

# 1 Dynamic Postural Balance in Patients with Temporomandibular 2 Disorders (TMD)

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## 7 **Abstract**

8 Temporomandibular Disorders (TMD) is a set of painful conditions that involve the  
9 masticatory muscles, Temporomandibular Joint (TMJ), and/or associated orofacial structures.  
10 Some studies have established that patients with TMD present postural alterations. Objective:  
11 To assess Dynamic Postural Balance (DPB) in patients with Temporomandibular Disorders  
12 (TMD) compared to a control group at the Stomatology Clinic of the Autonomous University  
13 of Puebla (BUAP). Materials and methods: Forty patients with TMD were tested, diagnosed  
14 by a standardized researcher with DC/TMD; 75

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16 **Index terms**— postural balance, temporomandibular disorders, balance.

## 17 **1 Introduction**

18 3% to 7% seek treatment for pain and dysfunction associated to TMD ???. Yuasa additionally reports that  
19 approximately 75% of the population has at least one TMD sign and 33% has at least one symptom, but only  
20 3.6% to 7% seeks treatment for severe TMD symptoms ???. In addition, TMD symptoms occur disproportionately  
21 between sexes, with an increased incidence reported in women; the female-male ratio ranges between 2:1 and  
22 8:1 ??-10. Most of the patients who present symptoms are between 20 and 50 years old ??1-12. On the  
23 other hand, Postural Balance has been defined by Riemann et al 13 as the process of coordinating corrective  
24 movement strategies and movements at the selected joints to remain in postural equilibrium. Dynamic Postural  
25 Balance is the ability to maintain the center of gravity over the base of support while it moves or an external  
26 disturbance is applied to the body. There are some studies in the bibliography which suggest a link between the  
27 Temporomandibular Joint (TMJ)/dental occlusion and posture. Some authors have reported postural alterations  
28 in subjects with TMD in comparison to healthy ones ??4. Other studies inform that patients with TMD have an  
29 advanced cephalic position in contrast to subjects without TMD ??5. Changes in mandibular position induced  
30 or not by TMD, may influence in the neck and posture muscles [16][17][18] and such subjects have a deviation  
31 in the anterior or posterior pelvic line ??9. To emphasize this, it has been demonstrated that changes in the  
32 mandibular position cause changes in the electromyographic activity of the masticatory muscles and neck muscles  
33 (trapezius and sternocleidomastoid), which suggest that alterations in the mandibular position disturb the cervico-  
34 craneal with TDM have a higher prevalence of cervical hyperlordosis ??1. Furthermore, it has been shown the  
35 influence of the various mandibular positions in the postural balance, specifically, the myocentric mandibular  
36 position has proved to improve postural balance ??2. Apparently, the Postural Balance has an association  
37 with Temporomandibular Disorders and/or dental occlusion, so that the objective of the current study was to  
38 establish the association between Temporomandibular Disorders and the Dynamic Postural Balance in patients  
39 with any ailment in comparison with a control group from the Stomatology empormandibular Disorders (TMD)  
40 is a collective term embracing all the problems relating to Temporomandibular Joint (TMJ), the masticatory  
41 muscles, and/or associated orofacial structures as bones, ligaments, and cartilages ??-2. Over 25% of the adult  
42 population presents symptoms of TMD, nevertheless, only a small percentage of affected individuals look for  
43 treatment 3 . Other studies conducted in this same population have detected TMD symptoms from 16% to 59%  
44 4 , but only T system 20 . Some studies have established that patients e-mails: alfloreslara90@hotmail.com, Forty

## 6 MATERIALS AND METHODS

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45 patients with TMD were tested, diagnosed by a standardized researcher with DC/TMD; 75% female average aged  
46 27.7±9.5 and 40 controls without TMD, paired by age and sex without significant differences in body mass index  
47 (BMI) between groups ( $p>.05$ ). To assess the Dynamic Postural Balance, the Biodex Stability System was used  
48 (BSS) (Biodex Medical Systems, Shirley, NY, USA), which consists of a movable multiaxial balance platform that  
49 provides up to 20° of surface tilt in a 360° range of motion. The prearranged level of instability of the platform  
50 ranged between a slightly unstable surface, level of stability 8, to a very unstable surface, level of stability 2.  
51 Three indices were obtained electronically based on the platform degree tilt: Anterior-Posterior Stability Index  
52 (APSI), Medial-Lateral Stability Index (MLSI) and the Overall Stability Index (OSI). Additionally, the system  
53 determined the percentages of time used in the four concentric balance zones: A, B, C and D as shown in Figure  
54 1. Lower values in the Dynamic Postural Balance Indices represent better stability than the higher ones; in the  
55 same way a greater permanence in the most peripheral zones reveals a poor balance.

56 Once obtained the results, a database was developed with the SPSS v.19 statistical program, for the analysis  
57 with descriptive statistics (mean, median, mode and standard deviation) and inferential statistics. The Dynamic  
58 Postural Balance difference between groups was assessed by the Student's T-test, with statistical significance  
59  $<.05$ .

## 60 2 Results

61 Forty patients with TMD were tested, diagnosed by a standardized researcher with DC/TMD; 75% female  
62 average aged 27.7±9.5 and 40 controls paired by age and sex without significant differences in BMI between  
63 groups ( $p>.05$ ).

64 As shown in Table ??, the three indices: OSI, APSI and MLSI revealed a slightly better balance in the cases,  
65 compared to the control ones. Nevertheless, none of the above comparisons showed statistical significance.

## 66 3 Table 1 : Comparison by group of the Dynamic Postural 67 Balance Indices

68 The permanence time in the balance zones showed that the group cases remained more time in the optimum  
69 balance zone (A) compared to the control group. None of the above comparisons showed statistical significance.

## 70 4 Discussion

71 The current study did not find association between the Temporomandibular Disorders and the Dynamic Postural  
72 Balance.

73 Descriptively, the three balance indices: OSI, APSI and MLSI, as well as the permanence time in the optimum  
74 balance zone (A) were lower in the TMD group, however, it did not show statistically significant differences  
75 between groups.

76 Authors as Lee and Okeson 15 proved that patients with TMD show an advanced cephalic position, Zonnenberg  
77 and Van Maanen 19 Clinic of the Autonomous University of Puebla (BUAP), Mexico..

## 78 5 II.

## 79 6 Materials and Methods

80 A prolective, case-control study was conducted at the Stomatology Clinic of the Autonomous University of Puebla.  
81 Through convenience sampling method, in which 40 patients per group were selected.

82 Munhoz and colleagues 21 observed that patients with TMD have higher prevalence of cervical hyperlordosis,  
83 all this leads to the hypothesis that TMD could affect Postural Balance.

84 Kittel and Bérzin 23 assessed through the Chattecx Balance System the stability and weight distribution in  
85 orthostatic position of subjects with TMD and a control group. Those authors demonstrated that the TMD  
86 group has greater symmetrical weight distribution than the control group, similar to the results of the current  
87 study, however, Kittel and Bérzin found statistically significant differences between groups.

88 These results could be supported by the fact that subjects with present TMD reduced muscular activity  
89 throughout maximum intercuspsation due to a protective effect to minimize Temporomandibular Joint movement,  
90 this coupled to presence of pain in patients with TMD, also appears to has an effect in reduction of body sway  
91 ??4. Perinetti 25, on the other hand, by the use of the Lizard statokinesigram, researched on the correlation  
92 between TMD and postural alterations and did not find statistically significant differences in evaluating a group  
93 of patients with TMD and a control group, as in the current study. It should be noted that one of the possible  
94 explanations for the type of instrument could support the controversy in the results reported in the literature  
95 used to determine the Postural Balance. The Biodex Stability System (Biodex Medical Systems, Shirley, NY,  
96 USA), instrument used in this study, consists of a movable multiaxial circular platform with 360° range of motion,  
97 with the potential of varying surface tilt, which makes the Postural Balance assessment to be carried out in a  
98 fully dynamic position.

99 This instrument has demonstrated reliability and validity in previous studies ??6-27. On the other hand,  
100 other studies have used different instruments to assess Postural Balance. These other instruments do not allow

101 dynamic multiaxial assessment of Postural Balance, as the Chattecx Balance System and others, these latter only  
102 uses force plates combined with software to determine the center of gravity and based on this, measure the rate  
103 of Postural Balance. Such diversity in the use of instruments could be the main cause of the controversial result  
104 found in the literature.

105 The main strength of this study is based on the use of a valid and reliable instrument to establish the Postural  
106 Balance Index; it is noteworthy that there is no bibliographical evidence that has assessed Dynamic Postural  
107 Balance within concentric zones mentioned above. In the current study, it was observed that patients with TMD  
108 presented higher percentages of optimal balance (95.6%) compared to the control subjects (93.6%), although no  
109 significant differences were denoted. On the other hand, a weakness of this research lies in the absence of a prior  
110 calculation of sample size, which could influence in the absent association between Temporomandibular Disorders  
111 and Dynamic Postural Balance reported in the current study.

112 V.

## 113 **7 Conclusion**

114 The Dynamic Postural Balance of patients with TMD; OSI, APSI, MLSI, as well as the permanence time in  
115 optimum balance zone, is equal to the control ones. Bibliography

## 116 **8 Global Journal of**

117 Medical Research



Figure 1:

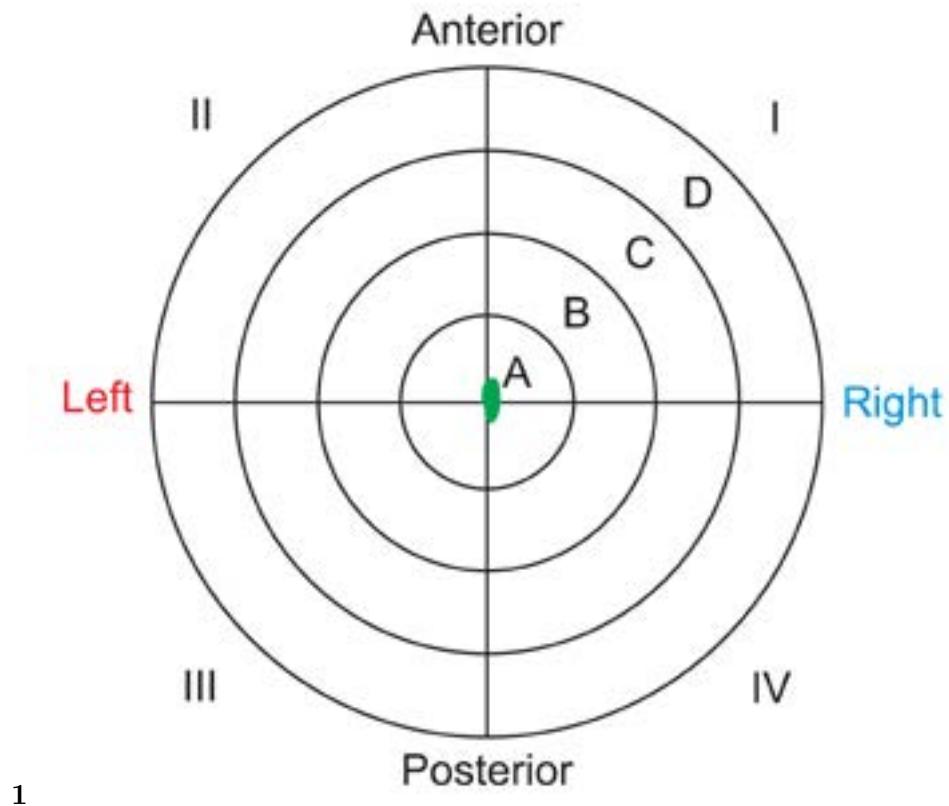


Figure 2: Fig. 1 :

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[Note: \* Student's T-testIV.]

Figure 3: Table 2 :

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