Correlation Between Values of the Helkimo Anamnestic and Clinical Dysfunction Index in Patients Suffering from Post Traumatic Stress Disorder

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SUMMARY
The aim of this research was to determine the correlation between values of Helkimo anamnestic dysfunction index (symptoms) and values of Helkimo clinical dysfunction index (signs) within a group of subjects suffering from PTSD and a control group. The subjects were divided into two groups, the first comprising 38 subjects of both sexes, aged 30 to 60, who had been professionally diagnosed with PTSD. The control group comprised 32 subjects of both sexes. All patients had their histories taken in compliance with the Helkimo anamnestic dysfunction index (Ai), and a clinical examination was performed in compliance with the Helkimo clinical dysfunction index (Di). Anamnestic data provided the information on TMD symptoms, and clinical examination confirmed signs of the TMD. A Pearson’s correlation was calculated in order to compare values of the Helkimo anamnestic (Ai) and clinical dysfunction index (Di). In the control group, it was found that there is no statistically significant relationship between the two indices. The relationship between the two indices proved to be statistically significant for the PTSD group. It is concluded that the Helkimo anamnestic (Ai) and the Helkimo clinical dysfunction (Di) indices have no joint variables in the control group, whereas there was a joint variation of the two indices among the group of subjects suffering from PTSD.

Keywords: Correlation, Temporomandibular dysfunction, Post-traumatic stress disorder

1. INTRODUCTION
Bell (1), introduced the term temporomandibular dysfunction (TMD), which has since been used widely. The term refers not only to joints, but also to all the dysfunctions related to the masticatory system. The use of different terms added confusion to this field. Absence of communication and coordination among researchers in the field led to the use of different terminology. Attempting to coordinate the efforts, the American Dental Association (2), introduced the official term of temporomandibular dysfunction (TMD). TMD denotes diseases of the muscles and the mandibular joint, muscular and skeletal diseases, and frequently also parts of systemic diseases of a generalized fibromyalgia, or a form of rheumatoid arthritis. In addition, fear, tension and stressful situations contribute to the overall condition of the masticatory system (3). Because of all this, some authors believe that TMD includes pathological diseases primarily affecting the function of muscles and the mandibular muscle, with a possible alteration to the tooth surface (4). After a cause has crossed the level of individual physiological tolerance of the masticatory system, the system itself starts to respond with certain signs of change. Changes usually happen on the temporomandibular joints (TMJ), supportive tooth structures, and the teeth themselves. If the lowest level of individual physiological tolerance is on the muscles, the patient usually feels muscular tension and pain when moving the mandible. This symptom is referred to as pain-related restricted mandibular movement. When the lowest level of individual physiological tolerance is in the joints, the patient usually feels tension in the joint/s and pain. The joint may also produce sounds, usually in the form of clicks and/or crackling. Muscles and joints may sometimes tolerate the changes, but increased muscle activity leads to changes in supportive teeth structures and the teeth themselves, possibly resulting in tooth abrasion, pulpitis and/or tooth mobility. (5)

According to Helkimo (6), the most frequent symptoms of TMD are found in the area of the TMJ, a sensation of fatigue in the jaw area, a sensation of stiffness of the jaw upon waking up or when opening the mouth, luxation or locking of the mandible when opening the mouth, pain when opening the mouth, and pain in the region of the TMJ or in the area of the masticatory muscles (cheeks). The most frequent signs of TMD include reduced movement of the mandible, reduced TMJ function, pain when moving the mandible, muscle pain and pain in the TMJ.

TMD causes are complex and multi-factorial. Numerous factors may lead to TMD. Those that may increase the
risk of TMD are referred to as predispositions. Those that may lead to an onset of TMD are the initiatory, and those that affect the possibility of treatment or increase its progression are referred to as prolonging factors. In some cases, one and the same factor may be a predisposition, an initiating and a prolonging factor at the same time (7,8).

The role of psychosocial stressors, parafunctions and other psychological and behavioral processes in TMD pain has been examined in a number of studies. For example, war-related stress has been linked to TMD (9), and stressors as mild as performing mental arithmetic and solving five-letter anagrams can also increase masticatory muscle activity thought to be associated with TMD. (10, 11) Similar relationships between stress and TMD have been reported in children, adolescents and adults (12,13,14). The American Psychiatric Association (15), defines post-traumatic stress disorder (PTSD) as a form of pathological response to stress, in which the patient, through intrusive thoughts and dreams, regularly experiences the trauma suffered, and is consequently placed in a state of permanent increased tension.

As a result of increased motor activity and the neurotransmitter disruptions which accompany PTSD, particularly with regard to noradrenalin, serotonin, endogenic opiates, and the hypothalamic-pituitary-adrenal axis, (16,17,18) marked increased tension.

As a result of increased motor activity and the neurotransmitter disruptions which accompany PTSD, particularly with regard to noradrenalin, serotonin, endogenic opiates, and the hypothalamic-pituitary-adrenal axis, (16,17,18) marked manifestations of symptoms and signs of TMD can be expected (9). The hypothalamus, i.e. the reticular, and particularly the limbic system, are primarily responsible for an individual’s emotional state. These centers affect muscular activity in a number of ways, one of which is the gamma-efferent path. Stress affects the body by activating the hypothalamus, which in turn prepares the body for a reaction. Through complex neurological pathways, the hypothalamus increases the activity of gamma-efferent fibers, causing the contraction of interarafusel fiber in the muscle spindle. This sensitizes the muscle spindle enough that a minor extension may cause a reflex contraction. The overall effect is increased muscle tone. An increased level of emotional stress increases the muscle tone not only in the head and neck muscles, but can also increase the level of non-functional muscle activity, such as bruxism and teeth clenching (19). The sympathetic activity, i.e. the sympathetic system, also plays a role. Extended activity of the sympathetic masticatory system may affect certain fibers, such as muscles. Sympathetic activity has been proved to increase muscle tone, leading to a sensation of muscular pain, affecting the symptoms and signs of TMD (20,21). Emotional stress can also affect the symptoms and signs of TMD by decreasing the patient’s physiological tolerance. This is possibly caused by an increase in the sympathetic tone, rendering the sympathetic response, which plays an important role in chronic pain (9). The aim of this research was to determine the correlation between values of Helkimo anamnestic dysfunction index (symptoms) and values of Helkimo clinical dysfunction index (signs).
Furthermore, both groups of patients had their history taken using the Helkimo anamnestic dysfunction index (Ai), and clinical examinations were conducted in compliance with the Helkimo clinical dysfunction index (Di). Case histories rendered the information on symptoms of TMD and clinical tests determined the signs of these disorders.

Anamnestic tests using the Helkimo anamnestic dysfunction index was performed using yes-no questionnaires. The information thus obtained allowed the patients to be classified as anamnestically dysfunctional indexes Ai: 0, I and II, (Table 1). After that, a clinical test of their masticatory system was conducted in compliance with the Helkimo clinical dysfunction index. This is an index which examines the clinically visible dysfunction of the masticatory system on the basis of five signs of TMD: restricted maximum movement of the mandible, restricted TMJ function (the presence of murmur, crackle and traction in the joint was assessed by the examiner without using a stethoscope), painful mandibular movement (Table 2), muscle pain (the following bilateral areas were subject to routine palpatory examination: m. masseter profundus, m. masseter superficialis, m. temporalis-pars anterior, medialis, posterior, and insertion at the coronoid process, m. pterygoideus lateralis, m. pterygoideus medialis), and painful TMJ. Scores were determined in compliance with a three-level scale of acuteness, the following score was assigned: 0 points for absence of symptoms, 1 point for mild pain, 5 points for an acute symptom. TMD was defined as the presence of one of the five signs cited. Scores assigned for the five symptoms were summed up. Each individual had a total dysfunction score ranging from 0 to 25 points. The higher the score, the more acute/serious the disorder. (Table 3).

3. RESULTS

Subjective symptoms were addressed in the research by determining the differences in the frequency of certain symptoms between the PTSD-affected group and

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Healthy N</th>
<th>Healthy %</th>
<th>PTSD N</th>
<th>PTSD %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound in the TMJ area</td>
<td>10</td>
<td>31.3</td>
<td>22</td>
<td>57.9</td>
</tr>
<tr>
<td>Jaw rigidity</td>
<td>2</td>
<td>6.3</td>
<td>12</td>
<td>31.6</td>
</tr>
<tr>
<td>Fatigue in the jaw area</td>
<td>1</td>
<td>3.1</td>
<td>16</td>
<td>42.1</td>
</tr>
<tr>
<td>Difficulty when opening the mouth</td>
<td>1</td>
<td>3.1</td>
<td>7</td>
<td>18.4</td>
</tr>
<tr>
<td>Locked mandible</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Pain in the TMJ or in the area of masticatory muscles</td>
<td>0</td>
<td>0.0</td>
<td>4</td>
<td>10.5</td>
</tr>
<tr>
<td>Pain during mandible movement</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Luxation of the mandible</td>
<td>0</td>
<td>0.0</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Total subjects</td>
<td>32</td>
<td>100</td>
<td>38</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 4. Frequency of symptoms of TMD according to Helkimo anamnestic dysfunction index (Ai) by subject group.
Of the subjective symptoms, the presence of sound in the area of TMJ was reported by the majority of non-PTSD-affected patients (31.3%), as well as PTSD-affected ones (57.9%). Jaw rigidity was confirmed in 6.3% subjects with no PTSD, and in 31.6% of subjects with PTSD. Fatigue of the jaw was confirmed in 3.1% of subjects with no PTSD and in 42.1% of subjects with PTSD. Difficulties in opening the mouth were confirmed in 3.1% of subjects without PTSD and in 18.4% of subjects with PTSD. Locking and/or luxation of the jaw was not reported by any of the subjects. Pain in the TMJ or the area of masticatory muscles was not confirmed in any of the subjects without PTSD, but it was confirmed in 10.5% of the subjects with PTSD, (Table 4).

Pursuant to the Helkimo anamnestic dysfunction index (Ai), 68.8% of subjects without PTSD and 34.2% of those with PTSD were found to have no subjective symptoms of TMD, which means that their Helkimo anamnestic index was zero, Ai0. 21.8% of subjects without PTSD and 36.8% of subjects with PTSD had mild subjective symptoms, meaning that they fell within Helkimo anamnestic index one, Ai I. 3.1% of subjects without PTSD and 28.9% with PTSD had acute subjective symptoms of TMD, meaning they fell within Helkimo anamnestic index two, Ai II. (Table 5)

As with the subjective symptoms, the difference in the frequency of signs of TMD (objective symptoms) was tested for the group with PTSD and the group without PTSD. The Helkimo Clinical dysfunction index (Di) is calculated on basis of five signs. The following are analyzed: impaired range of mandibular movement, impaired TMJ function, pain during the mandibular movement, TMJ and muscle pain.

Normal mandibular movement was confirmed for 71.9% of the subjects without PTSD and 28.9% subjects with PTSD. Mildly restricted movement was confirmed for 28.1% of the subjects without PTSD and 63.2% of those with PTSD, whereas seriously restricted mandibular movement was confirmed for no subjects without PTSD, but was confirmed for 7.9% of the subjects with PTSD. Normal TMJ function was found in 84.4% of the subjects without PTSD and 57.9% of the subjects with PTSD. Mildly restricted TMJ function was found in 15.6% of the subjects without PTSD and 42.1% with PTSD, and no subject from either group presented an acutely reduced TMJ function.

Muscular pain was presented by no subject from the control group, whereas it was found in 34.2% of the subjects with PTSD. This pain was confirmed in 1 to 3 areas of palpation. Palpation confirmed no-response for TMJ in 96.9% of the subjects without PTSD and in 76.3% of the subjects with PTSD. Lateral sensitivity to palpation in relation to TMJ was not found in any of the subjects without PTSD, but was found in 34.2% of the subjects with PTSD. Sensitivity to TMJ palpation through the external auditory canal was found in 7.9% of the subjects with PTSD. Painful mandibular movement was not found in any of the subjects without PTSD, and absence
of pain was confirmed for 89.5% of the subjects with PTSD. 5.3% of the subjects with PTSD experienced pain in a single movement of the mandible. The same percentage reported pain in two or more movements, (Table 6).

The Helkimo clinical dysfunction index was determined in accordance with the total number of dysfunction scores and classification in each dysfunction group. 18. 4% had no clinical signs of dysfunction (Di0), compared with 56.3% of subjects in the control group. 60. 5% of subjects with PTSD had mild signs of dysfunction (Di I), 21.1% had moderate signs (Di II) and none had severe clinical signs (Di III). 43.8 % of subjects in the control group had mild clinical signs of dysfunction and none had moderate or severe signs, (Table 7).

In order to compare the Helkimo anamnestic dysfunction index (Ai) and the Helkimo clinical dysfunction index (Di) within the same group, a Pearson correlation was calculated to measure the relationship between the two variables. Table 8, presents the results of the correlation calculation in the control group. The table shows that there is no statistically significant relationship between the two indices.

The relationship between the Helkimo anamnestic dysfunction index (Ai) and the Helkimo clinical dysfunction index (Di) were tested in the same way among subjects diagnosed with PTSD. In this case, the relationship proved to be statistically significant, as p=0.01, (Table 9).

4. DISCUSSION

The functional capabilities of the masticatory system were evaluated by means of the Helkimo anamnestic dysfunction index (Ai) and the Helkimo clinical dysfunction index (Di) (6).

It should be noted that the Helkimo indices are considered useful and are recommended for epidemiological research, (22,23,24) despite criticism (25) and the emergence of new indices that have been designed to eliminate the shortcomings of the Helkimo indexes. (22,26,27) In this research, the Helkimo anamnestic dysfunction index (Ai) was used to the prevalence of subjective symptoms of TMD among both the group with PTSD and the control group.

65. 7% of the subjects with PTSD and 31.2% of the subjects in the control group had one of the TMD symptoms. Both groups confirmed that sound in the TMJ region was the most frequent symptom.

The results confirmed earlier research, Engermark et al (28) Mazengo et al (29), which showed that sound in the joint area was the most frequent anamnestic symptom.

In their research, Egermark et al (28), and Magnusson et al (30), concluded that sound in the area of TMJ was a significant predictor of TMD, with p=0.011.

Magnusson et al (31) stated that sound in the TMJ was not an indication that medical treatment is required, and there is still uncertainty whether sound, with or without pain, should be considered a sign or a symptom of TMD.

Nurallah and Johanson (32) , Okeson (33), Stanišić-Sinobad (34), Bumann and Lotzmann (35), stated that sound may appear with or without the presence of pain or evident diseases and distress in the muscles or the TMJ region.

Pain was found in 10. 5% of the subjects with PTSD, whereas subjects in the control group indicated no pain, which can be explained by the impact of PTSD, substantiated by reference sources indicating that pain is often associated with exposure to stress (36).

The Helkimo anamnestic dysfunction index established that 68.8% of subjects without PTSD and 34.2% of subjects with PTSD had no subjective TMD symptoms, meaning that their Helkimo anamnestic dysfunction index was zero, Ai0. These findings differ from the findings of Uhac et al., (9) whose study found that 76% of subjects without PTSD and 18% with PTSD had no subjective symptoms. 21.8% of subjects from the control group and 36.8% of subjects with PTSD had mild subjective symptoms, which means that they fell within Helkimo anamnestic dysfunction index one, Ai I. Uhac et al.(9) found that 22% of subjects in the control group and 8% of subjects with PTSD had mild subjective symptoms. 3.1% of subjects in the control group and 28.9 % with PTSD had acute subjective TMD symptoms, and fell within Helkimo anamnestic index two, Ai II. Uhac et al.(9) found that 2% of subjects in the control group and 74% of subjects with PTSD had acute subjective symptoms.

The Helkimo clinical dysfunction index (Di) found a prevalence of signs of TMD in both the group with PTSD and the control group.

81.6 % of subjects with PTSD and 43. 8% of the control group had one of the TMD symptoms. All the subjects with PTSD were classified under dysfunction indexes Di 0, I, II, whereas one of the subjects was classified within dysfunction index Di III. These results are slightly different from those reported by Uhac et al (9).
In both groups, mildly restricted mandibular movement was the most frequent sign of TMD, and was found in 63.2% of the subjects with PTSD and in 28.1% of the control group. According to Ajanovic M. (37) limited mobility of the mandible is one of the most frequent symptoms of TMD in its early stages. These results are not in compliance with the opinion expressed by Lunden et al (38), who stated that pain was the most frequent sign of temporomandibular dysfunction, though the results did correspond with the research results of Otuyemi et al (39).

The Helkimo clinical dysfunction index (Di) was determined in accordance with the total number of dysfunction scores and classification in each dysfunction group. 18.4% had no clinical signs of dysfunction (Di0), compared with 56.3% of subjects in the control group. 60.5% of subjects with PTSD had mild signs of dysfunction (Di1), 21.1% had moderate signs (Di II) and none had severe clinical signs (Di III). 43.8% of subjects in the control group had mild clinical signs of dysfunction and none moderate or severe signs. According to Uhac et al., (9) only 2% of subjects with PTSD had no clinical signs of dysfunction (Di0), compared with 48% of subjects in the control group. 28% of subjects with PTSD had mild signs of dysfunction (DiII), 22% moderate signs (DiIII) and 48% severe clinical signs of dysfunction (DiIII). 50% of subjects in the control group had mild clinical signs of dysfunction, 2% moderate signs, and none severe signs of dysfunction.

In order to compare the Helkimo anamnestic and the Helkimo clinical dysfunction index of the same group, a Pearson correlation was calculated to measure the relationship between the Helkimo anamnestic (Ai) and dysfunction indices (Di). The results present correlation calculations for the control group and indicate that there is no statistical connection between the two indices, as illustrated by p=0.45. Since p>0.05, these two indices can be said to have no joint variation among the healthy subjects.

For the test of a relationship between the Helkimo anamnestic and the Helkimo clinical dysfunction indices of the same group diagnosed with PTSD, the results proved to be statistically significant, with p=0.01. This result indicates that as the anamnestic index value grows, there is an increase in the dysfunction index, and vice versa.

5. CONCLUSION

The relationship between the Helkimo anamnestic (Ai) and the Helkimo clinical dysfunction (Ai) indices among subjects diagnosed with PTSD proved to be statistically significant, with p=0.01. This result indicates that as the value of the Helkimo anamnestic dysfunction index (Ai) increases, the Helkimo clinical dysfunction index (Di) increases, and vice versa. Calculation of the same correlation among subjects of the control group showed that there was no statistically significant correlation between the two indices, with p>0.05. This result indicates that the Helkimo anamnestic dysfunction index (Ai) and the Helkimo clinical dysfunction index (Di) have no joint variation among the control group.

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