for a net extrusive movement of 0.3 mm. The mandibular incisor (Ii/ML) exhibited intrusive movement of 1.7 mm during treatment and extrusive movement of 0.1 mm during follow-up, for a net intrusive movement of 1.6 mm. Overbite decreased 3.8 mm compared with the controls during treatment and increased 1.4 mm during follow-up, for a net decrease of 2.4 mm. The maxillary molar (Msc/NL) was intruded 1.1 mm during treatment and extruded 0.2 mm during follow-up, for a net intrusion of 0.9 mm. The mandibular molar (Mic/NL) was extruded 1.0 mm during treatment and intruded 0.3 mm during followup, for a net extrusive movement of 0.7 mm.* ***TERTIÄRZIELGRÖßE*** *For the angular measurements, the position of the maxilla relative to the cranial base (SNA) had a decrease during treatment (1.3°) compared with the control group and an increase of 0.2° during the follow-up period, for a net decrease of 1.1°. The treatment induced forward movement of the mandible (1.5°) relative to the cranial base (SNB). This increase was maintained during the follow-up period, for a net increase of 1.5°. ANB angle had a decrease of 2.8° from T1 to T2 and an increase of 0.4° during the follow-up period, for a net decrease of 2.4°. The maxillary incisor angle (Is/SNL) moved lingually 2.8° during treatment and moved labially 8.2° during follow-up, for a net labial movement of 5.4°. The mandibular incisor angle (Ii/ML) proclined 10.4° during treatment and moved back 8.0° during follow-up, for a net proclination of 2.4°. The interincisal angle decreased 9.1° during treatment and increased 1.2° during follow-up, for a net decrease of 7.9°.*
Angaben auffälliger positiver und/oder negativer Aspekte	*Gutes Studien, reliable und valide Durchführung. Keine Angabe von Interessenskonflikten oder Finanzierung. Keine Powerkalkulation, keine Verblindung, keine Angaben von Störgrößen. Keine Angaben zur Selektion des Patientenguts. Hier auch keine Angabe von Schweregrad oder irgendwelcher Einschluss/Ausschlusskriterien.*
Schluss-folgerung des Begutachters	<u>methodische Qualität:</u> gut
	<u>Klinische Aussagekraft:</u> Die Behandlung der Klasse II mit der Herbst-Appliance führt zu skeletallen und dentalen Veränderungen. Diese Veränderungen sind 16 Monate nach dem Entfernen stabil.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Varlik, Iscan 2008

The effects of cervical headgear with an expanded inner bow in the permanent dentition

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SUMMARY In this study, the effects of cervical headgear (CHG) use on the transverse dimension of the maxillary dental arch were evaluated in patients in the permanent dentition. Thirteen girls and 12 boys (mean age: 13.41 ± 0.52 years) with a bilateral full cusp Class II molar relationship comprised the study group. Fifteen girls and 10 boys with a Class I normal occlusion comprised the controls. In the treatment group, CHG with an expanded inner bow was used for a mean period of 11.2 ± 5.6 months. The headgear was used for molar distalization and the force magnitude was 196.1 cN. After CHG treatment, the patients underwent non-extraction fixed orthodontic treatment for 14.1 ± 2.5 months. During this period, the control group received regular dental check-ups. Dental casts obtained at the beginning (T1) and end (T2) of headgear use and at the end of orthodontic treatment (T3) and posteroanterior cephalograms taken at T1 and T2 were evaluated. A Student's *t*-test was used for intergroup comparison at T1, T2, and T3 and a Mann–Whitney *U*-test with a Bonferroni correction for comparison of treatment/observation changes.

At T2, intercanine (0.96 ± 0.56 mm), interpremolar (1.6 ± 0.55 mm for the first premolar, 1.74 ± 0.65 mm for the second premolar), and intermolar (2.31 ± 0.75 mm) widths increased, while the distance between the intersection of the zygomatic process and the maxillary alveolar process on the right (JR) and left (JL) did not change. Fixed orthodontic treatment did not have any effect on any of the measurements. With the intentional expansion of the inner bow of CHG, the amount of maxillary dental arch expansion achieved in the permanent dentition was statistically significant ($P = 0.017$).

Population	**Klasse-II-Anomalie** In this study, the effects of cervical headgear (CHG) use on the transverse dimension of the maxillary dental arch were evaluated in patients in the permanent dentition (Turkey).
Schweregrad	Bilateral full cusp Class II molar relationship
Einschluss-kriterien	The selection criteria for the treatment group were as follows: 1. Bilateral full cusp Class II molar relationship. 2. No history of previous orthodontic treatment. 3. Maximum crowding of 4 mm in the maxillary and mandibular dental arches. 4. Absence of a posterior crossbite. 5. Permanent dentition. 6. No missing teeth. 7. No maxillary skeletal protrusion (SNA angle: 80 ± 2 degrees). 8. Dental casts available at the beginning (T1) and end (T2) of CHG use and at the end of the fi xed appliance therapy (T3). 9. Posteroanterior (PA) cephalograms available at T1 and T2. The selection criteria for the control group were as follows: 1. Skeletal Class I. 2. Bilateral Class I molar relationship. 3. Well-aligned dental arches (maximum 2 mm crowding). 4. No missing teeth. 5. No history of previous orthodontic treatment. 6. Normal overjet and overbite.
Ausschluss-kriterien	keine Angaben

Intervention	**kieferorthopädische Behandlung** *In the treatment group, a Ricketts ’ type CHG Micro Progressive universal facebow (GAC International Inc., Bohemia, New York, USA) was used. The long outer bow of the headgear was bent 20 degrees upwards in relation to the inner bow. The inner bow was expanded 10 mm (5 mm each side) wider than the distance between the right and the left fi rst maxillary molar tubes (0.018 × 0.025 inch Micro Progressive convertible triple tube with 0 degree torque and slot offset, and gingival headgear tube, GAC International Inc.). The force magnitude was 196.1 cN. The expansion of the inner bow and the amount of force were controlled at each visit (every 4 weeks) and activation was carried out when necessary. The subjects were asked to wear the headgear 14 – 16 hours a day. The headgear treatment lasted between 6 and 17 months (mean: 11.2 ± 5.6 months). All patients in the headgear group received non-extraction fi xed orthodontic treatment. The duration of treatment with fi xed appliances was between 12 and 17 months (mean: 14.1 ± 2.5 months).* VERSUCHSGRUPPE: **headgear** N=29 (Anfang) / N=25 (Ende) / Alter = 13,41 ± 0,52 Jahre / ♂:♀ = 12:13 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behanldung
Kontrolle	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=25/25 / Alter = 13,12 ± 0,73 Jahre / ♂:♀ = 10:15 • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *dental changes (intercanine, interpremolar (first), interpremolar (second), Intermolar (first), JR-JL distance)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	With the intentional expansion of the inner bow of a CHG exerting a distal force of 196.1 cN, a statistically signifi cant maxillary arch expansion was achieved in the permanent dentition. Although the changes (T2 – T1) observed in the treatment group were signifi cantly different from those of the control group, the only measurement, which differed between the two groups at T2 and T3, was intermolar distance. No transversal skeletal change was observed after CHG use and the amount of dental expansion was less than that achieved by other means of orthodontic expansion. The expansion achieved with the CHG remained unchanged and the fi xed appliance treatment did not cause any additional transverse changes in the maxillary arch.

Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE headgear** ***PRIMÄRZIELGRÖßE*** *Descriptive statistics and comparisons of the two groups at T1, T2, and T3 as well as the comparison of changes in the treatment and control groups from T1 to T2, T2 to T3, and T1 to T3 are summarized in Table 1 . The results of the Student's t -test revealed that there were no significant differences (P > 0.05) between the control and treatment groups at T1. At T2 and T3, the only measurement that showed signifi cant difference (P < 0.05) between the groups was the intermolar distance. The increases observed in the intercanine (0.96 ± 0.56 mm), interpremolar (1.6 ± 0.55 mm for first premolar, 1.74 ± 0.65 mm for second premolar), and intermolar (2.31 ± 0.75 mm) widths in the treatment group due to the CHG (T2 – T1) were significantly greater (P < 0.017) than the changes that occurred in the control group. CHG treatment did not change the JR – JL distance. All measurements remained essentially unchanged during the fixed appliance therapy (T3 – T2) and the comparison of the changes observed during this period revealed no signifi cant difference between the two groups (P > 0.017)*
Angaben auffälliger positiver und/oder negativer Aspekte	*Studiendesign fragwürdig, da Klasse II Patienten mit Klasse I Kontrollen verglichen werden. Kein ITT Analysen. Dafür Powerkalkultionen. Keine Verblindung, Angaben zur Finanzierung oder zu Interessenskonflikten der Autoren.Keine Angabe möglicher Störgrößen, Keine Konfidenz Intervalle angegeben.*
Schluss-folgerung des Begutachters	methodische Qualität: schlecht gewählte Kontrollgruppe
	Klinische Aussagekraft: Eine Erweiterung des Innenbogens des headgear bewirkte ein Oberkieferzahnbogenerweiterung im bleibenden Gebiss.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Vilanova, Henriques et al 2018

Class II malocclusion treatment effects with Jones Jig and Distal Jet followed by fixed appliances

Lorena Vilanova[a]; José Fernando Castanha Henriques[b]; Guilherme Janson[c]; Mayara Palm Patel[d]; Rachelle Simões Reis[e]; Aron Aliaga-Del Castillo[e]

ABSTRACT

Objectives: To compare the skeletal, dentoalveolar, and soft tissue changes in Class II malocclusion patients treated with Jones Jig and Distal Jet distalizers followed by fixed appliances.

Materials and Methods: The experimental groups comprised 45 Class II malocclusion subjects divided into two groups. Group 1 consisted of 25 patients treated with the Jones Jig, and group 2 consisted of 20 patients treated with the Distal Jet. Group 3 comprised 19 untreated Class II subjects. Cephalograms were analyzed before and after orthodontic treatment. For intergroup comparisons, one-way analysis of variance and post hoc Tukey tests were performed.

Results: During treatment, the experimental groups exhibited significant increases in occlusal plane inclination and maxillary second molar mesial tipping. Additionally, the molar relationship improved and overjet decreased significantly in the experimental groups. The Jones Jig group showed greater mandibular incisor proclination and greater overbite reduction than the control group. No significant intergroup differences in nasolabial angle changes were found.

Conclusions: Treatment protocols using the Jones Jig and Distal Jet followed by fixed appliances were effective in correcting Class II malocclusion by means of dentoalveolar changes without significant skeletal and soft tissue changes. The experimental groups showed occlusal plane clockwise rotation and greater mesial tipping of maxillary second molars when compared to the untreated group. (*Angle Orthod.* 2018;88:10–19.)

Population	**Klasse-II-Anomalie** The experimental sample comprised class II malocclusion patients who were treated at the Department of Orthodontics, Bauru Dental School, University of Sao Paulo, Brazil. Additionally, the records of untreated Class II malocclusion subjects obtained from the files of the same department were used as the control group
Schweregrad	minimum of one-quarter cusp Class II molar relationship
Einschluss-kriterien	The selection criteria were that the patients presented with bilateral dental Class II malocclusion, all permanent teeth up to the first molars erupted, no severe mandibular crowding, and no previous orthodontic treatment. Each group was treated at different times. The patients were selected for each of the groups if they satisfied the selection criteria.
Ausschluss-kriterien	keine Angaben

Intervention Versuchsgruppe 1	**kieferorthopädische Behandlung** *The original nickel-titanium (NiTi) coil spring (American Orthodontics, Sheboygan, Wisc) that exerted 70–75 g of force was replaced by another NiTi coil spring (G&H Wire Co, Greenwood, Ind). Although it produced a continuous force of 125 g, it was activated 5 mm every 4 weeks to maintain its effective length. A modified Nance button, attached to the second premolars, was used as anchorage, as recommended.* VERSUCHSGRUPPE: **Jones Jig** N=25/25 / Alter = 12,90 ± 1,43 Jahre / ♂:♀ = 14:11 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Intervention Versuchsgruppe 2	**kieferorthopädische Behandlung** *Patients in this group were treated with the Distal Jet, as recommended by Carano and Testa9 (Figure 2). Bands were fitted on the maxillary first premolars and first molars.5 The Distal Jet was seated as one unit and cemented with glass ionomer cement. For patients with erupted second molars, 240 g of force was applied, and 180 g was used in those without erupted secondmolars. The Distal Jet appliancewas activated on both sides, sliding the collar distally to fully compress the open-coil spring. To maintain the force level, the appliance was reactivated in the same manner once a month. After distal movement was complete, the Distal Jet was converted to a Nance holding arch.* VERSUCHSGRUPPE: **Distal Jet** N=20/20 / Alter = 12,77 ± 1,22 Jahre / ♂:♀ = 15:5 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated** N=19/19 / Alter = 12,91 ± 1,43 Jahre / ♂:♀ = 10:9 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **dentofaziale Ästhetik** PRIMÄRZIELGRÖßE: *Maxillary and mandibular skeletal (SNA, A-PTV, SNB, B-PTV, ANB)* SEKUNDÄRZIELGRÖßE: *Vertical skeletal (FMA, SN.occlusal plane, ANS-Me)* TERTIÄRZIELGRÖßE: *Maxillary dentoalveolar (Mx1.SN, Mx1-PTV, Mx1.NA, Mx1-NA, Mx4.Sn, Mx4-PTV, Mx5.SN, Mx5-PTV, Mx6.SN, Mx6-PTV, Mx7.SN, Mx7-PTV)* QUARTÄRZIELGRÖßE: *Mandibular dentoalveolar (Md1.NB, Md1-NB)* QUINTÄRZIELGRÖßE: *soft tissue (NLA)* SEXTÄRZIELGRÖßE: *Interdental (molar relationship, Overjet, Overbite)*

Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Nonextraction treatment with the Jones Jig and Distal Jet followed by fixed appliances (including the use of headgear and Class II elastics) was effective in correcting Class II malocclusion by means of dentoalveolar changes. 2. Both the Jones Jig and Distal Jet groups showed occlusal plane clockwise rotations and greater mesial tipping of the maxillary second molars when compared to the untreated group. 3. There were no significant intergroup differences in terms of soft tissue changes.
Zusammen-fassung der Ergebnisse	**GRUPPE untreated VS. GRUPPE Jones Jig/Distal Jet** ***PRIMÄRZIELGRÖßE*** 1: Jones Jig / 2: Distal Jet / 3: Control Variable / Mean (SD) / Mean (SD) / Mean (SD) / P Maxillary and mandibular skeletal SNA, °: 0.60 (1.85) a / 0.00 (2.62) a / -0.67 (2.43) a / .629 A-PTV, mm: 1.15 (2.29) a / 1.13 (1.63) a / 1.99 (3.62) a / .896 SNB, °: 0.74 (2.28) a / 0.28 (2.18) a / -0.36 (2.24) a / .293 B-PTV, mm: 2.03 (2.75) a / 1.47 (2.88) a / 1.89 (5.09) a / .871 ANB, °: -0.72 (2.18) a / -0.24 (1.98) a / -0.11 (3.03) a / .757 ***SEKUNDÄRZIELGRÖßE*** Vertical skeletal FMA, °: 1.23 (2.62) a / 1.73 (1.89) a / 0.31 (4.48) a / .264 GN.GoGo, °: 0.23 (2.45) a / 0.95 (2.52) a / 1.16 (5.47) a / .668 SN.occlusal plane, °: 1.15 (3.30) a / 2.28 (2.11) a / -1.22 (5.47) a / .011* ANS-Me, mm: 5.60 (3.82) a / 4.75 (3.03) a / 3.48 (5.38) a / .197 ***TERTIÄRZIELGRÖßE*** Maxillary dentoalveolar Mx1.SN, °: -1.63 (3.62) a / -3.09 (5.47) a / -1.87 (4.32) a / .342 Mx1-PTV, mm: 1.28 (3.12) a / 0.67 (2.60) a / 1.63 (4.48) a / .660 Mx1.NA, °: -1.63 (3.77) a / -4.08 (4.88) a / -1.43 (5.74) a / .262 Mx1-NA, mm: 0.12 (2.55) a / -0.63 (2.45) a / -0.18 (2.53) a / .601 Mx4.SN.4, °: -1.63 (4.69) a / 1.69 (3.80) a / 0.59 (3.23) a / .111 Mx4-PTV, mm: 2.20 (3.09) a / 1.77 (2.04) a / 2.10 (4.49) a / .894 Mx6.SN, °: 1.78 (4.91) a / 0.60 (5.89) a / 0.08 (3.00) a / .101 Mx6-PTV, mm: 2.22 (2.00) a / 1.60 (2.13) a / 1.81 (4.58) a / .864 Mx6.SN, °: 1.55 (4.95) a / 0.05 (5.80) a / 0.20 (5.65) a / .146 Mx6-PTV, mm: 1.82 (1.89) a / 1.42 (2.29) a / 1.98 (4.60) a / .839 Mx7.SN, °: 5.44 (7.31) a / 4.51 (4.75) a / -0.76 (5.81) a / .004* Mx7-PTV, mm: 1.42 (1.91) a / 1.02 (2.09) a / 1.47 (4.00) a / .845 ***QUARTÄRZIELGRÖßE*** Mandibular dentoalveolar Md1.NB, °: 2.52 (5.58) a / 2.69 (5.44) a / -0.73 (3.28) a / .004 Md1.NB, mm: 1.41 (1.88) a / 1.12 (1.71) ab / 0.08 (0.85) b / .021* Md6-PTV, mm: 2.63 (2.23) a / 1.59 (1.87) a / 2.42 (3.14) a / .798 ***QUINTÄRZIELGRÖßE*** Soft tissue NLA, °: 1.60 (7.64) a / 3.28 (6.57) a / 2.36 (8.51) a / .879 ***SEXTÄRZIELGRÖßE*** Interdental Molar relationship, mm: -2.36 (1.36) a / -1.31 (0.58) a / -0.22 (1.24) b / <.001* Overjet, mm: -1.80 (1.66) a / -1.83 (1.46) a / -0.14 (2.00) b / .002* Overbite, mm: -1.08 (1.51) a / -1.12 (1.84) ab / -0.13 (1.94) b / .025*
Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführte Kohortenstudie. Keine Angabe von Funding oder möglichen Interessenskonflikten der Autoren. Keine Angabe zum Patientenscreening, keine Verblindung. Power wurde kalkuliert. In der Versuchsgruppe 2 keine gleichmäßige Genderverteilung. Keine Angabe möglicher Störgrößen und Konfidenzintervalle.*
Schluss-	<u>methodische Qualität:</u> gut

folgerung des Begutachters	Klinische Aussagekraft: Behandlung mit Jones Jig und Distal Jet, gefolgt von festsitzenden Apparaturen, führten zur Korrektur der Malokklusionen durch dentoalveolare Veränderungen.
Evidenz-level (SIGN)	**2+**
Qualität	**Acceptable ⊕**

Evidenztabelle Dorri 2015 - Watkinson, Harrison 2013

Cochrane Clinical Answers

Question:

In children with prominent lower front teeth (class III malocclusion), how does orthodontic treatment affect outcomes?

Mojtaba Dorri

https://doi.org/10.1002/cca.996 | 27 December 2015

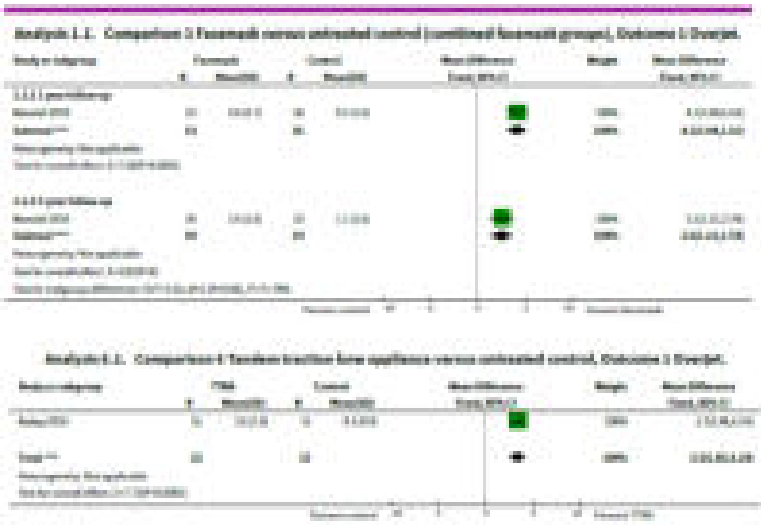
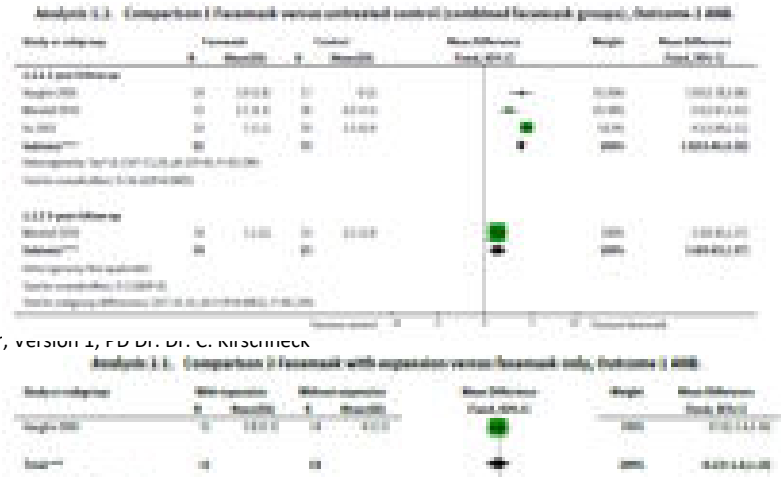
Answer

Moderate to low-quality evidence shows that the use of facemask therapy in children (mean age 8 years) may lead to short and medium term reductions in prominent lower front teeth and may improve self-esteem, compared with no treatment.

We cannot judge the effects of chin cup or tandem traction bow appliance as only very low-quality evidence is available.

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Primärliteratur. Einzelstudien mit individuellen Patienten; Single Center Studien aus der Türkei, China, und den USA
Schweregrad	Keine Angabe
Einschluss-kriterien *Bei Review: PICOS*	Children or adolescents or both (aged 16 years or less) receiving any type of orthodontictreatment to correct prominent lower front teeth (Class III malocclusion; Class III treatment (Facemask, Chin Cup, tandem traction bow); Orthodontic treatments were compared with control groups who received either no treatment, delayed treatment or a different active intervention; Orthodontic treatments were compared with control groups who received either no treatment, delayed treatment or a different active intervention
Ausschluss-kriterien	Non RCT

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Facemask (alone), Facemask with expansion, Nanda facemask, Chin Cup** N=?? (Anfang) / N=196 (Ende) / Alter = 8 / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Behandlung** **und** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/** KONTROLLGRUPPE: **Untreated Class II, Facemask (alone), Conventional facemask** N=?? (Anfang) / N=148 (Ende) / Alter = 8 / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** **und** **medizinischer Schaden, Nebenwirkungen bzw. Zunahme der Anomalie /Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung Overjet **Facemask compared with no treatment** **Tandem traction bow appliance versus untreated control** 1 year follow up, 3 years follow up (Facemask) 1 year follow-up (TTBA)  ANB **Facemask versus untreated control** **Facemask with expansion versus facemask only** **Nanda facemask versus conventional facemask** **Chin cup versus untreated control** 1 year follow up, 3 years follow up (Facemask) 1 year follow-up (others) 

Outcome	**Outcome** **Facemask versus untreated control (combined facemask groups)** **Facemask with expansion versus facemask only** **Chin cup versus untreated control** **Comparison 5 600 g chin cup versus 300 g chin cup** 1 year follow up  **OASIS** **Facemask versus untreated control (combined facemask groups)** 1 year follow up, 3 years follow up 

Studientyp	**Systematisches Review mit Meta-Analyse** RCT N= 7 *Review:* Gesamt-Teilnehmerzahl in Bezug auf PICO: Overjet, OASIS N= 69 (1year), N=63 (3 years), ANB N= 155 (1year), N= 63 (3 years) Wits N= 46
Schluss-folgerungen der Autoren	**Moderate to low-quality** evidence shows that the use of facemask therapy in children (mean age 8 years) may lead to short and medium term **reductions in prominent lower front teeth and may improve self-esteem**, compared with notreatment. We **cannot judge the effects of chin cup or tandem traction bow appliance** as only very low-quality evidence is available
Zusammen-fassung der Ergebnisse	**GRUPPE Facemask (alone), Facemask with expansion, Nanda facemask, Chin Cup VS. GRUPPE Untreated Class II, Facemask (alone), Conventional facemask** **Overjet 1 year**: There was a statistically significant di_erence between groups, in favor of facemask (mean di_erence 4.10 mm, 95% CI 3.04 to 5.16) **Overjet 3 years**: There was a statistically significant di_erence between groups, in favor of facemask (mean di_erence 2.50 mm, 95% CI 1.21 to 3.79) **ANB 1 year**: There was a statistically significant di_erence between groups, in favor of facemask (mean di_erence 3.93°, 95% CI 3.46 to 4.39) **ANB 3 years**: There was a statistically significant di_erence between groups, in favor of facemask (mean di_erence 1.40°, 95% CI 0.43 to 2.37) **Wits**: There was a statistically significant di_erence between groups, in favor of face mask (mean di_erence -3.84 mm, 95% CI -5.31 to -2.37) **OASIS 1 year**: One RCT with 69 participants found that children wearing the facemask had a lower OASIS score (better selfesteem) compared with no treatment. **OASIS 3 years**: There was no statistically significant di_erence between groups (mean di_erence -3.40, 95% CI -7.99 to 1.19) Adverse Effects: One RCT with 73 children reported temporomandibular joint signs and symptoms: pain, clicking, crepitus, locking, and muscle tenderness. No quantitative data was reported but apparently the low prevalence of signs and symptoms precluded meta-analysis

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Sehr gutes Review nach Cochrane Vorgaben. Die Einzelstudien von moderater bis guter Qualität, einzelne mit Schwächen in der RoB Analyse (Allocation, Blinding)*
Schluss-folgerung des Begutachters	methodische Qualität: Review: Sehr gutes review; Einzelstudien (Meta Analyse): moderat bis gut
	Technisch ist das Review von hoher Qualität (erfüllt Cochrane Standards. Zusammen mit der moderaten bis guten Qualität der Primärliteratur ergibt sich eine hohe klinische Relevanz.
Evidenzlevel (SIGN)	**1++**
Qualität	**Hoch ⊕⊕⊕**

Evidenztabelle Wendl et al. 2017

Retrospective 25-year follow-up of treatment outcomes in angle Class III patients

Early versus late treatment

Retrospektive Untersuchung von Behandlungsergebnissen bei Klasse-III-Patienten 25 Jahre nach der Therapie

Frühe und späte Behandlung im Vergleich

B. Wendl[1] · A. P. Muchitsch[2] · B. Winsauer[3] · A. Walter[3] · B. Droschl[2] · N. Jakse[2] · M. Wendl[4] · T. Wendl[4]

Abstract

Objectives To assess early versus late treatment of Class III syndrome for skeletal and dental differences.

Methods Thirty-eight Class III patients treated with a chincup were retrospectively analyzed. Baseline data were obtained by reviewing pretreatment (T0) anamnestic records, cephalograms, and casts. The cases were assigned to an early or a late treatment group based on age at T0 (up to 9 years or older than 9 years but before the pubertal growth spurt). Both groups were further compared based on posttreatment data (T1) and long-term follow-up data collected approximately 25 years after treatment (T2).

Results Early treatment was successful in 74% and late treatment in 67% of cases. More failures were noted among male patients. The late treatment group was characterized post therapeutically by significantly more pronounced skeletal parameters of jaw size relative to normal Class I values; in addition, a greater skeletal discrepancy between

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Pre- and posttreatment anamnestic records, cephalograms, and casts were analyzed for this study, which comprised 38 female and male Class III patients who had received chincup therapy and were followed up after approximately 25 years. We assigned the patients to early or late treatment group based on their age at T0 (<9 years or > 9 years but before the pubertal growth spurt). Clinical Department of Oral Surgery and Orthodontics, Medical University Graz Only patients for whom complete pretreatment (T0), posttreatment (T1), and 25-year follow-up (T2) documentation was available and who had presented skeletal and dental Class III syndrome at T0 (negative overjet, Wits appraisal <-1 mm, negative ANB difference, Class III malocclusion) were included. Cleft disease or any other syndromes led to exclusion. The patients were required to wear the chincup at 600 g per side for 24 h/day whenever possible and, once a positive overjet was achieved, overnight.
Schweregrad	Wits appraisal <-1mm
Einschluss-kriterien *Bei Review: PICOS*	• negative overjet, • Wits appraisal <-1 mm • negative ANB difference • Class III malocclusion
Ausschluss-kriterien	Cleft disease or any other syndromes.
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Early treatment group** N=29 (Anfang) / N=29 (Ende) / Alter = <9 (5-9) Jahre / ♂:♀ = ?:? • Gebissphase: Milchgebiss und frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung (interzeptiv)
Kontrolle Kontrollgruppe	**kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** KONTROLLGRUPPE 1: **Late treatment group** N=9 (Anfang) / N=9 (Ende) / Alter = >9 Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) • Stabilität des Behandlungsergebnisses PRIMÄRZIELGRÖßE: sagittal skeletal and dental parameters (ANB, Wits appraisal, overjet, anterior posterior dysplasia indicator (APDI))
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	Early initiation (age ≤9, 5-9) is an important prerequisite for successful outcome in the treatment of Class III syndrome. Compared to the outcome of late (age >9) treatment, those of early treatment are characterized by significant skeletal changes, most importantly in terms of mandibular length, ramus height, and growth direction (gonial angle). Early treatment results in a better jaw relationship and less dental compensation. Notizen des Extraktors (SSen): -Early (age ≤9, 5-9) treatment habe ich als „Frühbehandlung (interzeptiv)“, - late (age >9) treatment als “reguläre Behandlung“ eingestuft.
Zusammen-fassung der Ergebnisse	**GRUPPE Early treatment group (II) VS. GRUPPE Late treatment group (III)** The relationship between the time of treatment and treatment success is shown in Table 2. Outcomes were successful in 74% of cases in the early versus 67% in the late treatment group. Clearly more failures were seen among male patients (80%). However, the early treatment group accounted for two-thirds of all patients. The intergroup differences are shown in greater detail in Table 3. The late treatment group, due to these patient’s more advanced age, showed greater lengths of the maxillary and cranial base already at T0. Also, this group showed higher values for mandibular length, Cond-Pog, ramus height, and lower face height at T0 and T1, larger APDI and gonial angles at T1, smaller angles from AB to mandibular plane at T0, T1, T2, less negative overjet at T0, less positive overjet at T1, and retrusive lower-incisor inclinations at T0 indicating dental compensation. 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: Kohortenstudie* *Durchführung: Klasse III Early treatment group VERSUS Late treatment group.* *Auswertung: Fehleranalyse durchgeführt, die Analyse valid und reproduzierbar* *Power der Studie/Patientenzahl: nicht kalkuliert,* *Funding: None.* *Interessenkonflikte: None.* *Bias (SIGN/AMSTAR/EinzelstudienRoB –): High quality (++)*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt hoch
	Klinische Aussagekraft: Die interzeptive Klasse-III Frühbehandlung (overall mean age ≤9, 5-9) mit der Kopfkinnkappe (KKK), führte zur Verbesserung (+1,6 mm) der Wits-Beurteilung und (+1,0mm) des Overjets und zur Verschlechterung des ANB-Winkels (-1,4°) 25 Jahre nach Abschluss der Behandlung im Vergleich zur regulären Behandlung (overall mean age >9). Diese Änderungen der Parameter waren nicht signifikant. (Siehe Tabelle 3) Zusätzlich hatten die Autoren als Behandlungserfolg, den sie in beiden Gruppen (74 % der Frühbehandlung, 67% der regulären Behandlung) unterschiedlich beobachtet haben wie folgt beschrieben: „Criteria for treatment success were positive overjet and overbite (>1 mm) and no transverse crossbite.“ Es ist unklar wie lange man die Therapie durchgeführt hat. Im Gegensatz zu dem obengenannten Ergebniss, hatten die Autoren im Material und Methodik wie folgt bekannt gegeben: „The patients were required to wear the chincup at 600 g per side for 24 h/day whenever possible and, once a positive overjet was achieved, overnight.“ Des Weiteren enthält die Studie keine genauen Angaben über die Steuerung des Alters, keine Details ob und wie bei den Patienten (mit oder ohne Erfolg mit KKK) die weitere KFO-Behandlung weitergeführt wurde. Da die Studie auch keine unbehandelte Kl. III Studienarm hat, sind die Ergebnisse auch entsprechen zu beurteilen.
Evidenz-level (SIGN)	**2++**
Qualität **(RoB, SIGN /AMSTAR II)**	**High quality (++)**

Evidenztabelle Westwood et al. 2002

ORIGINAL ARTICLE

Long-term effects of Class III treatment with rapid maxillary expansion and facemask therapy followed by fixed appliances

Patricia Vetlesen Westwood, DDS, MS,[a] James A. McNamara, Jr, DDS, PhD,[b] Tiziano Baccetti, DDS, PhD, Lorenzo Franchi, DDS, PhD,[c] and David M. Sarver, DMD, MS[d]

Ann Arbor, Mich, San Diego, Calif, Florence, Italy, and Tuscaloosa, Ala

In this cephalometric investigation, we compared the long-term effects of an initial phase of rapid maxillary expansion and facemask (RME/FM) therapy followed by comprehensive edgewise therapy with the effects of growth in untreated, matched controls. The treated sample consisted of 34 patients who underwent RME/FM treatment before the pubertal growth spurt (average age, 8 years 3 months at the beginning of treatment). At the final observation period (average age, 14 years 10 months), all patients were in decelerative growth phases as determined by the cervical vertebral maturation (CVM) method. After the first 10 months of active treatment, significant favorable changes in both the maxillary and the mandibular skeletal components were noted. The forward movement of the maxilla was 1.8 mm greater than in the controls, mandibular projection was reduced by almost 3 mm, and the relative sagittal intermaxillary discrepancy improved by 4.3 mm, as measured by the Wits appraisal. During the posttreatment period, the treated and untreated Class III subjects generally grew similarly, although the skeletal relationship of the maxilla to the mandible remained unchanged in the RME/FM group, whereas the controls had an increased skeletal discrepancy of 3.0 mm. Over the long term, there was a slightly greater increase in midfacial length (1.6 mm) in the treatment group than in the controls. Similarly, the distance from Point A to nasion perpendicular decreased by 1.2 mm in the treated group. The overall increase in mandibular length was 2.4 mm less in the RME/FM group than in the controls, and mandibular projection relative to nasion perpendicular was 3.0 mm less in the treated group. The change in the Wits appraisal was substantial between groups (5.1 mm), with an improvement in the intermaxillary relationship in the treated group (3.4 mm); the Wits appraisal worsened (−2.7 mm) in the untreated controls. No clinically significant differences were observed between the groups in the vertical dimension. Overjet increased significantly in the treated group relative to the controls (4.4 mm), whereas the molar relationship decreased significantly (–3.9 mm). It appears that the favorable skeletal change observed over the long term is due almost entirely to the orthopedic correction achieved during the RME/FM protocol. During the posttreatment period that includes the pubertal growth spurt, craniofacial growth in RME/FM patients is similar to that of untreated Class III controls. Aggressive over-correction of the Class III skeletal malocclusion, even toward a Class II occlusal relationship, appears to be advisable, with the establishment of positive overbite and overjet relationships essential to the long-term stability of the treatment outcome. (Am J Orthod Dentofacial Orthop 2003;123:306-20)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** From the parent sample, 34 subjects (20 girls and 14 boys) were selected for the treated group (TG). Lateral cephalograms for each subject were analyzed at all 3 observation periods. The mean ages of the TG at first observation (T1), within 1 month after RME/FM therapy (T2), and at the long-term observation after the 2-phase treatment (T3), and the mean duration of observation intervals are given in Table I. The records of the untreated Class III subjects (control group, CG) were obtained from the Department of Orthodontics at the University of Florence, the University of Michigan Elementary and Secondary School Growth Study and 3 private orthodontic practices in Michigan. The cephalometric comparisons between the groups aimed to evaluate skeletal and dentoalveolar modifications at the following time periods: (1) from T1 to T2, the effects of treatment were compared with changes in a CG of 12 subjects (6 girls, 6 boys); (2) from T2 to T3, the effects of treatment and fixed appliance therapy were compared with changes in an untreated CG of 15 subjects (7 girls, 8 boys); (3) from T1 to T3, the effects of treatment and posttreatment were compared with changes in a CG of 22 subjects (13 girls, 9 boys) with untreated Class III malocclusions (Table II).
Schweregrad	Wits appraisal -1.5 mm or less.
Einschluss-kriterien *Bei Review: PICOS*	• European-American ancestry (white); • Class III malocclusion at the first observation (T1) characterized by an anterior crossbite or edge-to-edge incisal relationship and a Wits appraisal of -1.5 mm or less • no permanent teeth congenitally missing or extracted before or during treatment • cephalograms of adequate quality available at T1, within 1 month after RME/FM therapy (T2), and at the long-term observation after the 2-phase treatment (T3) • postpubertal skeletal maturation at T3 based on the CVM method of developmental staging (stage 4, 5, or 6).
Ausschluss-kriterien	Keine Angaben
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE: **CLASS III treated group** N=34 (Anfang) / N=34 (Ende) / Alter = 8,4 ± 1,7 Jahre / ♂:♀ = 0,7:1 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: frühe Behandlung

Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE 1: **Untreated Control Group T1-T2: CG T1-T2** N=12 (Anfang) / N=12 (Ende) / Alter = 8,1 ± 2,5 Jahre / ♂:♀ = 1:1 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: keine Behandlung KONTROLLGRUPPE 2: **Untreated Control Group T2-T3: CG T2-T3** N=15 (Anfang) / N=15 (Ende) / Alter = 8,8 ± 2,3 Jahre / ♂:♀ = 1,1:1 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: keine Behandlung KONTROLLGRUPPE 3: **Untreated Control Group T1-T3: CG T1-T3** N=15 (Anfang) / N=15 (Ende) / Alter = 8,8 ± 2,5 Jahre / ♂:♀ = 0,7:1 • Gebissphase: frühes und spätes Wechselgebiss • KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: sagittal skeletal and dental parameters (ANB, Wits appraisal, overjet and molar relationship) SEKUNDÄRZIELGRÖßE: mandibular length (Co-Gn) TERTIÄRZIELGRÖßE: Mandibular plane angle MPA
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	This study showed the following treatment and posttreatment craniofacial modifications throughout an observation interval of 6 years 4 months: 1. Treatment with RME/FM therapy for 10 months (T1 to T2) induced a significant response of the craniofacial skeleton in terms of forward movement of the maxilla and downward and backward movement of the mandible. 2. Although Class III craniofacial characteristics were re-established in the posttreatment period, postprotraction (T2 to T3) growth did not display significant relapse in any cephalometric measure. 3. Overall, RME/FM therapy was shown to be an effective treatment for correcting skeletal Class III malocclusion in the long term (T1 to T3). The favorable skeletal effects induced before the pubertal growth spurt with orthopedic facemask therapy led to the establishment of a positive overbite and overjet relationship. The occlusal relationships generally withstood subsequent Class III craniofacial growth throughout attainment of skeletal maturity as assessed by the CVM method.

Zusammen-fassung der Ergebnisse	**GRUPPE CLASS III treated group VS. GRUPPE Untreated Control Group T1-T2: CG T1-T2** **GRUPPE CLASS III treated group VS. GRUPPE Untreated Control Group T2-T3: CG T2-T3** **GRUPPE CLASS III treated group VS. GRUPPE Untreated Control Group T1-T3: CG T1-T3** ***[PRIMÄRZIELGRÖßE*** sagittal skeletal and dental parameters (ANB, Wits appraisal, overjet and molar relationship) The net improvement in the long-term skeletal relationship also is indicated by an increase in the ANB angle of about 3° in the Wits appraisal (approximately 6 mm), overjet 4.4 mm and in the molar relationship appr. 4mm, when compared with the controls. ***SEKUNDÄRZIELGRÖßE*** mandibular length (Co-Gn) The net long-term reduction in mandibular length (about -2.5 mm)**.** ***TERTIÄRZIELGRÖßE:*** Mandibular plane angle MPA The net long-term closing of the mandibular plane angle (1.2°).
Angaben auffälliger positiver und/oder negativer Aspekte	*Studiendesign: Kohortenstudie* *Durchführung: Klasse III MCH gegen unbehandelte Klasse III Kohorte verglichen.* *Auswertung: Fehleranalyse durchgeführt, die Analyse valid und reproduzierbar* *Power der Studie/Patientenzahl: nicht kalkuliert,* *Funding: None.* *Interessenkonflikte: None.* *Bias (SIGN/AMSTAR/EinzelstudienRoB): High quality (++)*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt hoch
	Klinische Aussagekraft: **Die frühe Klasse-III Behandlung (overall mean age <8,5 ± 2,2 years)** mit der RPE und FM, mit anschließender festsitzender Apparatur, führte zu signifikanten dentoskelettalen langfristen Ergebnisse in Bezug auf die Verbesserung der sagittalen (+6 mm für die Wits-Beurteilung) und dentalen (+4,4 mm für Overjet, -44 mm für die Molarenbeziehung) Parameter; diese Veränderungen blieben **6 Jahren und 4 Monaten nach Abschluss der Behandlung weiterhin** stabil. Desweiteren die Behandlung mit der RPE und FM und die Therapie mit festsitzenden Apparaten eine moderate Abnahme der UK-Länge (ca. 2,5mm) und geringe „Anti-Clockwise Rotation“ Unterkiefers verursacht.
Evidenz-level (SIGN)	**2++**
Qualität (RoB, SIGN /AMSTAR II)	**High quality (++)**

Evidenztabelle Wieslander 1975

Early or late cervical traction therapy of Class II malocclusion in the mixed dentition

Lennart Wieslander, leg. tandläk., M.S.D.*
Stockholm, Sweden

Population	**Klasse-II-Anomalie** The material for this study consisted of two groups of Class II malocclusions,treated with cervical traction.
Schweregrad	average ANB discrepancy of 6 degrees.
Einschluss-kriterien	In all cases there was a full Class II molar relationship and an average ANB discrepancy of 6 degrees.
Ausschluss-kriterien	keine Angabe
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** *A 10 to 15 ounce force was applied to the first permanent molars for 12 to 14 hours per day, and there was an average treatment time of 2 years and 3 months in both groups.* VERSUCHSGRUPPE: **early mixed dentition** N=23/23 / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** *A 10 to 15 ounce force was applied to the first permanent molars for 12 to 14 hours per day, and there was an average treatment time of 2 years and 3 months in both groups* KONTROLLGRUPPE: **late mixed dentition** N=23/23 / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: *skeletal changes (ANB, PTM, Maxillary molar, Pogonion, ANS, Menton, Palatal plane, Mandibular plane, ANS-PTM, Articulare-gnahtion)*
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	It was the purpose of this investigation to evaluate the effect, of cervical traction in Class II malocclusions in which treatment was started either early or late in the mised dentition. Evaluation of the data indicated that the amount and direction of growth were of the greatest importance for effective treatment. Vertical growth appeared to be of particular importance and correlated to the anteroposterior improvement of the relationship between the maxilla and the mandible. Cervical traction, as advocated in this study, was more favorable in the early mixed dentition. A greater amount of growth and a subsequent increased reduction in the ANB angle was recorded during this period. The effect of treatment upon the maxilla, as revealed in posterior movement of the masillarp molar and the pterygomaxillary fissure, was more evident in early treatment. Great individual variability was observed, but in cases in which there was a severe discrepancy in the relationship between the maxilla and the mandible treatment in the early; mixed dentition may be essential.
Zusammen-fassung der Ergebnisse	**GRUPPE early VS. GRUPPE late mixed dention** ***PRIMÄRZIELGRÖßE*** *The difference in reduction of the ANB angle between the two groups was also statistically significant. Individual cases with great improvement in the relationship between the maxilla and the mandible usually belonged to the group of headgear patients treated early (Table II).*
Angaben auffälliger positiver und/oder negativer Aspekte	*Gut durchgeführte Kohortenstudie von 1975. Keine Angaben von Funding oder möglichen Interessenskonflikten. Keine Angaben zur Verblindung. Konfidenzintervallen, möglichen Störgrößen oder Patientenscreening. Angaben zum chronologischen Alter und zu Geschlechterverteilung fehlen.*
Schluss-folgerung des Begutachters	methodische Qualität: gut Klinische Aussagekraft: Die Richtung des Wachstums ist für eine wirksame Behandlung von Bedeutung. Es gab große individuelle Unterschiede
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Acceptable ⊕**

Evidenztabelle Woon, Thiruvenkatachari 2017

Early orthodontic treatment for Class III malocclusion: A systematic review and meta-analysis

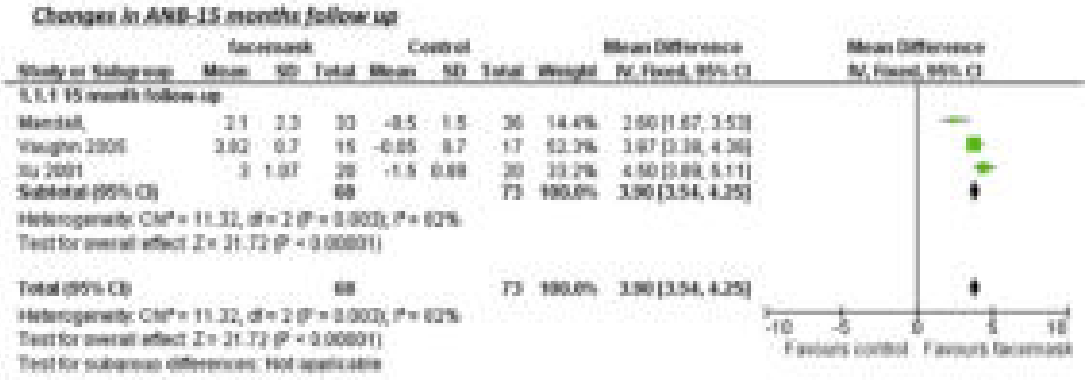
See Choong Woon and Badri Thiruvenkatachari
Manchester, United Kingdom

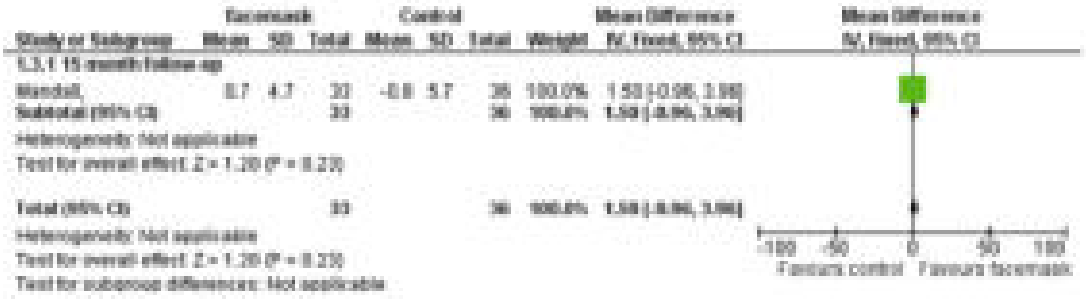
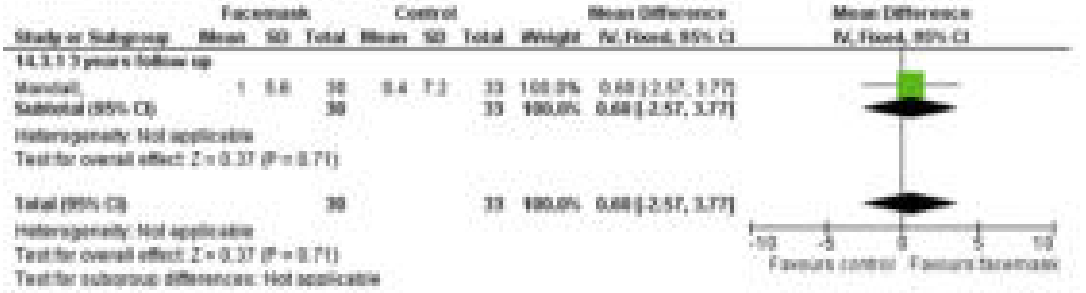
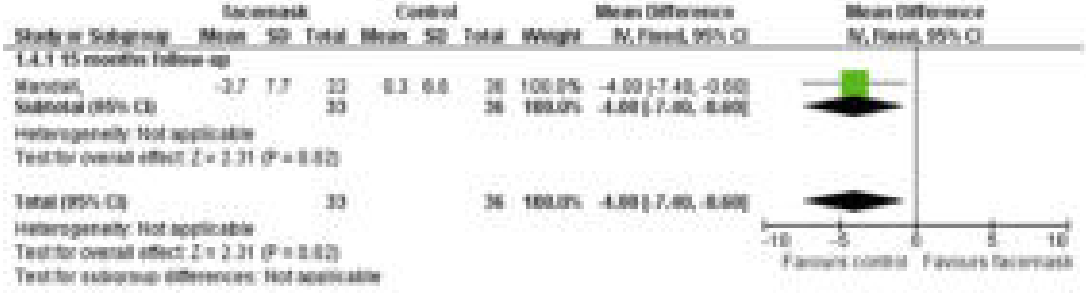
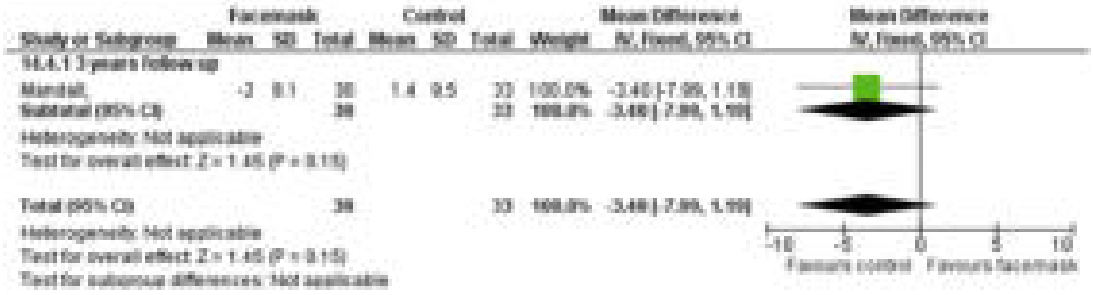
Introduction: Class III malocclusion affects between 5% and 15% of our population. The 2 most common dilemmas surrounding Class III treatment are the timing of treatment and the type of appliance. A number of appliances have been used to correct a Class III skeletal discrepancy, but there is little evidence available on their effectiveness in the long term. Similarly, early treatment of Class III malocclusion has been practiced with increasing interest. However, there has been no solid evidence on the benefits in the long term. The aim of this systematic review was to evaluate the effectiveness of orthodontic/orthopedic methods used in the early treatment of Class III malocclusion in the short and long terms. **Methods:** Several sources were used to identify all relevant studies independently of language. The Cochrane Central Register of Controlled Trials, Cochrane Database of Systematic Reviews, Embase (Ovid), and MEDLINE (Ovid) were searched to June 2016. The selection criteria included randomized controlled trials (RCTs) and prospective controlled clinical trials (CCTs) of children between the ages of 7 and 12 years on early treatment with any type of orthodontic/orthopedic appliance compared with another appliance to correct Class III malocclusion or with an untreated control group. The primary outcome measure was correction of reverse overjet, and the secondary outcomes included skeletal changes, soft tissue changes, quality of life, patient compliance, adverse effect, Peer Assessment Rating score, and treatment time. The search results were screened for inclusion, and the data extracted by 2 independent authors. The data were analyzed using software (version 5.1, Review Manager; The Nordic Cochrane Centre, The Cochrane Collaboration; Copenhagen, Denmark). The mean differences with 95% confidence intervals were expressed for the continuous data. Random effects were carried out with high levels of clinical or statistical heterogeneity and fixed effects when the heterogeneity was low. **Results:** Fifteen studies, 9 RCTs and 6 CCTs, were included in this review. In the RCT group, only 3 of 9 studies were assessed at low risk of bias, and the others were at high or unclear risk of bias. All 6 CCT studies were classified as high risk of bias. Three RCTs involving 141 participants looked at the comparison between protraction facemask and untreated control. The results for reverse overjet (mean difference, 2.5 mm; 95% CI, 1.21-3.79; $P = 0.0001$) and ANB angle (mean difference, 3.96°; 95% CI, 3.54-4.25; $P < 0.0001$) were statistically significant favoring the facemask group. All CCTs demonstrated a statistically significant benefit in favor of the use of each appliance. However, the studies had high risk of bias. **Conclusions:** There is a moderate amount of evidence to show that early treatment with a facemask results in positive improvement for both skeletal and dental effects in the short term. However, there was lack of evidence on long-term benefits. There is some evidence with regard to the chincup, tandem traction bow appliance, and removable mandibular retractor, but the studies had a high risk of bias. Further high-quality, long-term studies are required to evaluate the early treatment effects for Class III malocclusion patients.
Trial registration number: PROSPERO CRD42015024252. (Am J Orthod Dentofacial Orthop 2017;151:28-52)

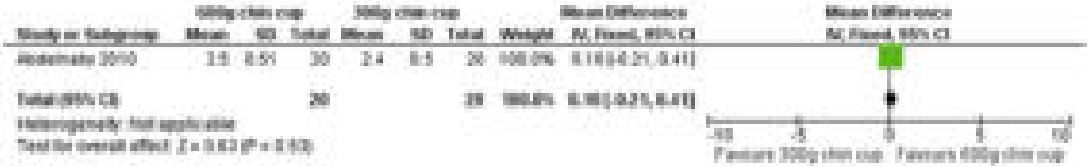
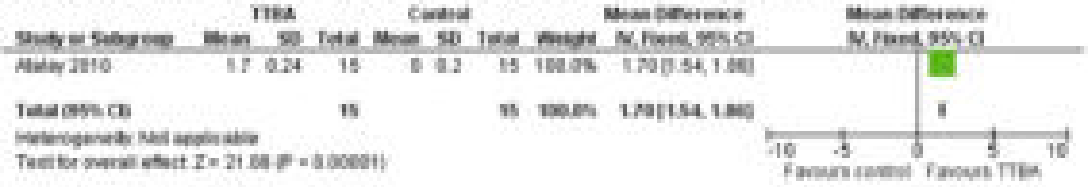
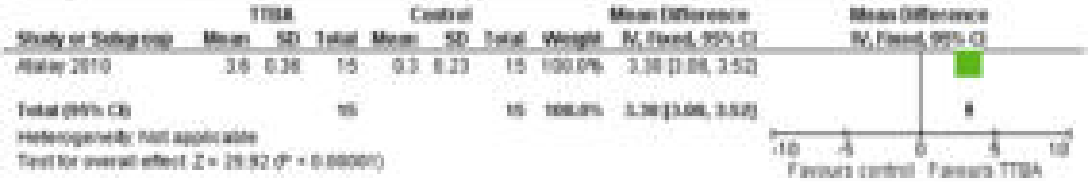
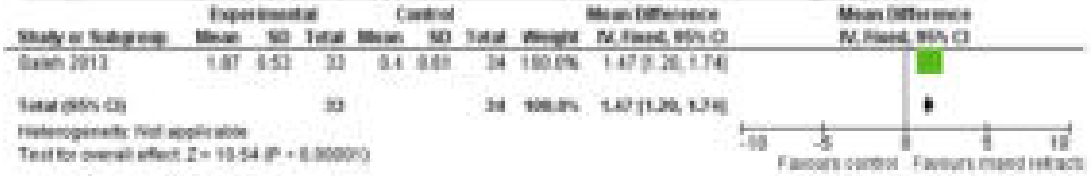
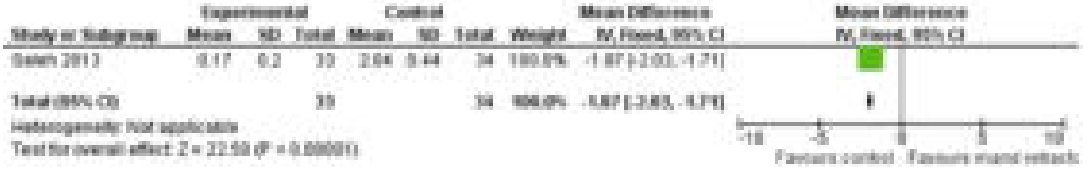
Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • Patients with Class III malocclusion between 7 and 12 years of age Review: RCTs and prospective CCTs. • Monozentrische Studien aus Europa (UK, Türkei) den USA, Asien (China) und Afrika (Ägypten).
Schweregrad	Keine Angabe

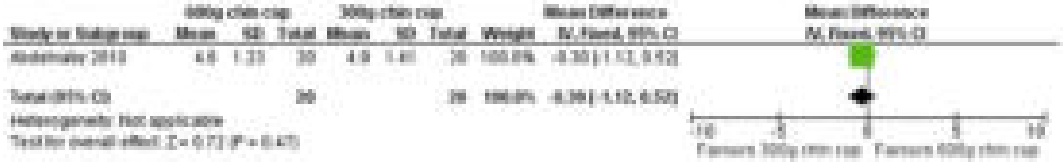
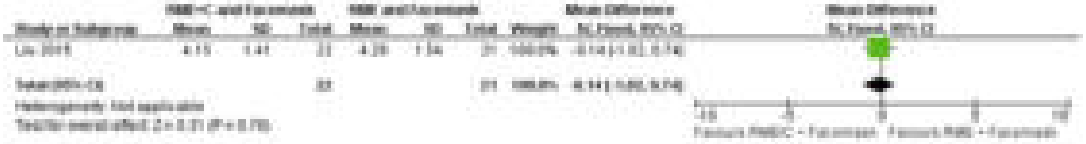
Einschluss-kriterien *Bei Review: PICOS*	• Population: Patients with Class III malocclusion between 7 and 12 years of ag • Intervention orthodontic treatment with a removable or fixed orthodontic/orthopedic appliance for early correction of Class III malocclusion • Comparison no treatment, delayed treatment, or intervention with the same appliance with different forces, different mechanics, **o**r a different appliance • Outcome, **planned** PRIMÄRZIELGRÖßE: correction of reverse overjet and skeletal changes (measured in millimeters or by other index of malocclusion) with the measurements based on study models, or cephalometric or clinical assessment SEKUNDÄRZIELGRÖßE: soft tissue changes, quality of life, patient compliance, adverse effects, Peer Assessment Rating score, and treatment time. Follow-up: 6 months to 36 months
Ausschluss-kriterien	Not fullfilling inclusion criteria Retrospective comparative studies Adult patients included in study
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE **Patients with Class III malocclusion between 7 and 12 years of age and orthodontic treatment with a removable or fixed orthodontic/orthopedic appliance for early correction of Class III malocclusion** Total: N= ? (Anfang) / N= 468 (Ende) / Alter = 8,6; 1,0 ♂:♀ = 242:226 CCT: N= ? (Anfang) / N= 190 (Ende) / Alter = 8,2; 1,3 ♂:♀ = 102:88 RCT: N= ? (Anfang) / N= 278 (Ende) / Alter = 8,9; 0,8 ♂:♀ = 140:138 davon in der Meta-Analyse: RCT, Meta: N= ? (Anfang) / N= 79 (Ende) / Alter = 8,6; 0,8 ♂:♀ = 44:35 • Gebissphase: frühes Wechselgebiss, • KFO Behandlung: frühe Behandlung

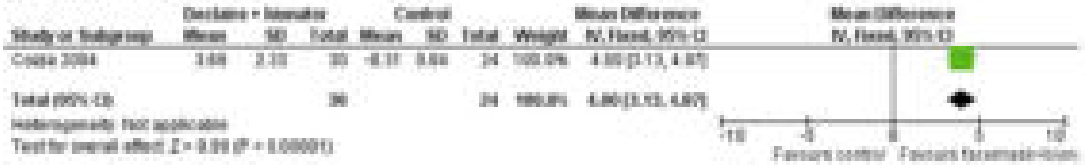
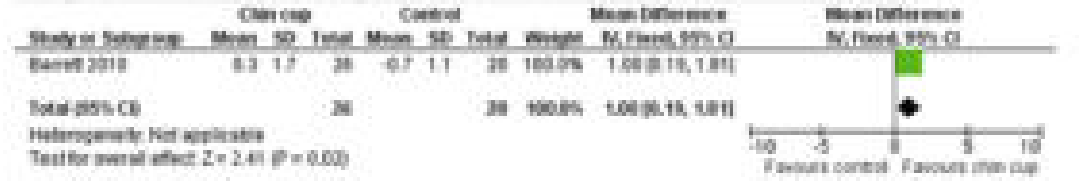
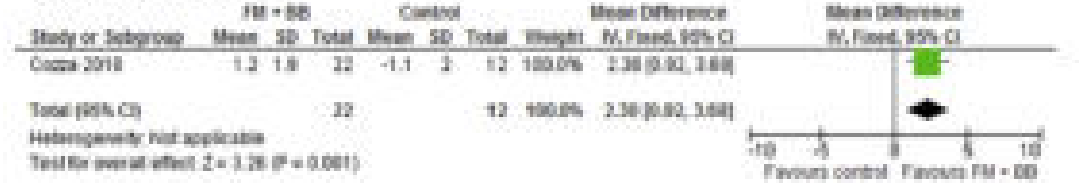
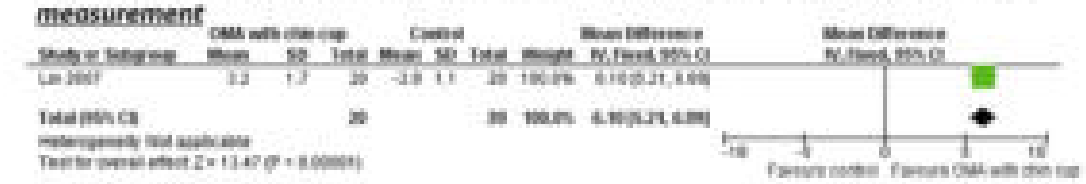
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **und** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/andere Apparturen/ andere Kräfte** KONTROLLGRUPPE: **Patients with Class III malocclusion between 7 and 12 years of age and no treatment, delayed treatment, or intervention with the same appliance with different forces, different mechanics, or a different appliance** Total: N= ? (Anfang) / N= 314 (Ende) / Alter = 8,1; 1,2 ♂:♀ = 158:156 CCT: N= ? (Anfang) / N= 158 (Ende) / Alter = 7,7; 1,3 ♂:♀ = 80:78 RCT: N= ? (Anfang) / N= 156 (Ende) / Alter = 8,2; 1,0 ♂:♀ = 78:78 davon in der Meta-Analyse: RCT, Meta: N= ? (Anfang) / N= 70 (Ende) / Alter = 8,3; 1,5 ♂:♀ = 39:31 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

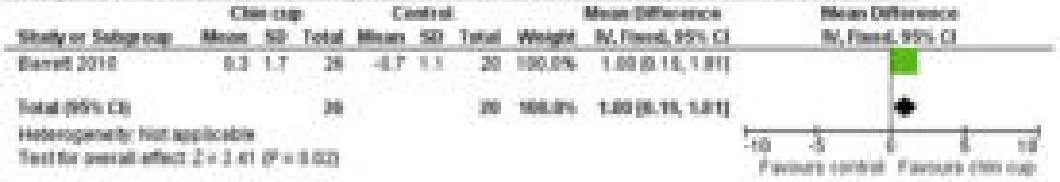
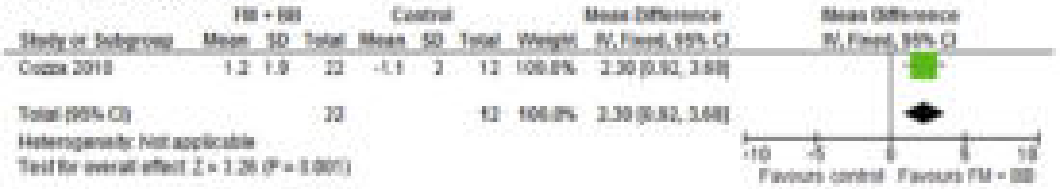
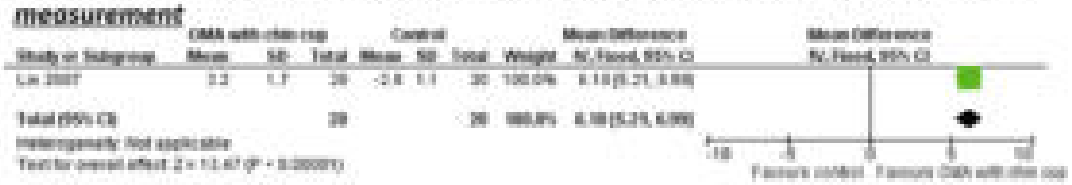
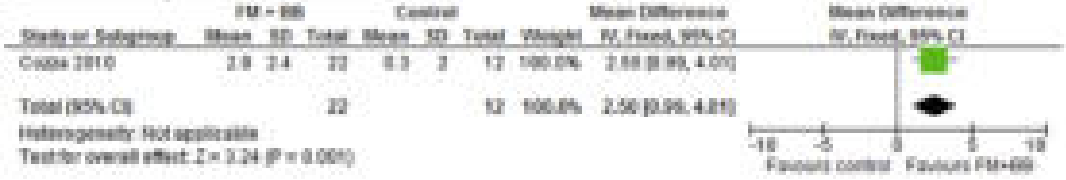
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär • dentofaziale Ästhetik • mundgesundheitsbezogene Lebensqualität (MLQ), psychische Entwicklung • Reduktion der Belastung des Patienten, Behandlungszeit PRIMÄRZIELGRÖßE: correction of reverse overjet and skeletal changes (measured in millimeters or by other index of malocclusion) with the measurements based on study models, or cephalometric or clinical assessment SEKUNDÄRZIELGRÖßE: soft tissue changes, quality of life, patient compliance, adverse effects, Peer Assessment Rating score, and treatment time. ANB and Overjet FM ± RME vs. untreated control  

Outcome	**Quality of Life** FM ± RME vs. untreated control *Plers Harris concept scores-15 months follow up*  *Plers Harris concept scores-3 years follow up*  *OASIS- 15 months follow up*  *OASIS- 3years follow up* 

Outcome	Comparisons between different treatments, other appliances vs. untreated, different force levels, differnt outcomes (skeletal, dental) **CAVE: Ergebnisse basieren teil weise auf CCTs (jeweils vermerkt)** **RCTs** Comparison of different forces (FM) Non-FM appliances vs. untreatedl *Comparison between 400g chin cup and 200g chin cup -ANB changes*  *Comparison between tandem traction bow appliance and control - ANB changes*  *Comparison between tandem traction bow appliance and control - Overjet correction*  *Comparison between removable mandibular retractor and control - Linear changes of A point*  *Comparison between removable mandibular retractor and control - Linear changes of B point* 

Outcome	**RCTs** Comparison of treatements *Comparison between conventional facemask and other appliance- ANB changes*  *Comparison between facemask with and without expansion*  *Comparison between 400g chin cup and 200g chin cup -Wits*  *Comparison between Facemask with RME versus Facemask with RME/C- ANB changes* 

Outcome	CCTs **Treatments (all) vs. untreated** ***Comparison between Modified maxillary protractor versus untreated control- ANB measurement***  ***Comparison between Delaire facemask and Bionator III versus untreated control- ANB measurement***  ***Comparison between Chincup versus untreated control- ANB measurement***  ***Comparison between Facemask with Bite Block appliance versus untreated control- ANB measurement***  ***Comparison between OMA with Chincup versus untreated control- Reverse overjet measurement*** 

Outcome	**continued** ***Comparison between Chincup versus untreated control- ANB measurement***  ***Comparison between Facemask with Bite Block appliance versus untreated control- ANB measurement***  ***Comparison between OMA with Chincup versus untreated control- Reverse overjet measurement***  ***Comparison between Chincup versus untreated control- Reverse overjet measurement***  ***Comparison between Facemask with Bite Block appliance versus untreated control- Reverse overjet measurement*** 
Studientyp	**Systematisches Review mit Meta-Analyse** Systematisches Review: N= 15 (9 RCTs, 6 CCTs). Von den 9 RCTs wurden 3 für die Meta-Analyse verwendet.

Schluss-folgerungen der Autoren	1. The overall **quality of evidence was low**. Only 3 ofthe 15 studies were classified as having a low riskof bias. 2. There is **moderate evidence to show that early treatment with a facemask resulted in positive improvements in both skeletal and dental changes in the short term**. However, there is a **lack of evidence for the long-term benefits**. 3. Although the chincup appliance showed greater skeletal changes when compared with the untreated control group, due to high heterogeneity and high risk of bias, the results should be interpreted with caution. 4. Further long-term, high-quality studies are needed to determine the long-term effects of orthopedic treatment for Class III patients. 5. The results from this study could be a starting point for clinicians to have a discussion with both patients and their parents to make an informed decision regarding early treatment.
Zusammen-fassung der Ergebnisse	**GRUPPE Patients with Class III malocclusion between 7 and 12 years of age and orthodontic treatment with a removable or fixed orthodontic/orthopedic appliance for early correction of Class III malocclusion VS. GRUPPE Patients with Class III malocclusion between 7 and 12 years of age and no treatment, delayed treatment, or intervention with the same appliance with different forces, different mechanics, or a different appliance** Three RCTs looked at the comparison between protraction facemask and untreated control. The results for **reverse overjet** (mean difference, 2.5 mm; 95% CI, 1.21-3.79; P 5 0.0001) **and ANB angle** (mean difference, 3.90_; 95% CI, 3.54-4.25; P \0.0001) were **statistically significant favoring the facemask group**. All CCTs demonstrated a statistically significant benefit in favor of the use of each appliance. However, the studies had high risk of bias.
Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Die wesentlichen RCT basierten Meta-Anaylsen finden sich in dieser Form auch bei Dorrie et al 2015 und Watkinson et al.2013. Ergänzt wurde die Piers Harris Analyse aus Mandall et al. Die zusätzlichen Analyse/ Vergleiche (Comparisons between different treatments, other appliances vs. untreated, different force levels, differnt outcomes (skeletal, dental)) sind Vergleiche weiterer Apparturen (nicht-FM) mit unbehandelten Kontrollen, oder deren Vergleiche (treatment 1 vs. treatment 2) einige basieren auf nicht randomisierten kontrollierten Kohortenstudien und sind daher nur mit Einschränkungen klinisch relevant. Das Review bietet im Vergleich mit den Vorgenannten wenig Neues. Die methodische Durchführung ist aber in Ordnung. Es fehlt lediglich eine dezidierte „publication bias“ Analyse und die Rolle des Geldgebers wurde nicht untersucht. Die Analyse zahlreicher Outcomes wurde geplant, es wurde allerdings nur ein geringer Teil dokumentiert, es fehlen Angaben zut Therapiedauer (Belastung) sowie zur dentofaziale Ästhetik (soft tissue changes) zur Compliance und zu unerwünschten Wirkungen. Ordentlich durchgeführtes Review. Interssanterweise weicht die Qualitätsbewertung der Primärliteratur von der in Watkinson et al 2013 z.T. deutlich ab. Watkinson et al bewerten größtenteils niedriger. Die klinische Relevanz für die dentalen und skeletalen outcomes ist identisch zu Dorrie et al und Watkinson et al. Die zusätzlichen Vergleiche sollten entsprechend ihrem Ursprung s(z.T. CCTs) entspechend vorsichtiger im Hinblick auf eine klinische Relevanz interpretiert werden.

Schluss-folgerung des Begutachters	methodische Qualität: Review: moderat; Einzelstudien: schlecht (laut Review)
	Die klinische Relevanz für die dentalen und skeletalen outcomes ist identisch zu Dorrie et al und Watkinson et al. Die zusätzlichen Vergleiche sollten entsprechend ihrem Ursprung s(z.T. CCTs) entspechend vorsichtiger im Hinblick auf eine klinische Relevanz interpretiert werden.
Evidenz-level (SIGN)	**1+**
Qualität (RoB, /AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle Xiang, M. et al., 2017

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Review Article

Changes in airway dimensions following functional appliances in growing patients with skeletal class II malocclusion: A systematic review and meta-analysis

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Meta-analysis

ABSTRACT

Objectives: The purpose of the study was to evaluate the treatment effects of functional appliances (FAs) on upper airway dimensions in growing Class II patients with mandibular retrognathism.

Methods: Five databases and the references of identified articles were electronically searched for relevant studies that met our eligibility criteria. The quality of the included studies was assessed using the Newcastle-Ottawa Scale. The effects of FAs on airway dimensions were combined by meta-analysis using the RevMan and STATA software.

Results: Seven studies (177 treated patients with mean age: 11.40 years and 151 untreated controls with mean age: 11.03 years) were included in this review. Compared to the control group, the oropharyngeal dimensions in the treatment group subjects were significantly increased at the superior pharyngeal space (MD = 1.75 mm/year, 95% CI: 1.13–2.32 mm, P < 0.00001), middle pharyngeal space (MD = 1.68 mm/year, 95% CI: 1.13–2.23 mm, P < 0.00001) and inferior pharyngeal space (MD = 1.21 mm/year, 95% CI: 0.48–1.95 mm, P = 0.001). No significant differences were found in nasopharyngeal and hypopharyngeal dimensions and the position of hyoid bone (P > 0.05). Soft palate length and soft palate inclination were improved significantly in the treatment group (P < 0.05).

Conclusions: The results showed that FAs can enlarge the upper airway dimensions, specifically in the oropharyngeal region, in growing subjects with skeletal Class II malocclusion. The early intervention for mandibular retrognathism with FAs may help enlarge the airway dimensions and decrease potential risk of obstructive sleep apnea syndrome for growing patients in the future.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** Growing patients with skeletal class II malocclusion due to retrognathic mandible with at least two high-quality cephalograms or CBCTs existing, one at the pre-treatment phase and the other at the posttreatment phase
Schweregrad	Nicht angegeben

Einschluss-kriterien *Bei Review: PICOS*	Population: Growing patients with skeletal class II malocclusion due to retrognathic mandible with at least two high-quality cephalograms or CBCTs existing, one at the pre-treatment phase and the other at the posttreatment phase Intervention: Functional appliances only Comparison: Control group, with Class II malocclusion, matched for age, had pre-functional treatment only or no treatment. The pre-functional treatment included only sectional fixed orthodontic appliance to correct mild crowding and/or rotations Outcome: PRIMÄRZIELGRÖßE: oropharyngeal dimensions (superior pharyngeal space SPS, middle pharyngeal space MPS, inferior pharyngeal space IPS, oropharyngeal area; measured in mm) SEKUNDÄRZIELGRÖßE: nasopharyngeal dimensions (nasopharyngeal height S-PNS, height of nasopharynx HNP, lower airway thickness LAT, upper airway thickness UAT, depth of nasopharynx DNP) TERTIÄRZIELGRÖßE: hypopharyngeal dimensions depth of hypopharynx (DHP) QUARTÄRZIELGRÖßE: skeletal changes (maxillary sagittal position SNA, mandibular sagittal position SNB, maxillary length CoA, mandibular length CoGn, mandibular plane angle FMA) WEITERE ZIELGRÖßE 1: hyoid bone (H-SN, C3-H) WEITERE ZIELGRÖßE 2: soft palate (Length of soft palate SPL, Thickness of soft palate SPT, Inclination of soft palate SPI) PRIMÄRZIELGRÖßE: oropharyngeal dimensions (superior pharyngeal space SPS, middle pharyngeal space MPS, inferior pharyngeal space IPS, oropharyngeal area; measured in mm) Study type: Randomized or non-randomized controlled trials, cohort studies
Ausschluss-kriterien	1. airway problems or abnormalities 2. followed-fixed appliances
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Functional appliances** N=177 (Anfang) / N=?? (Ende) / Alter = 11,48 Jahre / ♂:♀ = ?:? Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr KFO-Behandlung: reguläre Behandlung

Kontrolle Kontrollgruppe	**Keine kieferorthopädische Behandlung** For the control group, the majority of the patients were untreated individuals, whereas in the two studies [43,44], the participants were treated with only sectional fixed orthodontic appliance – S. 171 KONTROLLGRUPPE: **Control group, with Class II malocclusion, matched for age, had pre-functional treatment only or no treatment. The pre-functional treatment included only sectional fixed orthodontic appliance to correct mild crowding and/or rotations** N=137 (berechnet, aber im Text mit 153) (Anfang) / N=?? (Ende) / Alter = 11,20 Jahre / ♂:♀ = ?:? Gebissphase: spätes Wechselgebiss, permanentes Gebiss < 18. Lebensjahr KFO-Behandlung: keine Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** **Atmung und Luftraum (Airway space, Schlafapnoe), Schlucken und Sprechen** PRIMÄRZIELGRÖßE: oropharyngeal dimensions (superior pharyngeal space SPS, middle pharyngeal space MPS, inferior pharyngeal space IPS, oropharyngeal area; measured in mm) SEKUNDÄRZIELGRÖßE: nasopharyngeal dimensions (nasopharyngeal height S-PNS, height of nasopharynx HNP, lower airway thickness LAT, upper airway thickness UAT, depth of nasopharynx DNP) TERTIÄRZIELGRÖßE: hypopharyngeal dimensions depth of hypopharynx (DHP) QUARTÄRZIELGRÖßE: skeletal changes (maxillary sagittal position SNA, mandibular sagittal position SNB, maxillary length CoA, mandibular length CoGn, mandibular plane angle FMA) WEITERE ZIELGRÖßE 1: hyoid bone (H-SN, C3-H) WEITERE ZIELGRÖßE 2: soft palate (Length of soft palate SPL, Thickness of soft palate SPT, Inclination of soft palate SPI)
Studientyp	**Systematisches Review mit Meta-Analyse** Inkludierte Studien in Bezug auf PICO: nonrandomized studies N=7 (N = 6 for meta-analysis): 4 retro-, 3 prospective NRSI Gesamt-Teilnehmerzahl in Bezug auf PICO: N=314 (berechnet, im Text angegeben mit 330)

Schluss-folgerungen der Autoren	According to this meta-analysis we concluded that early treatment with FAs had **positive effects on the upper airway, especially on oropharyngeal** dimensions, in growing skeletal Class II patients. FAs cause the **forward reposition of the mandible and the adaptive changes of the soft palate**, thereby increasing the airway dimensions, which may help decrease the airway resistance and the potential risk of OSAS in the future.
Zusammen-fassung der Ergebnisse	**Functional appliance VERSUS Class II malocclusion patiens with pre-functional treatment (only sectional fixed orthodontic appliance to correct mild crowding and/or rotations) only or no treatment** **oropharyngeal dimensions (superior pharyngeal space SPS, middle pharyngeal space MPS, inferior pharyngeal space IPS, oropharyngeal area; measured in mm):** With regard to the changes of orophayngeal dimensions, there were four cephalometric variables to be pooled (Fig. 2). According to our results, the **oropharyngeal dimensions were the most evidently effected by FAs** compared to the nasopharyngx and hypopharyngx, and **significant improvements were found at SPS** (MD = 1.73 mm/year, 95% CI, 1.13 - 2.32 mm, P < 0.00001), **MPS** (MD =1.68 mm/year, 95% CI 1.13 – 2.23 mm, P< 0.00001) and **IPS** (MD = 1.21 mm/year, 95% CI 0.48 – 1.95 mm, P =0.001) with acceptable heterogeneity. Three studies [41,42,45] assessed the effect of FAs on **oropharyngeal area, and one study [42] could not be pooled** due to the difference in measuring methods. Although the three studies each indicated that the FAs could increase the oropharyngeal area, we found **no significant differences** (MD = 838.49 mm/year, 95% CI, -106.97-1783.94 mm, P = 0.08).

	nasopharyngeal dimensions (nasopharyngeal height S-PNS, height of nasopharynx HNP, lower airway thickness LAT, upper airway thickness UAT, depth of nasopharynx DNP): Five studies examined the nasopharyngeal changes, and the five cephalometric variables could be pooled (Fig. 3). **No significantly difference were found except in S-PNS, which was slightly decreased** an average of 0.89mm/ year (95% CI, -1.48 to -0.31 mm, P = 0.0003) compared tot he control group. **hypopharyngeal dimensions depth of hypopharynx (DHP):** As for the changes in hypopharyngeal dimensions [43,44], there were **no statistically significant changes** (Fig. 4,MD = 0.83 mm/year, 95% CI, -0.19 to 1.86 mm, P = 0.11). **skeletal changes (maxillary sagittal position SNA, mandibular sagittal position SNB, maxillary length CoA, mandibular length CoGn, mandibular plane angle FMA):** With regard to the skeletal changes, we found that FAs can force mandibular advancement with an **annual increase in SNB angles by 1.79°/year** (Fig. 5, 95% CI, 0.89-2.69 mm, P < 0.0001). The **effective length of the mandible was not significantly different** between the treatment group and the control group because **only two studies** were included. Therefore, our meta-analysis was not able to establish that FAs can increase in mandibular length but concluded that FAs can reposition the mandible forward. In addition, we also found **no significant change in the maxilla** (SNA, MD = -0.34 °/year, 95% CI -0.86 to 0.18 °, P =0.2; CoA MD = -0.58 mm/year, 95% CI -3.21 to 2.05 mm, P = 0.67). For the effect of FAs on the **mandibular plane angle, significant change was found on SN-GoGn** (MD = 1.19 °/year, 95% CI, 0.50-1.89 °, P = 0.0007) but FMA (MD = 0.62 °/year, 95% CI,-1.66 to 2.90 °, P = 0.59), and the inconsistency may due to the limited number of primary studies. **hyoid bone (H-SN, C3-H):** There was **no statistically significant effect in the vertical and sagittal direction of hyoid bone** (Fig. 6, H-SN, MD= -1.44 mm/year, 95% CI, -2.95 to 0.08 mm, P = 0.06; C3-H MD = 0.92 mm/year, 95% CI, 0.3-2.14 mm, P = 0.14). **soft palate (Length of soft palate SPL, Thickness of soft palate SPT, Inclination of soft palate SPI):** Finally, for the soft palate morphology, **SPL and SPI were significantly decreased with little heterogeneity** (SPL, MD = -2.01 mm/year, 95% CI,-2.93 to -1.09 mm, P < 0.0001; SPI MD = -5.08 °/year, 95% CI -7.49 to -2.67 °, P < 0.0001) and the change of **SPT was unapparent** compared to the control group (MD = 0.36 mm/year, 95% CI,-0.55-1.26 mm, P = 0.44) (Fi 7).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: kein Protokoll a priori, Kontrollgruppe schließt neben unbehandelten Patienten auch solche mit* "pre-functional treatment" ein, *Kontrollgruppe durch Klasse II und Alters-Anpassung vergleichbar* *Durchführung: detaillierte Angaben zu den eingeschlossenen Studien, Messergebnisse als jährliche Veränderung zur besseren Vergleichbarkeit angegeben* *Auswertung: Literatursichtung und Datenextraktion nicht durch zwei unabhängige Auswerter, RoB-Analyse durch zwei unabhängige Auswerter, vergleichbare Größen der Kontroll- & Versuchsgruppe* *Power der Studie/Patientenzahl: Abweichung zwischen den berechneten und im Text genannten Patientenzahlen der Kontrollgruppe, 7 Studien (6 zur Meta-Analyse)/ 314 (berechnet)* *Funding:* This work was supported by the Program for Innovation Team Building at Institutions ofHigher Education (NO CXTDG201602006) funded by the Chongqing Municipal Education Commission of China in 2016. *Interessenkonflikte:* The authors declare that they have no conflict of interest. *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?** **3. Did the review authors explain their selection of the study designs for inclusion in the review?** **5. Did the review authors perform study selection in duplicate?** **6. Did the review authors perform data extraction in duplicate?** **7. Did the review authors provide a list of excluded studies ar justify the exclusions?** **9. Did the review authors use a satisfactory technique for asse the risk of bias (RoB) in individual studies that were include the review?** **10. Did the review authors report on the sources of funding for studies included in the review?** **12. If meta-analysis was performed, did the review authors asse potential impact of RoB in individual studies on the results of meta-analysis or other evidence synthesis?** **14. Did the review authors provide a satisfactory explanation f and discussion of, any heterogeneity observed in the results of review?** **15. If they performed quantitative synthesis did the review aut carry out an adequate investigation of publication bias (small bias) and discuss its likely impact on the results of the revie** *Publikationsbias (Reviews):* Funnel plots and the Begg's rank correlation test were conducted to detect publication bias if the number of included studies exceeded 10.
Schluss-folgerung	methodische Qualität: Review akzeptabel, Einzelstudien von hoher Qualität

des Begutachters	Klinische Aussagekraft: Bei wachsenden Klasse-II-Patienten scheint ein funktionskieferorthopädisches Gerät zu einer positiven Veränderung des Luftraumes, insbesondere des oropharyngealen, zukommen. Die Größenzunahme ist vermulitch auf eine Vorverlagerung der Mandibula und entsprechende Veränderungen des weichen Gaumens zurückzuführen, während die Maxilla nicht wesentlich verändert wird. Diese Feststellung bezieht sich jedoch nur auf das Kurzzeitergebnis nach der Therapie, Aussagen über die langfristige Stabilität können an dieser Stelle nicht getroffen werden.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN /AMSTAR II)	**Moderat ++**

Evidenztabelle Yagci, Uysal 2010

Effects of conventional and modified facemask therapies on dentofacial structures

Ahmet Yagci, DDS, PhD,[a] Tancan Uysal, DDS, PhD[b]

Objective: The purpose of this prospective study was to evaluate the dentofacial effects of conventional and modified facemask therapies with rapid maxillary expansion, in a group of Class III patients, and compared with an untreated control group. **Methods:** The conventional facemask group (Group 1) comprised of 24 patients, 13 girls and 11 boys (mean age, 9.2 ± 1.4 years); the modified facemask treatment group (Group 2) comprised of 24 patients, 12 girls and 12 boys (mean age, 9.3 ± 1.6 years); and the control group (Group 3) comprised of 21 subjects, 11 girls and 10 boys (mean age, 9.8 ± 1.9 years). Treatment and control changes within the groups and the differences between the groups were analyzed statistically. Intra-group comparisons were evaluated using the non-parametric Wilcoxon's test and intergroup changes were analyzed using the Kruskal-Wallis test. The statistical significance of intergroup differences was further assessed with the Mann-Whitney test for independent samples and applying Bonferroni's correction ($p < 0.016$). **Results:** In group 1, SNB changes were less than the control. There were increases in SNA, ANB, SN-MP, A to N perp and Upper lip to E plane. In group 2, SNB, U1-NA (mm) U1-NA (°) and Pog to N perp (mm) changes were less than the control. There were increases in SNA, ANB, SN-MP, A to N perp and Upper lip to E plane. **Conclusions:** Modified facemask appliance can be used effectively in Class III patients with a retrognathic maxilla. Facemask therapies with expansion resulted in an anterior advancement and translation of maxilla without rotation; and the mandible moved downward and backward in both treatment groups. (**Korean J Orthod 2010;40(6):432-443**)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • Children with Class III molar relationship. Anterior crossbite or edge-to-edge incisal relationship ・ANB angle of 0° or less; and nasion perpendicular to A-point of 2 mm or less. • Turkey
Schweregrad	ANB < 0° A-N perp < 2mm
Einschluss-kriterien	Children with: ・Class III molar relationship ・Anterior crossbite or edge-to-edge incisal relationship ・ANB angle of 0° or less; and nasion perpendicular to A-point of 2 mm or less ・No congenitally missing or extracted teeth ・No deformity in the nasomaxillary complex ・Cephalometric radiographs of adequate quality available before and at the end of facemask-expansion therapy..

Ausschluss-kriterien	Patients with craniofacial abnormality, psychosocial impairment, craniofacial anomaly or skeletal openbite (at least a 1 mm opening when the incisal edges of the maxillary and mandibular incisors were projected perpendicularly onto the N-Me plane)
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **FM Pet + splint:** Petit-type facemask and a bonded full coverage maxillary acrylic splint and heavy elastics (500g) **RME+FM Pet:** Modified bonded rapid maxillary expansion appliance with full occlusal coverage, specially designed facebow, petit-type facemask, heavy elastics (500g) Patients were instructed to wear the facemask full-time except during meals VERSUCHSGRUPPE 1: **FM Pet + splint** N= 24(Anfang) / N=24 (Ende) / Alter = 9,2; 1,4/ ♂:♀ = 11:13 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung VERSUCHSGRUPPE 2: **RME+FM Pet** N= 24(Anfang) / N=24 (Ende) / Alter = 9,3; 1,6/ ♂:♀ = 12:12 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** N=21 (Anfang) / N=21 (Ende) / Alter = 9,8; 1,9 ♂:♀ = 10:11 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: Skeletal: SNA, SNB, ANB SEKUNDÄRZIELGRÖßE: Dental: UL to E plane
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	**Modified facemask appliance can be used effectively** in Class III patients with a retrognathic maxilla. Facemask therapies with expansion resulted in an anterior advancement and translation of the maxilla without rotation and the mandible moved downward and backward in both treatment groups. **Both treatment protocols have similar effects except for incisor positions**.

Zusammen-fassung der Ergebnisse	**GRUPPE FM Pet + splint VS. GRUPPE untreated Class III** **GRUPPE RME+FM Pet VS. GRUPPE untreated Class III** T1 (pre-treatment) (mean age 9,2 years FM Pet + splint; 9,3 years RME+FM Pet) T2 (post-treatment) (mean age 10,3 vears FM Pet + splint; 10,5 years RME+FM Pet) Control T1: 9,8; T2: 10.7 SNA, SNB, ANB/ UL to E plane *FM Pet + splint vs.control* In *FM Pet + splint*, SNB changes were less than the control and this changes were statistically significant ($p < 0.05$). There were increases in SNA, ANB, SN-MP, ($p < 0.001$) and A to N perp and Upper lip to E plane ($p < 0.01$). RME+FM Pet vs. control In RME+FM Pet, SNB, U1-NA (o) ($p < 0.05$) and U1-NA (mm) and Pog to N perp (mm) ($p < 0.01$) changes were less than the control. There were increases in SNA, SN-MP ($p < 0.01$) and ANB, A to N perp and Upper lip to E plane ($p < 0.001$) *FM Pet + splint vs.* RME+FM Pet When both treatment groups were compared, no statistically significant differences were found in any of the measurements
Angaben auffälliger positiver und/oder negativer Aspekte	Die Äquivalenz von Versuch- und Kontrollgruppe ist umfassend geprüft und die Unterscheide irrelevant für das Outcome. Eien Power Berechnung wurde durchgeführt. Die prospektive Studie hat ein akzeptables Risiko für Selection Bias. Insgesamt ordentliche Studie. Die klinische Relevanz ist gegeben. *Funding:* keine Angabe *Interessenkonflikte:* keine Angabe *Bias (SIGN): Prospektive Studie. Äquivalenz der Gruppen gegeben. Power Berechnung durchgeführt.*
Schluss-folgerung des Begutachters	<u>methodische Qualität: akzeptabel</u> <u>Klinische Aussagekraft</u> Insgesamt ordentliche Studie. Die klinische Relevanz ist gegeben.
Evidenz-level (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle Yang, Li et al. 2014

SYSTEMATIC REVIEW AJO-DO

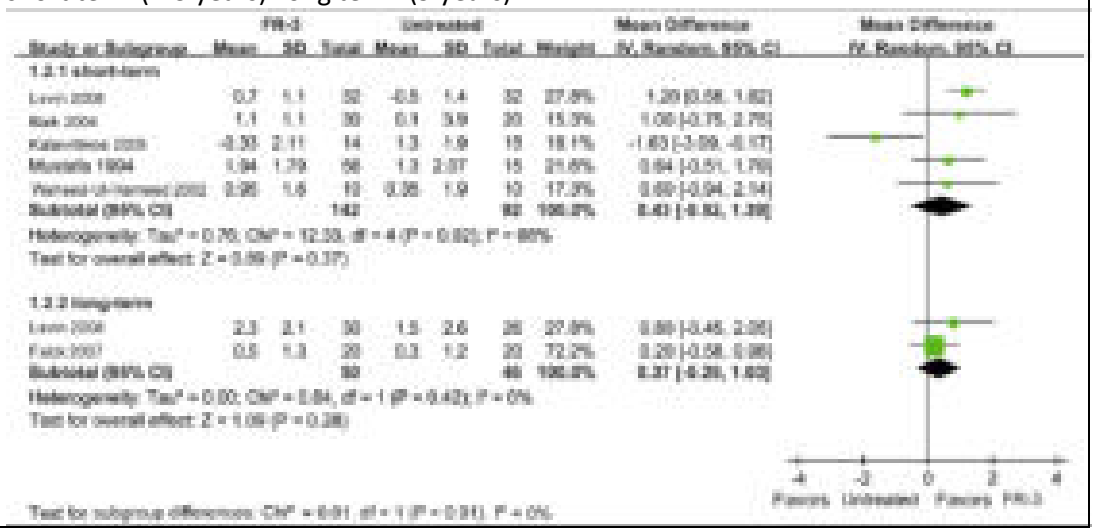
Treatment effectiveness of Fränkel function regulator on the Class III malocclusion: A systematic review and meta-analysis

Xianrui Yang,[a] Chunjie Li,[b] Ding Bai,[c] Naichuan Su,[d] Tian Chen,[e] Yang Xu,[a] and Xianglong Han[a]
Chengdu, Sichuan, China

Introduction: The Fränkel function regulator III appliance (FR-3) has been used to correct Class III malocclusions for many years; however, its treatment effectiveness is controversial. In this study, we aimed to assess the effectiveness of the FR-3 in treating patients with Class III malocclusion in the growth and development period. **Methods:** Medline (via PubMed), Cochrane Central Register of Controlled Trials, Embase, Chinese Biomedical Literature Database, China National Knowledge Infrastructure, VIP Database for Chinese Technical Periodicals, Scirus, Lilacs, Scopus, and World Health Organization International Clinical Trials Registry Platform were searched electronically. Relevant journals and reference lists of included studies were manually searched. The quality of the included studies was assessed with the Newcastle-Ottawa scale. The meta-analysis was carried out using RevMan (version 5.2; Nordic Cochrane Centre, Cochrane Collaboration, Copenhagen, Denmark). **Results:** Seven high-quality cohort studies were included. The meta-analysis showed that SNA changes did not differ in the short (mean difference, 0.43°; 95% CI, −0.52°-1.39°) and long (mean difference, 0.37°; 95% CI, −0.29°-1.03°) terms. However, SNB changes significantly differed in the short (mean difference, −1.62°; 95% CI, −2.62° to −0.62°) and long (mean difference, −1.50°; 95% CI, −2.12° to −0.88°) terms. By contrast, MPA changes did not differ in the short term (mean difference, 0.55°; 95% CI, −0.74°-1.84°). **Conclusions:** Clinical evidence suggests that the FR-3 might restrict mandibular growth but not stimulate forward movement of the maxilla. Further high-quality studies are necessary to confirm the effectiveness of the FR-3. (Am J Orthod Dentofacial Orthop 2014;146:143-54)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • Participants, with ages from 5 to 15 years, who were diagnosed as having an Angle Class III malocclusion in the growth and development period, without limitations for sex and race; the diagnostic criteria for Class III malocclusion were mandibular prognathism, maxillary retrusion, or anterior crossbite, including both skeletal and dental deformities. Review: Study type: randomized controlled trials, clinical controlled trials, and cohort studies • Monozentrische Studien aus Europa (Deutschland, Griechenland, Türkei)) und Asien (Korea, Pakistan).
Schweregrad	Keine Angabe

Einschluss-kriterien *Bei Review: PICOS*	• Population: Participants, with ages from 5 to 15 years, who were diagnosed as having an Angle Class III malocclusion in the growth and development period, without limitations for sex and race; the diagnostic criteria for Class III malocclusion were mandibular prognathism, maxillary retrusion, or anterior crossbite, including both skeletal and dental deformities. • Intervention FR-3 appliances according to the clinicians' instructions • Comparison no treatment • Outcome, changes in cephalometric measurements, including overbite and overjet in both groups PRIMÄRZIELGRÖßE: SNA, SNB, MPA, ANB SEKUNDÄRZIELGRÖßE: Wits TERTIÄRZIELGRÖßE: overjet, overbite Follow-up: 1- 9 years
Ausschluss-kriterien	Patients had other diseases affecting growth and development. Repetitive publication (only well-described articles were included)
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** VERSUCHSGRUPPE **Fränkel III** • Total: N= ?(Anfang) / N= 182 (Ende) **/** Alter = 8,5 ± 1,0 / ♂:♀ = 80:102 (davon in der Meta-Analyse: RCT, Meta: N= ? (Anfang) / N= 162 (Ende) / Alter = 8,4 ± 1,0 ♂:♀ = 70:92) • Gebissphase: frühes Wechselgebiss • KFO Behandlung: frühe Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated Class III** • Total: N= ? (Anfang) / N= 157 (Ende) / Alter = 8,3 ± 1,1 ♂:♀ = 77:80 (davon in der Meta-Analyse: RCT, Meta: N= ? (Anfang) / N= 138 (Ende) / Alter = 8,1 ± 1,1 ♂:♀ = 68:70) • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: keine Behandlung

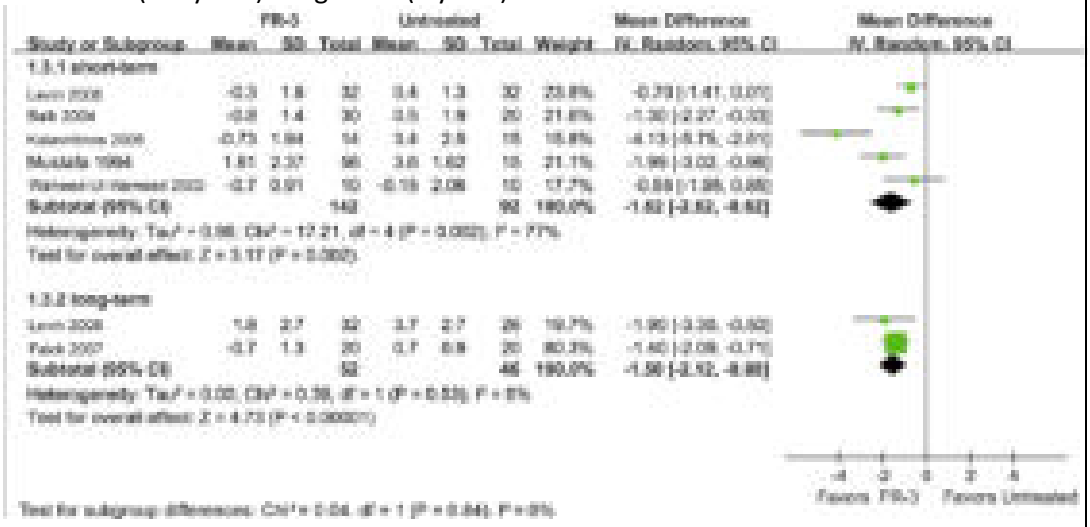
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär PRIMÄRZIELGRÖßE: SNA, SNB, MPA, ANB SEKUNDÄRZIELGRÖßE: Wits TERTIÄRZIELGRÖßE: overjet, overbite **SNA** FR3 vs. untreated control short term (2-3 years) Long term (9 years) 

Outcome	

SNB

FR3 vs. untreated control

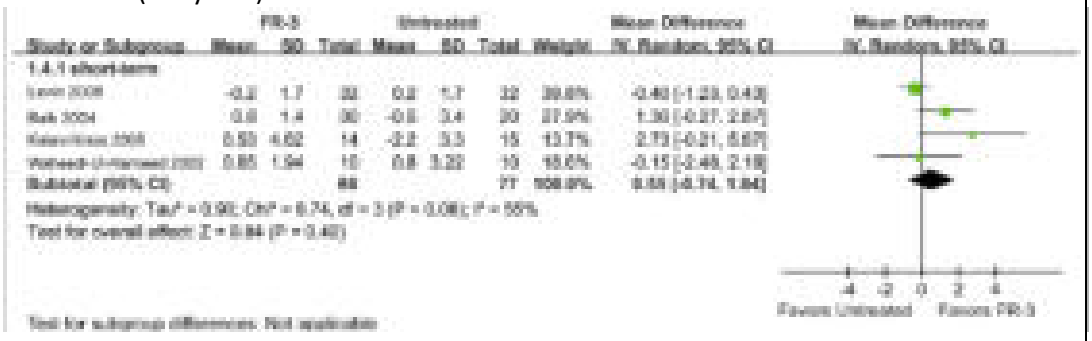
short term (2-3 years) Long term (9 years)



MPA

FR3 vs. untreated control

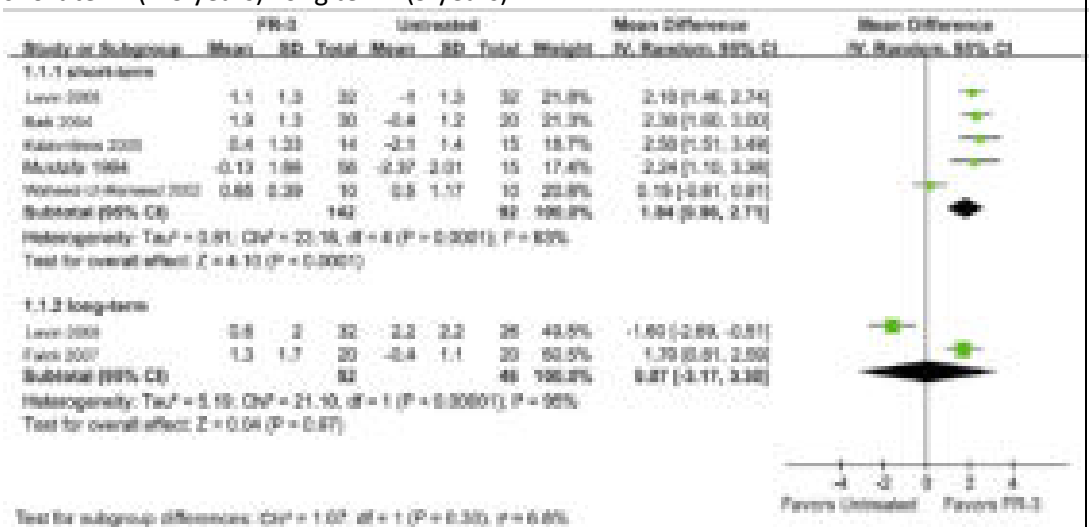
short term (2-3 years)

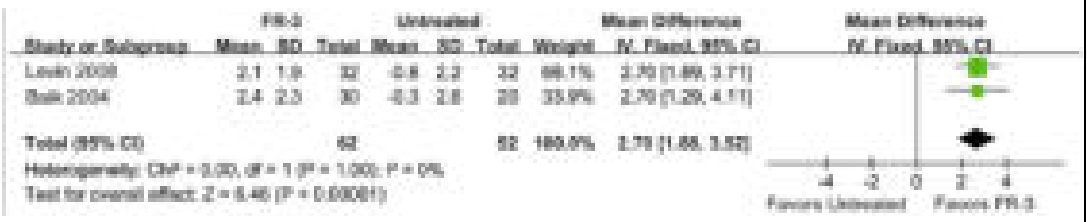
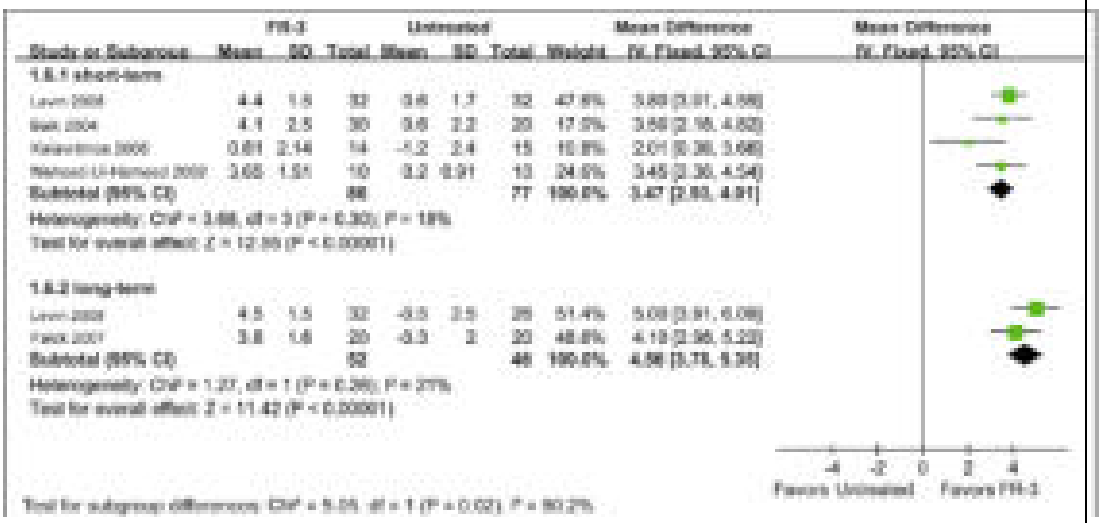
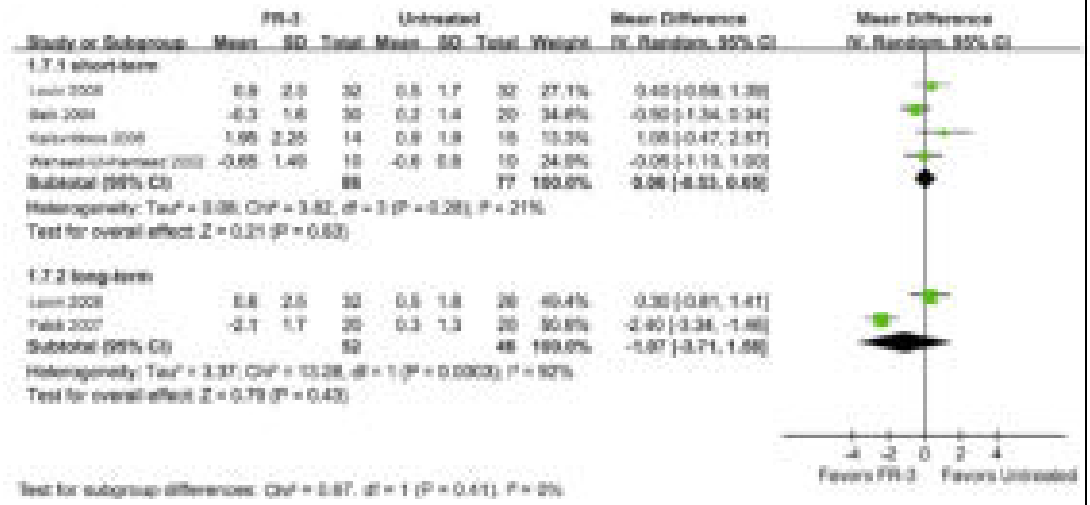


ANB

FR3 vs. untreated control

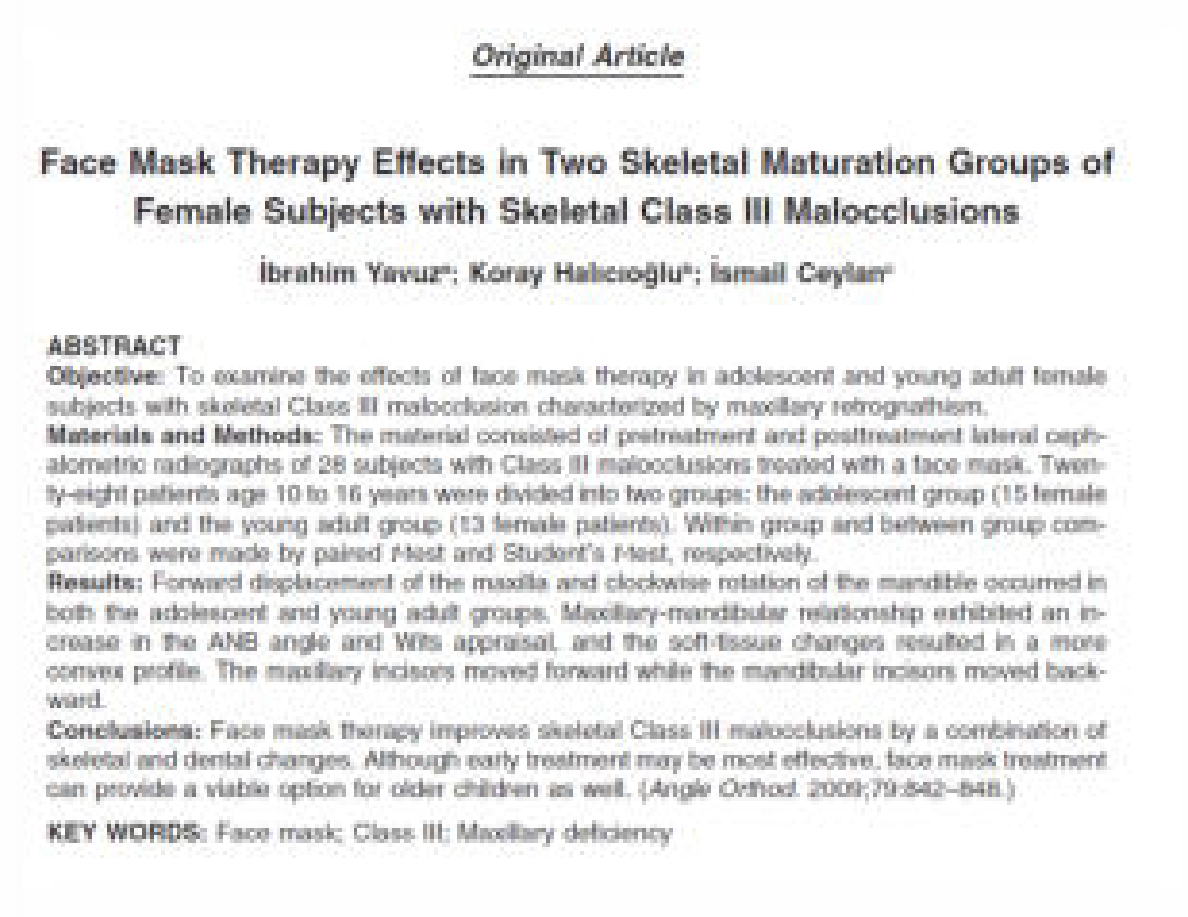
short term (2-3 years) Long term (9 years)



Outcome	Wits FR3 vs. untreated control  Overjet FR3 vs. untreated control short term (2-3 years) Long term (9 years)  Overbite FR3 vs. untreated control short term (2-3 years) Long term (9 years) 
Studientyp	**Systematisches Review mit Meta-Analyse** N= 7 (all CCTs). Von diesen wurden 6 für die Meta-Analyse verwendet.

Schluss-folgerungen der Autoren	The **evidence supporting the forward movement** of the maxilla caused by the FR-3 appliance is **not strong enough**. Conversely, the theory that the FR-3 appliance **restricts mandibular development seems reasonable**. Further **high-quality studies are needed** to arrive at a stable conclusion on the effectiveness of the FR-3 appliance on Angle Class III malocclusions.
Zusammen-fassung der Ergebnisse	**GRUPPE Patients with Class III malocclusion between 7 and 12 years of age and orthodontic treatment with a removable or fixed orthodontic/orthopedic appliance for early correction of Class III malocclusion VS. GRUPPE untreated Class III** **SNA** changes **did not differ between** the 2 groups in the short term (mean difference, 0.43°; 95% CI, °0.52°-1.39°) and long term (mean difference, 0.37; 95% CI, °0.29°-1.03°) . **SNB** changes: short-term effects, with **significant differences** were observed between the groups (mean difference, °1.62°; 95% CI, °2.62° to °0.62°). In terms of long-term effects, 2 studies with 52participants in the FR-3 groups and 46 participants in the control groups had significant differences (mean difference, °1.50°; 95% CI, °2.12° to °0.88°). **Mandibular plane angle (MPA)** changes (only short term evaluated): **no difference** (mean difference, 0.55°; 95% CI, °0.74°-1.84°). **ANB** changes showed showed **statistical differences** in both the short term (mean difference, 1.84°; 95% CI, 0.96°-2.71°) and long term (mean difference, 0.07°; 95% CI, °3.17°-3.30°). **Wits** changes (only short term evaluated): **significant differences** (mean difference, 2.70 mm;95% CI, 1.88-3.52 mm). **Overjet, overbite**: **significant differences in overjet** between the short term (mean difference, 3.47 mm; 95% CI, 2.93-4.01 mm) and long term (mean difference, 4.56 mm; 95% CI, 3.78-5.35 mm). However, **no difference existed in overbite** in the short term (mean difference, 0.06 mm; 95% CI, 0.53-0.65 mm) and long term (mean difference, 1.07 mm; 95% CI, 3.71-1.58 mm)
Angaben auffälliger positiver und/oder negativer Aspekte	Die methodische Durchführung ist in Ordnung. Es fehlt lediglich eine dezidierte „publication bias“ Analyse sowie ein begründete Liste mit ausgeschlossenen Studien und die Rolle des Geldgebers wurde nicht untersucht. Die größte Einschränkung ist die ausschließliche Verwendung von NRSIs. Diese reichten in der Qualitätsbewertung von schlecht bis gut und waren im Mittel moderat. Die klinische Relevanz wird durch den ausschließlichen Einschluss von NRSI eingeschränkt.
Schluss-folgerung des Begutachters	methodische Qualität: Review: moderat; Einzelstudien: moderat (laut Review)
	Klinische Aussagekraft: Die klinische Relevanz wird durch den ausschließlichen Einschluss von NRSI eingeschränkt.
Evidenzlevel (SIGN)	**2+**
Qualität (RoB, /AMSTAR II)	**Moderat ⊕⊕**

Evidenztabelle Yavuz et al. 2009



Original Article

Face Mask Therapy Effects in Two Skeletal Maturation Groups of Female Subjects with Skeletal Class III Malocclusions

İbrahim Yavuz[a]; Koray Halıcıoğlu[b]; İsmail Ceylan[c]

ABSTRACT

Objective: To examine the effects of face mask therapy in adolescent and young adult female subjects with skeletal Class III malocclusion characterized by maxillary retrognathism.

Materials and Methods: The material consisted of pretreatment and posttreatment lateral cephalometric radiographs of 28 subjects with Class III malocclusions treated with a face mask. Twenty-eight patients age 10 to 16 years were divided into two groups: the adolescent group (15 female patients) and the young adult group (13 female patients). Within group and between group comparisons were made by paired *t*-test and Student's *t*-test, respectively.

Results: Forward displacement of the maxilla and clockwise rotation of the mandible occurred in both the adolescent and young adult groups. Maxillary-mandibular relationship exhibited an increase in the ANB angle and Wits appraisal, and the soft-tissue changes resulted in a more convex profile. The maxillary incisors moved forward while the mandibular incisors moved backward.

Conclusions: Face mask therapy improves skeletal Class III malocclusions by a combination of skeletal and dental changes. Although early treatment may be most effective, face mask treatment can provide a viable option for older children as well. (*Angle Orthod.* 2009;79:842–848.)

KEY WORDS: Face mask; Class III; Maxillary deficiency

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** • The material consisted of the lateral cephalograms and hand-wrist films of 28 female subjects with skeletal Class III malocclusions caused by maxillary deficiency, which were treated with a face mask at the Department of Orthodontics, Ataturk University and Faculty of Dentistry. • The initial cephalometric radiographs (T1) were obtained before face mask treatment, the second (T2) after achieving a positive overjet and/or Class I occlusion. The patients were divided into two developmental groups according to Fishman's system of hand-wrist skeletal maturation assessment. • Group 1 (adolescents), which represented the accelerating growth velocity (SMI 1–3) consisted of 15 female patients. • Group 2 (young adults), which represented the completing adolescent growth spurt (SMI 10, 11) consisted of 13 female patients.
Schweregrad	zero or negative overjet, Class III molar relationship, ANB angle of 0 ° or less, and Wits appraisal of - 1 mm or less.

Einschluss-kriterien *Bei Review: PICOS*	The inclusion criteria were zero or negative overjet, Class III molar relationship, ANB angle of 0 ° or less, and Wits appraisal of - 1 mm or less.
Ausschluss-kriterien	Exclusion criteria were any craniofacial anomaly, severe posterior crossbite, any previous orthodontic treatment, and severe skeletal open bite
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE: **Group 1 (adolescents)** N=15 (Anfang) / N=15 (Ende) / Alter = 10,4 ± 1,08 Jahre / ♂:♀ = 0:15 • Gebissphase: spätes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase** KONTROLLGRUPPE: **Group 2 (young adults)** N=13 (Anfang) / N=13 (Ende) / Alter = 14,02 ± 0,63 Jahre / ♂:♀ = 0:13 • Gebissphase: permanentes Gebiss < 18 • KFO-Behandlung: Spätbehandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE: sagittal skeletal and dental parameters (ANB, Wits appraisal) SEKUNDÄRZIELGRÖßE: Kiefer mandibular length (Co-Gn), maxillary length (Co-A) TERTIÄRZIELGRÖßE: vertical skeletal measurements: (PP-SN angle, MP-SN angle, LAFH distance)
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	1. Correction of a skeletal Class III malocclusion characterized by maxillary retrognathism with face mask therapy appears to result from a combination of skeletal and dental changes. 2. In both age groups, skeletal change was primarily a result of anterior and vertical movement of the maxilla. Mandibular position was directed backward and downward with a significant increase in lower face height. 3. Dental changes also contributed to the correction and soft tissues changed in a more convex profile.

Zusammen-fassung der Ergebnisse	**GRUPPE Group 1 (adolescents) VS. GRUPPE Group 2 (young adults)** ***[PRIMÄRZIELGRÖßE*** sagittal skeletal and dental parameters (ANB, Wits appraisal) **comparison of differences post- vs pre-treatment** **ANB (°)** Young adult: 2.25 ±1.20, adolescent: 3.65 ± 1.56 **p=.014 (sig.)** **Wits (mm**) Young adult: 4.76 ± 3.05, adolescent: 5.82 ± 3.55 **p= .409 (not sign.)** ***SEKUNDÄRZIELGRÖßE*** mandibular length (Co-Gn) **Co-Gn (mm)** Young adult: -0.58 ± 1.27, adolescent: 3.73 ± 4.37 p= **.002 (sig.)** ***TERTIÄRZIELGRÖßE:*** vertical skeletal measurements: (PP-SN angle, MP-SN angle, LAFH distance) **PP-SN**: Young adult: -1.39 ± 1.17, adolescent:-2.45 ± 1.46 **p= .047 (sig.)** **MP-SN:** Young adult: 1.33 ± 1.79, adolescent: 1.87 ± 1.86 **p= .446 (not sign.)** **LAFH:** Young adult: 3.36 ± 2.11, adolescent: 6.60 ± 3.10 **p= .004 (sign.)**
Angaben auffälliger positiver und/oder negativer Aspekte	*Studiendesign: Kohortenstudie* *Durchführung: Group 1 (adolescents) VERSUS Group 2 (young adults),* *Auswertung: The initial cephalometric radiographs (T1) were obtained before face mask treatment, the second (T2) after achieving a positive overjet and/or Class I occlusion. Fehleranalyse durchgeführt, die Analyse valid und reproduzierbar* *Power der Studie/Patientenzahl: nicht kalkuliert,* *Funding: None.* *Interessenkonflikte: None.* *Bias (SIGN/AMSTAR/EinzelstudienRoB –): High quality (++) X*
Schluss-folgerung des Begutachters	methodische Qualität: insgesamt hoch
	Klinische Aussagekraft: Die Ergebnisse aus dieser Studie weisen darauf hin, dass eine Behandlung mit der Geischtsmaske bei den Heranwachsenden effektiver als bei den jungen Erwachsenen sein kann. Trotzdem hat man hier den Zeitpunkt T2 definitionsgemäß als Einstellung der Klasse I-Verzahnung bei positivem Overjet definiert. Das zeigt wiederum, dass die Gruppe 2(junge Erwachsenen) ebenso die Studie mit einer erfolgreichen Behandlung abgeschlossen haben. Marginale Unterschiede zeigten sich jedoch in der Behandlungsdauer mit der Gesichtsmaske. Für die Heranwachsende war dies 6.89±1.53 und für die junge Erwahsenen 8.00 ± 1.65.
Evidenz-level (SIGN)	**2++**
Qualität (RoB, SIGN /AMSTAR II)	**High quality (++)**

Evidenztabelle Zhang, Jia et al 2018

ORIGINAL ARTICLE AJO-DO

Dentoskeletal effects of facemask therapy in skeletal Class III cleft patients with or without bone graft

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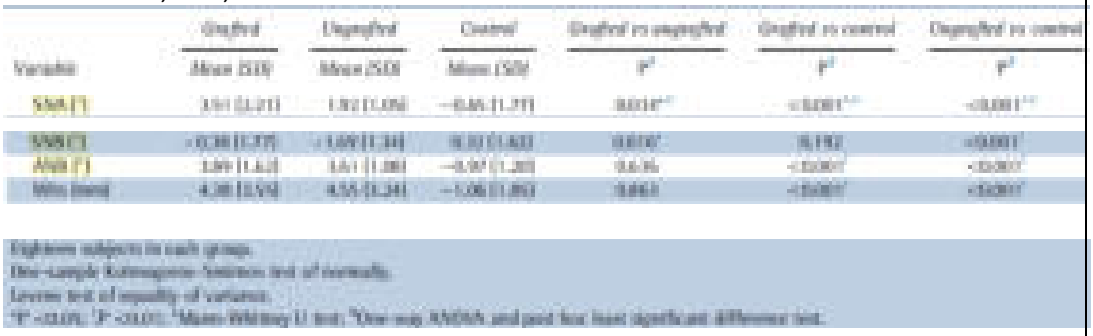
Introduction: The association between maxillary protraction and bone graft in patients with cleft lip and palate remains unclear. The purpose of this study was to investigate whether a secondary alveolar bone graft influences dentoskeletal effects of facemask therapy in unilateral cleft lip and palate patients with a skeletal Class III relationship. **Methods:** In this prospective nonrandomized clinical trial, 61 consecutive boys with unilateral cleft lip and palate and skeletal Class III malocclusion were divided into 3 groups: grafted facemask group (n = 21), ungrafted facemask group (n = 20), and untreated control group (n = 20). Sixteen dentoskeletal measurements on lateral cephalometric radiographs were compared before and after therapy or observation with 1-way analysis of variance or the Mann-Whitney U test. **Results:** After facemask therapy, the grafted group showed a statistically significantly greater advancement of Point A (S-Vert-A, 4.18 ± 1.94 mm; SNA, 3.51° ± 2.21°) than did the ungrafted group (S-Vert-A, 2.64 ± 1.58 mm; SNA, 1.92° ± 1.05°). Furthermore, significant SNB changes were found in the grafted group when compared with those in the ungrafted group (−0.38° ± 1.77° vs −1.69° ± 1.34°; $P < 0.05$). The changes in the mandibular plane angle (MP-SN, MP-FH) in the grafted group were less pronounced than in the ungrafted group by approximately 2° ($P < 0.05$). Flaring of the maxillary incisors was more pronounced in treated subjects than in untreated subjects. The mandibular incisors proclined in both grafted (1.54° ± 4.21°) and control (0.97° ± 3.71°) patients, and were retroclined in the ungrafted group (−2.13° ± 3.68°). **Conclusions:** Facemask therapy performed after an alveolar bone graft produced more anterior maxillary migration (90%) and less pronounced mandibular clockwise rotation (10%) than those in the ungrafted group (50%, 50%, respectively). (Am J Orthod Dentofacial Orthop 2018;153:542-9)

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie (inkl. LKG)** Children with skeletal and dental ClassIII malocclusion and a history of complete UCLP Northern China, Beijing and Hangzhou, P. R. China
Schweregrad	-4°< ANB < 0°
Einschluss-kriterien	Children with: 1) operated nonsyndromic UCLP; (2) concave profile with anterior crossbite; (3) palatoplasty surgery before 3 years of age; (4) no pharyngeal flap surgery; (5) -4°< ANB < 0°; and (6)cervical vertebral maturation stage between CS1 and CS3
Ausschluss-kriterien	•additional congenital anomaly, temporomandibular disorder, •previous orthodontic treatment.

Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **Grafted FM**: Secondary alveolar bone graft (cancellous bone graft from the iliac crest) at least 5 months previously to allow for clinically and radiographically successful osseointegration. The Hyrax appliance was banded on the maxillary permanent first molars and deciduous first molars or permanent first premolars. Protraction hooks were soldered bilaterally to the buccal aspects of the permanent first molar bands and extended anteriorly to the canine area.The protraction elastics were 30° down the occlusal plane, and the protraction force was 450 to 500 g per side. Maxillary expansion was not conducted. Bite-block appliances in the mandibular arch were inserted to prevent incisor interference. All patients were instructed to wear the facemask (Tiantian Dental Equipment, Hunan, China) for a minimumof 12 to 14 hours per day. **Ungrafted FM:** wie Grafted FM, jedoch ohne secondary alveolar bone graft VERSUCHSGRUPPE 1: **Grafted FM** N= 21 (Anfang) / N=18 (Ende) / Alter = 9,98 ± 1,1/ ♂:♀ =21:0 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung VERSUCHSGRUPPE 2: **Ungrafted FM** N= 20 (Anfang) / N=18 (Ende) / Alter = 9,54 ± 1,3/ ♂:♀ =20:0 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** **und** **kieferorthopädische Therapie zu anderem Zeitpunkt /Zeitraum /Gebissphase/** KONTROLLGRUPPE: **Untreated Class III, UCLP** N=20 (Anfang) / N=18 (Ende) / Alter = 9,7 ± 1,43/ ♂:♀ = 18:0 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung
Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär) PRIMÄRZIELGRÖßE Skeletal: SNA, SNB, ANB Wits SEKUNDÄRZIELGRÖßE: Dental: Overjet
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**

Schluss-folgerungen der Autoren	We concluded that coupling maxillary protraction with preceding **secondary alveolar bone graft enhances maxillary advancement and minimizes adverse effects** such as rotation of the mandibular opening and incisor retroclination. 1. **Maxillary protraction** is an effective treatment modality for mild-to-moderate skeletal Class III relationships in growing **patients with UCLP**. 2. Facemask therapy after an alveolar bone graft procedure led to pronounced maxillary advancement (90%) and less pronounced mandibular clockwise rotation (10%) than those in the ungrafted group (50%, 50%, respectively) We evaluated the effects immediately after the facemask treatment but did not perform adequate follow-up. Therefore, longitudinal observations until completion of growth are **needed to assess long-term stability.**
Zusammen-fassung der Ergebnisse	**GRUPPE Grafted FM VS. GRUPPE Untreated Class III, UCLP** **GRUPPE Ungrafted FM VS. GRUPPE Untreated Class III, UCLP** T1 (pre-treatment): mean age 9,98 years, grafted FM; 9,54 years ungrafted FM T1 (observation): mean age 9,76 years, control T2 (post-treatment): mean age 11,23 years , grafted FM; 10,88, ungrafted FM T2 (observation): mean age 10,8, Control Skeletal: SNA, SNB, ANB Wits  Dental: Overjet 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe umfassend geprüft und gegeben. Die Kohortenstudie hat ein akzeptables Risiko für Selection Bias. Power/ Sample Size Berechnungen wurden durchgeführt. Die klinische Relevanz ist durch die Teilnehmern (Klasse III bei UCLP, ausschließlich männlich) auf diese Patientengruppe eingeschränkt. Insgesamt akzeptable Studie. Die klinische Relevanz ist möglicherweise eingeschränkt (Teilnehmer). *Funding: keine Angabe* *Interessenkonflikte:* keine *Bias (SIGN): Äquivalenz gegeben, Power/ Sample Size Berechnung durchgeführt.* Die klinische Relevanz ist durch die Teilnehmern (Klasse III bei UCLP, ausschließlich männlich) auf diese Patientengruppe eingeschränkt.
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Die klinische Relevanz ist durch die Teilnehmern (Klasse III bei UCLP, auschließlich männlich) auf diese Patientengruppe eingeschränkt.
Evidenzlevel (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle Zhao, Feng et al. 2015

RESEARCH Open Access

Effects of a novel magnetic orthopedic appliance (MOA-III) on the dentofacial complex in mild to moderate skeletal class III children

Ning Zhao*, Jing Feng, Zheng Hu, Rongqing Chen and Gang Shen

Abstract

Introduction: The objective of this study was to evaluate the changes of skeletal and dental structures in mild to moderate skeletal Class III children following the use of a new magnetic orthopedic appliance (MOA-III).

Methods: A total of 36 patients (14 boys and 22 girls, mean age 9 years and 5 months) who presented with a mild to moderate skeletal Class III jaw discrepancy were treated with MOA-III. Another group of 20 untreated patients (9 boys and 11 girls, mean age 9 years and 2 months) with the same level of deformity served as the control group. The average treatment time was 6.6 months. Radiographs were taken at the same time intervals for both groups. A paired *t* test was used to determine the significant differences before and after treatment, and a two-sample *t* test was used to analyze the differences between the treatment and control groups.

Results: The anterior crossbite in all subjects was corrected after MOA-III therapy. The maxillomandibular relationship showed favorable changes (ANB, Wits, overjet increased significantly, $P < 0.001$). The maxilla was anteriorly positioned (SNA, ptm-A, ptm-S increased significantly, $P < 0.001$) with clockwise rotation (PP-FH increased, $P < 0.001$). The mandible showed a slight downward and backward rotation (SNB decreased, $P < 0.05$, MP-SN, Y-axis increased, $P < 0.05$). The length of the mandibular body showed no significant changes (Go-Pg, $P > 0.05$). Significant upper incisor proclination and lower incisor retroclination were observed (U1-NA increased, $P < 0.001$, L1-NB, FMIA decreased, $P < 0.001$). The upper lip moved forward, and the lower lip moved backward (UL-EP increased, $P < 0.001$, LL-EP decreased, $P < 0.05$). In the control group, most of the parameters showed normal growth, except for some unfavorable mandibular skeletal and soft tissue changes (Go-Pg, Go-Co, MP-SN, N'-Sn-Pg' increased, $P < 0.001$). Significant positive changes were induced with the MOA-III appliance compared to the untreated group.

Conclusions: The MOA-III was effective for the early treatment of a mild to moderate Class III malocclusion in children.

Keywords: Magnetic, Twin-block, Angle Class III, Adolescent

Population *Setting* *Komorbiditäten*	**Klasse-III-Anomalie** Children with skeletal and dental ClassIII malocclusion:, anterior crossbite, 0° > ANB angle > -3°, Wits < 0 mm • China
Schweregrad	0°›ANB›-3°; Wits distance‹0 mm

Einschluss-kriterien	Children with: - skeletal and dental ClassIII malocclusion: ①0°›ANB›-3°; ②Wits distance‹0 mm; ③Angle`s class III molar relationship with anterior cross-bite; ④ with some anterior dental compensation, the upper incisor proclined labially and the lower incisor retroclined lingually, but there were no obviously transverse discrepancies and no need of maxillary expansion; ⑤ the patients could not retrude to edge to edge; and ⑥ without cleft palate or craniofacial syndrome.
Ausschluss-kriterien	Not fulfilling inclusion criteria
Intervention Versuchsgruppe	**kieferorthopädische Behandlung** **MOA-III (Magnetic orthopaedic appliance)** The MOA-III appliance was constructed from upper and lower removable appliances with two 7 × 5 × 4 mm3 Nd2Fe14B magnetic units bonded to each appliance .The two magnetic units were in the attracting configuration. The upper magnets were located at the position of the first premolar and bonded to the appliance with two expansion screws. and the lower magnets were positioned labially to the lower canine. After insertion of the MOA-III, the appliances were adjusted by closing the screws to maintain the distances between the paired magnets on both sides. The initial force was 300 g per side when the patients were at the maximal mouth closure position and the two opposing magnets were approximately 1.2 mm apart. The directions of forces were parallel to the occlusal plane. screw reactivations were performed by parents one turn each week (0.25 mm/week). VERSUCHSGRUPPE 1: **MOA-III** N= 36(Anfang) / N=36 (Ende) / Alter = 9,5/ ♂:♀ =14:22 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: Frühbehandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated Class III** N=20 (Anfang) / N=20 (Ende) / Alter = 9,2/ ♂:♀ = 9:11 • Gebissphase: frühes Wechselgebiss • KFO-Behandlung: reguläre Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: Skeletal: ANB, SNA, SNB, Wits SEKUNDÄRZIELGRÖßE: Dental: Overjet TERTIÄRZIELGRÖßE: QUARTÄRZIELGRÖßE:
Studientyp	**Beobachtungsstudie (Kohortenstudie oder Fall-Kontroll-Studie)**
Schluss-folgerungen der Autoren	- MOA-III was effective for the treatment of mild to moderate class III malocclusions in children. - In the maxilla, both the skeleton and dentition moved forward in the anteroposterior direction. Simultaneously, the maxilla rotated forward and downward. In the mandible, the most significant changes were lingual compensation of the lower incisors. At the same time, the mandible rotated downward and backward, but the length of the mandible body showed no significant changes. - For the soft tissue measurement, the upper lip moved forward and the lower lip retruded backward. The concave profiles were also improved
Zusammen-fassung der Ergebnisse	T1 (pre-treatment): mean age 9,5 years; MOA-III T1 (observation): mean age 9,2 years; Control) T2 (post-treatment): mean age 10,05 vears ; MOA-III T2 (observation): mean age 9,7; Control Skeletal ANB, SNA, SNB, Wits  Dental Overjet  Soft tissue UL-EP 

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN)	Die Äquivalenz von Versuch- und Kontrollgruppe ist unklar, da ein direkter Vergleich hinsichtlich relevanter Charakteristika nicht dargestellt wurde. Die Kohortenstudie hat ein gerade noch akzeptables Risiko für Selection Bias. Power/ Sample Size Berechnungen wurden nicht durchgeführt. Die klinische Relevanz ist durch die verwendetet proprietäre Apparatur möglicherweise eingeschränkt. Insgesamt gerade noch akzeptable Studie. Die klinische Relevanz ist eingeschränkt. *Funding:* keine Angabe *Interessenkonflikte:* keine *Bias (SIGN): Äquivalenz unklar, Keine Power/ Sample Size Berechnung. Bias durch Beschränkung auf proprietäre Apparatur.*
Schluss-folgerung des Begutachters	methodische Qualität: akzeptabel
	Klinische Aussagekraft: Eingeschränkt (Bias durch *Beschränkung auf proprietäre Apparatur*).
Evidenzlevel (SIGN)	**2+**
Qualität (RoB, SIGN)	**Acceptable (+)**

Evidenztabelle Zhou et al. 2014

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Systematic Review

The effectiveness of non-surgical maxillary expansion: a meta-analysis

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SUMMARY
OBJECTIVE: To evaluate and compare the effectiveness of rapid maxillary expansion (RME) and slow maxillary expansion (SME).
MATERIALS AND METHODS: PubMed, Embase, Web of Science, CENTRAL, ProQuest Dissertations & Theses, ClinicalTrial.gov, and SIGLE were searched from January 1980 to October 2012 for randomized or non-randomized controlled trials. The processes of study search, selection, and quality assessment were conducted independently and in duplicate. Original outcome data underwent statistical pooling through Review Manager 5.
RESULTS: Fourteen eligible studies were finally included and two interventions (RME and SME) studied. Four outcomes (maxillary intermolar width, maxillary intercanine width, maxillary interpremolar width, and mandibular intermolar width) during three time periods (expansion, retention, and net change) were statistically pooled. The sensitivity analysis revealed that the results from the meta-analysis were generally robust. Egger's test and Begg's test detected no publication bias except for maxillary intercanine width in expansion period for SME versus control.
CONCLUSIONS: SME is effective in expanding maxillary arch, while we cannot determine its effectiveness in mandibular arch expansion. RME is effective in expanding both maxillary and mandibular arches. Furthermore, SME is superior to RME in expanding molar region of maxillary arch, while similar with RME in mandibular arch expansion. However, we cannot compare their effectiveness in maxillary anterior region.

Population *Setting* *Komorbiditäten*	**Transversal Anomalie** • Participants would be otherwise healthy adults or children who had certain degree of transverse discrepancy and required maxillary expansion Details
Schweregrad	Keine Angaben

Einschluss-kriterien *PICOS*	• RME (rapid maxillary expansion): the rate of expansion generally varies in growing children from approximately 0.2 mm (1 turn) to 0.5 mm (2 turns), or more per day over a period of 1–3 weeks, and has an approximate 100 N across the midpalatal suture. • SME (slow maxillary expansion): defined as 1 turn (0.25 mm of expansion) every second day for a Haas or Hyrax appliance, or 1 molar widths activation for a quad-helix, with a force of 5–20 N. • SME vs. untreated controls • RME vs. untreated controls • All outcomes were reported in the included studies. • RCTs, controlled clinical trials
Ausschluss-kriterien	• Measurement by CBTC • Unavailable data • Studies investigating participants with orofacial anomalies, dental pathologies, and medical conditions
Intervention Versuchsgruppe	**Kieferorthopädische Behandlung** VERSUCHSGRUPPE 1: **SME** N=?? (Anfang) / N=?? (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss bis permanentes Gebiss ≥ 18 (ages ranged from 6.6 to 32.7) • KFO-Behandlung: Frühbehandlung bis Spätbehandlung VERSUCHSGRUPPE 2: **RME** N=?? (Anfang) / N=?? (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss bis permanentes Gebiss ≥ 18 (ages ranged from 6.6 to 32.7) • KFO-Behandlung: Frühbehandlung bis Spätbehandlung
Kontrolle Kontrollgruppe	**Keine kieferorthopädische Therapie** KONTROLLGRUPPE: **untreated controls** N=?? (Anfang) / N=?? (Ende) / Alter = ?? ± ?? Jahre / ♂:♀ = ?:? • Gebissphase: frühes Wechselgebiss bis permanentes Gebiss ≥ 18 (ages ranged from 6.6 to 32.7) • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** • **Stabilität des Behandlungsergebnisses** PRIMÄRZIELGRÖßE: maxillary intermolar width SEKUNDÄRZIELGRÖßE: maxillary intercanine width TERTIÄRZIELGRÖßE: maxillary interpremolar width QUARTÄRZIELGRÖßE: mandibular intermolar width
Studientyp	**Systematisches Review, Meta-Analyse** Inkludierte Studien in Bezug auf PICO: N=14: 2 RCTs, 12 controlled clinical trials Gesamt-Teilnehmerzahl in Bezug auf PICO: N=1048
Schluss-folgerungen der Autoren	1. SME is effective in expanding maxillary arch. 2. Cannot determine its effectiveness in mandibular arch expansion. 3. RME is effective in expanding both maxillary and mandibular arches.

Zusammen-fassung der Ergebnisse	**GRUPPE SME VS. GRUPPE untreated controls** **GRUPPE RME VS. GRUPPE untreated controls** **SME** VERSUS **untreated controls** ***maxillary intermolar width:*** Five studies investigated this outcome (Erdinc et al., 1999; Petren and Bondemark, 2008; Godoy et al., 2011; Petren et al., 2011; Shundo et al., 2012). A statistical pooling for retention was unavailable due to lack of the data in four studies (Erdinc et al., 1999; Petren and Bondemark, 2008; Petren et al., 2011; Shundo et al., 2012). Thus, meta-analysis was only performed for expansion and net change, it revealed that the pooled MD was 4.45 mm [95 per cent confidence interval (CI) = (3.31, 5.58)] and 2.49 mm [95 per cent CI = (0.56, 4.42)], respectively (Figure 2). ***maxillary intercanine width:*** Four studies investigated this outcome (Erdinc et al., 1999; Petren and Bondemark, 2008; Godoy et al., 2011; Petren et al., 2011). Likewise, only expansion and net change were available for statistical pooling. The results showed that the pooled MD was 2.58 mm [95 per cent CI = (1.25, 3.91)] and 2.27 mm [95 per cent CI = (1.43, 3.10)], respectively (Supplementary Figure 1). ***maxillary interpremolar width:*** Unfortunately, none of the included studies investigated this outcome. ***mandibular intermolar width:*** Five studies investigated this outcome (Erdinc et al., 1999; Petren and Bondemark, 2008; Godoy et al., 2011; Petren et al., 2011; Shundo et al., 2012). Similarly, meta-analysis was only performed for expansion and net change. The pooled MD was 0.49 mm [95 per cent CI = (−0.10, 1.07)] and 0.06 mm [95 per cent CI = (−1.16, 1.27)] for expansion and net change, respectively (Supplementary Figure 2). **RME** VERSUS **untreated controls** ***maxillary intermolar width:*** Six studies investigated this outcome (Handelman et al., 2000; McNamara et al., 2003; Isik et al., 2005; Geran et al., 2006; O'Grady et al., 2006; Phatouros and Goonewardene, 2008). The expansion outcome was a significant increase in the maxillary intermolar width [pooled MD = 4.09 mm, 95 per cent CI = (3.43, 4.76)], followed by a non-significant relapse [pooled MD = −0.40 mm, 95 per cent CI = (−1.00, 0.19)]. Moreover, the pooled MD of net change was 3.58 mm (95 per cent CI = 3.17–3.98; Figure 3). ***maxillary intercanine width:*** Six studies investigated this outcome (Handelman et al., 2000; McNamara et al., 2003; Isik et al., 2005; Geran et al., 2006; O'Grady et al., 2006; Phatouros and Goonewardene, 2008). The expansion outcome was a significant increase in the maxillary intercanine width [pooled MD = 2.7 mm, 95 per cent CI = (2.15, 3.27)], followed by a non-significant relapse [pooled MD = −0.41 mm, 95 per cent CI = (−1.22, 0.40)]. Furthermore, the pooled MD of net change was 2.64 mm (95 per cent CI = 2.20–3.08; Supplementary Figure 3). ***maxillary interpremolar width:*** Six studies investigated this outcome (Handelman et al., 2000; McNamara et al., 2003; Isik et al., 2005; Geran et al., 2006; O'Grady et al., 2006; Phatouros and Goonewardene, 2008). Similarly, the expansion outcome was a significant increase in the maxillary interpremolar width [pooled MD = 3.86 mm, 95 per cent CI = (3.10, 4.62)], followed by a non-significant relapse [MD = −0.16 mm, 95 per cent CI = (−0.71, 0.39)]. Moreover, the pooled MD of net change was 3.52 mm [95 per cent CI = (2.68, 4.37)] (Supplementary Figure 4). ***mandibular intermolar width:*** Five studies investigated this outcome (Handelman et al., 2000; McNamara et al., 2003; Isik et al., 2005; Geran et al., 2006; O'Grady et al., 2006). The expansion outcome was a significant increase in the mandibular intermolar width [pooled MD = 1.19 mm, 95 per cent CI = (0.89, 1.49)], followed by a significant increase in retention period [pooled MD = 0.65 mm, 95 per cent CI = (0.38, 0.92)]. The net change was also a highly significant increase [pooled MD = 2.02 mm, 95 per cent CI = (1.58, 2.45)] (Supplementary Figure 5).

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	Generell gut durchgeführtes Review, durchgeführte Metaanalyse. Einige Studiencharakteristika der Einzelstudien bleiben allerdings unklar. Des Weiteren ist die Zusammensetzung der Population nicht beschrieben, es werden keine Angaben zu Ethnizität, Setting gemacht. Hier wäre eine genauere Beschreibung wünschenswert. Auch ist das Alter der Patienten sehr weit gefächert (6.6 to 32.7), hier wäre eine Unterscheidung der Altersgruppen wichtig. Die Methode der Datenextraktion wird nur sehr knapp beschrieben. Positiv ist, dass alle Studien die gleiche Dosierung/Aktivierung der Expansion und einen gut definierten Zeitraum der Therapie untersuchen. Heterogenitätsanalysen wurden beschrieben und ausreichend diskutiert. Der Großteil der Einzelstudien wies eine mittlere Qualität auf, zwei eine hohe, drei eine niedrige. Die Verallgemeinerbarkeit der Daten ist gegeben. *Funding:* National Natural Science Foundation of China (81070858, 81100778). *Interessenkonflikte:* keine Angaben
Schluss-folgerung des Begutachters	methodische Qualität: gut
	Klinische Aussagekraft: hoch: SME ist eine effektive Therapiemethode zur transversalen Erweiterung des Oberkiefer-Zahnbogens, die Effektivität im Unterkiefer-Zahnbogen ist fraglich. RME ist eine effektive Therapiemethode zur transversalen Erweiterung des Ober- und Unterkiefer-Zahnbogens.
Evidenz-level (SIGN)	**1++**
Qualität **(RoB, SIGN /AMSTAR II)**	**Hoch** ⊕⊕⊕ - Keine oder eine unkritische Schwäche: Das systematische Review liefert eine genaue und umfassende Zusammenfassung der Ergebnisse der verfügbaren Studien zur Frage des Interesses.

Evidenztabelle Zymperdikas, V. F. et al., 2016

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Systematic Review

Treatment effects of fixed functional appliances in patients with Class II malocclusion: a systematic review and meta-analysis

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Summary

Objective: To assess the treatment effects of fixed functional appliances (FFAs) in treated versus untreated Class II patients by means of lateral cephalometric radiographs.

Search methods: Unrestricted electronic search of 18 databases and additional manual searches up to October 2014.

Selection criteria: Prospective randomized and non-randomized controlled trials reporting on cephalometric angular measurements of Class II patients treated with FFAs and their matched untreated controls.

Data collection and analysis: Skeletal, dental, and soft tissue cephalometric data were annualized and stratified according to the time of evaluation in effects. Following risk of bias evaluation, the mean differences (MDs) and 95 % confidence intervals (CIs) were calculated with random-effects models. Patient- and appliance-related subgroup analyses and sensitivity analyses were performed with mixed-effects models.

Results: Nine studies were included (344 patients; mean age: 13.5 years and 174 untreated controls; mean age: 12.8 years) reporting on cephalometric effects directly after the removal of FFAs. FFAs were found to induce a small reduction of SNA angle (MD = −0.83 degree/year, 95 % CI: −1.17 to −0.48), a small increase of SNB angle (MD = 0.87 degree/year, 95 % CI: 0.30–1.43), and moderate decrease of ANB angle (MD = −1.74 degree/year, 95 % CI: −2.50 to −0.98) compared to untreated Class II patients. FFA treatment resulted in significant dentoalveolar and soft tissue changes. Several patient- or appliance-related factors seem to affect the treatment outcome. Long-term effectiveness of FFAs could not be assessed due to limited evidence.

Conclusions: According to existing evidence, FFAs seem to be effective in improving Class II malocclusion in the short term, although their effects seem to be mainly dentoalveolar rather than skeletal.

Population *Setting* *Komorbiditäten*	**Klasse-II-Anomalie** • human patients with Class II malocclusion of any age or gender
Schweregrad	Nicht angegeben

Einschluss-kriterien *Bei Review: PICOS*	• population: human patients with Class II malocclusion of any age or gender • intervention: Orthodontic treatment with fixed functional appliances • comparison: Untreated patients with Class II malocclusion matched for age and gender • outcome: PRIMÄRZIELGRÖßE: angular skeletal cephalometric variables (SNA, SNB, SNPg, ANB, NAPg, SGo:NMe (%), SN-ML, NL-ML, SN-NL, SN-OP, y axis) SEKUNDÄRZIELGRÖßE: angular dental cephalometric variables (1s-SN, 1i-ML, 1s-1i, 1s-NA, 1i-NB, 1i-VL) TERTIÄRZIELGRÖßE: angular soft tissue cephalometric variables (N’SnPg’, Nasolabial angle, Mentolabial angle, H angle) QUARTÄRZIELGRÖßE: Ratios (ANSMe:Nme, Gonial Ratio, S-Ar/Ar-Go) • study type: Randomized controlled clinical trials, Prospective controlled clinical trials
Ausschluss-kriterien	1. any previous or subsequent phases with fixed appliances 2. craniofacial syndromes and/or cleft lip palate 3. temporomandibular joint disorders 4. Animal studies 5. Class II malocclusion treated with extractions, Class II elastics, orthognathic surgery, or removable functional appliances 6. Studies providing only linear cephalometric measurements Electromyographic evaluation 7. Evaluation employing 3D imaging techniques 8. Cost-benefit analysis, Unsupported opinion of expert, Editor’ s choices, Replies to the author/editor, Interviews, Commentaries, Books’/conferences’ abstracts, Summaries, Cross-sectional surveys, Case series without a control, Case reports, Case-control observational studies, Cohort studies, Retrospective clinical trials 9. Narrative reviews*, Systematic reviews*, Meta-analyses* *After checking the reference lists for relevant articles.
Intervention Versuchsgruppe	**Kieferorthpädische Behandlung** VERSUCHSGRUPPE: **Orthodontic treatment with fixed functional appliances** N=244 (Anfang) / N=?? (Ende) / Alter = 13,5 Jahre / ♂:♀ = ?:? • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: reguläre Behandlung
Kontrolle Kontrollgruppe	**keine kieferorthopädische Therapie** KONTROLLGRUPPE: **Untreated patients with Class II malocclusion matched for age and gender** N=174 (Anfang) / N=?? (Ende) / Alter = 12,8 Jahre / ♂:♀ = ?:? • Gebissphase: permanentes Gebiss < 18. Lebensjahr • KFO-Behandlung: keine Behandlung

Outcome	**direkter oder schadenspräventiver medizinischer Nutzen** **bzw. Korrektur/Prävention der Anomalie/Malokklusion/Dysgnathie** • **primäres kieferorthopäd. Behandlungsergebnis (skelettal/dentoalveolär)** PRIMÄRZIELGRÖßE: angular skeletal cephalometric variables (SNA, SNB, SNPg, ANB, NAPg, SGo:NMe (%), SN-ML, NL-ML, SN-NL, SN-OP, y axis) SEKUNDÄRZIELGRÖßE: angular dental cephalometric variables (1s-SN, 1i-ML, 1s-1i, 1s-NA, 1i-NB, 1i-VL) TERTIÄRZIELGRÖßE: angular soft tissue cephalometric variables (N’SnPg’, Nasolabial angle, Mentolabial angle, H angle) QUARTÄRZIELGRÖßE: Ratios (ANSMe:Nme, Gonial Ratio, S-Ar/Ar-Go)
Studientyp	**Systematisches Review mit Meta-Analyse** Inkludierte Studien in Bezug auf PICO: RCT & pCCT N=9 (“Two articles reported (59, 60) data from the same study/cohort and were grouped together“) 1 RCT, 8 pCCTs Gesamt-Teilnehmerzahl in Bezug auf PICO: N=418

Schluss-folgerungen der Autoren	According to existing evidence, the following conclusions can be drawn on the **short-term** effectiveness of FFAs: 1. The **treatment effects of FFAs on the skeletal tissues** in patients with Class II malocclusion excluding the effects of normal growth were **small** and probably of minor clinical importance. 2. The treatment of Class II malocclusion with FFAs was associated with **small stimulation of mandibular growth, small inhibition of maxillary growth, and with more pronounced dentoalveolar and soft tissue changes.** 3. Patient- and appliance-related factors seem to influence the treatment outcomes, yet complementary research is required to thoroughly investigate the respective effects. 4. The long-term effects of FFAs could not be properly assessed because of insufficient number of relative trials at present. Taking into account the clinical recommendations derived from the GRADE framework, high GRADE assessments could be drawn regarding the 1s-SN and 1i-ML angles exclusively. Particularly: 1. Clinicians should confidently expect an average reduction in the **1s-SN angle of 7.50 degree/year with the use of FFAs** compared to untreated patients. 2. Clinicians should confidently expect an **average increase in the 1i-ML angle of 7.99 degree/year with the use of FFAs** compared to untreated patients. Recommendations concerning the effectiveness of FFA treatment on the restriction of maxillary growth, advancement of the mandible, correction of skeletal Class II malocclusion, mandibular plane, and nasolabial angles are weaker and future research could affect them. Treatment of Class II malocclusion with FFAs seems to be not as effective as believed in matters of skeletal correction. Additional studies are required for a thorough assessment of the skeletal, dental, and soft tissue outcomes of FFAs in the long term. The provision of detailed data from these studies regarding patients’ characteristics (gender, growth pattern, and skeletal maturation), particular features of the used functional appliance (the exact appliance design and possible incorporation of additional elements), as well as the followed retention scheme should be considered. Finally, in order to enable also the assessment of linear variables, the magnification factor of the lateral cephalometric radiographs should be reported in each of the respective trials.

Zusammen-fassung der Ergebnisse	**Orthodontic treatment with fixed functional appliances VERSUS Untreated patients with Class II malocclusion matched for age and gender** ***Subgruppenanalyse:*** A. patient-related i. gender ratio (male patients/female patients) ii. skeletal growth stage (pre-peak and peak or post-peak) iii. growth pattern (horizontal, vertical, or average). B. appliance-related z. appliance used (i.e. the exact type and design of the respective appliance) zz. construction bite (single step versus stepwise mandibular advancement) ***Zeitpunkt des Vergleiches:*** 1. after the removal of the corresponding FFA 2. after the retention phase. *Zeitraum 2*: Due to inadequate number of identified studies, no meta-analyses could be performed concerning the changes induced by FFAs after the retention phase *Zeitraum 1*: after the removal oft he corresponding FFA **angular skeletal cephalometric variables (SNA, SNB, SNPg, ANB, NAPg, SGo:NMe (%), SN-ML, NL-ML, SN-NL, SN-OP, y axis):** With regard to the skeletal changes in the sagittal plane, the skeletal growth of the mandible was slightly affected by FFAs, with the **SNB angle being on average 0.87 degree/year greater** than the untreated group (Figure 2). Further, a statistically significant slight **restriction effect on the maxillary growth of about 0.83 degree/year** was induced by FFAs. The effect of FFAs on the skeletal relationships of the maxilla to the mandible was favourable, with the **ANB angle being on average 1.74 degree decreased annually** *(P* < 0.001) compared to the untreated group, indicating a moderate improvement of the skeletal Class II jaw relationships. Finally, as far as the vertical skeletal relationships are concerned, no significant effects could be found, except for **annual increases of the SN-ML and SN-OP angles by 0.48 and 10.09 degree/year, r**espectively. The later indicates a clinically significant effect on the inclination of the occlusal plane during mandibular advancement. A. patient-related i. gender ratio: Skeletal correction and facial convexity (via the ANB and NA-APg angles, respectively) were significantly associated with patient’s gender. ii. skeletal growth stage: Post-peak patients showed a greater dentoalveolar effect with a greater emphasis on SN-NL […] compared with patients at pre-peak and peak skeletal growth stage. B. appliance-related & z. appliance used: for mandibular sagittal growth (via the SNB angle) and skeletal Class II correction (via the ANB angle), no statistical differences were observed, whereas the Forsus™ Fatigue Resistant Device […]

	angular dental cephalometric variables (1s-SN, 1i-ML, 1s-1i, 1s-NA, 1i-NB, 1i-VL): With regard to the dentoalveolar changes, treatment effects were evident on all variables corresponding to the upper and lower dental arches. **Significant retroclination of the upper incisors** was observed compared to the untreated group, as seen from **the 1s-SN (−7.50 degrees/year) and 1s-NA (−4.24** degrees/year) angles. Additionally, the **lower incisors were significantly proclined, as seen from the1i-ML** (7.99 degrees/year), **1i-NB** (4.20 degrees/year), and **1i-VL** (19.78 degrees/year) angles. Consequently, a statistically significant **decrease in the interincisal angle** was also noted (−8.32 degrees/year). A. patient-related ii. skeletal growth stage: Post-peak patients showed a greater dentoalveolar effect with a greater emphasis on […] 1i-ML angles and a greater reduction in 1s-SN angle compared with patients at pre-peak and peak skeletal growth stage. B. appliance-related z. appliance used: the Forsus™ Fatigue Resistant Device was associated with the greatest proclination of the mandibular incisors. zz. construction bite: stepwise mandibular advancement was associated with greater retroclination of the upper incisors and greater proclination of the lower incisors compared to single step advancement. **angular soft tissue cephalometric variables (N’SnPg’, Nasolabial angle, Mentolabial angle, H angle):** The influence of FFAs on the soft tissues was **significant for almost all available outcomes, with the mentolabial angle providing the more evident change** (14.99 degrees/year). Further, the H-angle was slightly decreased (−1.95 degree/year), while the N’SnPg’ angle was slightly increased (2.01 degrees/year) compared to untreated patients. **Ratios (ANSMe:Nme, Gonial Ratio, S-Ar/Ar-Go):** Finally, **no significant changes** were observed regarding the cephalometric ratios investigated.

Angaben auffälliger positiver und/oder negativer Aspekte Studiendesign Durchführung Auswertung Funding Interessen-konflikte Bias (SIGN, AMSTAR II, Einzelstudien)	*Studiendesign: ausführliches Protokoll a priori aber ohne Registrierung, nur Winkelmessungen berücksichtigt um Messfehler durch lineare Werte zu vermeiden, zur besseren Verlgeichbarkeit wurden die Messergbnisse als jährliche Veränderungen angegeben, 1 RCT/ 8 pCCTs* *Durchführung: gute Subgruppenanalyse, Literatursichtung/ Datenextraktion/ RoB-Analyse durch zwei unabhänige Auswerter mit Interrater-Reliabiliät-Test (Cohen’s kappa), detaillierte Suchstrategie für einzelne Datenbanken* *Auswertung: Update der Literaturrecherche nach drei Jahren* *Power der Studie/Patientenzahl: 9/418* *Funding: -* *Interessenkonflikte: -* *Bias (SIGN/AMSTAR/EinzelstudienRoB – alle negativen Punkte aus Fragebogen auflisten):* **3. Did the review authors explain their selection of the study designs for inclusion in the review?** **7. Did the review authors provide a list of excluded studies and justify the exclusions?** **10. Did the review authors report on the sources of funding for the studies included in the** **15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the resul review?** **16. Did the review authors report any potential sources of conflict of interest, including an they received for conducting the review?** *Publikationsbias (Reviews):* If a sufficient number of trials were identified *(n* > 10), reporting biases (small-study effects or publication bias) were planned to be assessed through the inspection of a contour-enhanced funnel plot (42), Begg’s rank correlation test (43), and Egger’s weighted regression test (44). If the tests hinted towards the existence of publication bias, the Duval and Tweedie’s trim and fill procedure (45) was planned to be performed. Due to the limited number of included studies, an evaluation for the existence of reporting bias (including publication bias) was not possible to be performed. (N=9)
Schluss-folgerung des Begutachters	methodische Qualität: Review gut, Einzelstudien zum größten Teil gut
	Klinische Aussagekraft: Wird bei Klasse-II-Patienten eine festsitzende Klasse-II-Appartur eingesetzt, scheint die Malokklusion vor allem dentoalveolär und nur zu geringen Anteilen skeletal korrigiert zu werden. Dabei wirkt die Apparatur skelettal effektiver, wenn sich der Patient gerade vor oder im maximalen Wachstumsschub befindet. Ist dieses Peak überschritten, setzen die Veränderungen hauptsächlich dentoalveolär im Sinne einer Proklination der unteren und einer Reklination der oberen Frontzähne an. Diese Beobachtung scheint etwas ausgeprägter zu sein, wenn der Konstruktionsbiss in mehreren Schritten statt in einem einzigen angefertigt wird. Schließlich sollte beachtet werden, dass es unter Einsatz dieser Apparaturen zu einer Veränderung der Weichteile kommt. Alle Feststellungen beziehen sich ausschließlich auf den short-term, während zur langfristigen Stabilität an dieser Stelle keine Aussage getroffen werden kann.
Evidenz-level (SIGN)	**1+**
Qualität	**Moderat ⊕⊕**