The Overuse Concept Revisited: Some Conditions May be A Result of Postural Weakness Rather Than Over Use

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Abstract: A comparison of relative incidence of anterior compression syndromes in a patient population of self trained keyboard (computer input) operators as compared to formally trained type and piano players. Data indicates that those who received seated posture training as a part of their keyboard, type or performance training, had less incidence of anterior compression syndromes. A study of patients in a clinical setting who report symptoms of anterior compression syndrome (ACS) (Thoracic Outlet and Carpal Tunnel) and a comparison of their relative history of postural training. Those who received formal keyboard training had much less incidence of ACS.
Anterior Compression Syndromes May Result from Postural Weakness

**HYPOTHESIS**

The causative factors of anterior compression syndromes may be more intimately connected to the relative upper body posture at the time of activity than to the repetitive nature of the activity.

Increased incidence of both carpal tunnel syndrome and thoracic outlet syndrome is apparent in patients who are self trained (no formal training) keyboard operators.

**Review of Research Published on Anterior Compression Syndromes**

There are many articles appearing in the indexed sources for what are categorized as anterior compression syndromes. For the purpose of this treatment, thoracic outlet syndromes and carpal tunnel syndromes are considered. Articles range from early 1994 through late 1995. None included any consideration of upper body and spinal posture related etiology although some consideration of wrist posture was the topic of one piece although it did not relate any connection to the spinal posture. Conclusions have been drawn based on the fingertip loading during keyboard use and the relative key spring resistance. Studies using Electromyographic biofeedback to assess cumulative trauma and restrict certain
non-work related activities proved successful in reducing some symptoms. Assessments of key locations and keyboard angles was used to determine the amount of symptomatology in keyboard operators. One study concerned with the effect of work station design on sitting posture in young children did not involve any keyboarding activities. A study of the thoracic outlet syndrome as a functional disturbance of the thoracic upper aperture almost related postural considerations as it did consider the mechanical disturbance on the present of the a dysfunctional first rib. An article with a multi-disciplined list of authors discussed the high prevalence of undetected carpal tunnel syndrome in patients with fibromyalgia. This work touched on the fringe of mechanical dysfunction without the relativity to posture or structure. One study found in the last two years concerning itself with posture related to the use of high heeled shoes and their effect on the center of mass position and ground reaction forces, not overuse conditions.

**PATHOPHYSIOLOGY REVIEW**

An in-depth review of the anatomy and the pathophysiology at this point is not undertaken for the area of each condition. Be it sufficient to recommend the reader to consider the biomechanical effects on standing and sitting spinal posture on the overall positional and functional capabilities of the cervical spine and upper extremity joints. Following that review, an understanding of the intricate
relationship of the sitting spinal posture for keyboarding activities as a paramount 
determinant is certainly desired. This will serve to enhance understanding of the 
concept and is necessary to understand the further conclusions herein.

**RESEARCH**

Two kinds of patient populations were identified. Patients who had formal 
training in either typewriting or keyboarding and piano and those who had 
acquired self taught skills in keyboarding as a result of home computer acquisition.

There were no patients discovered who developed self taught piano skills.

Data were collected during a 7 month period. All patients in a private practice 
were invited to respond once to a questionnaire after being seen at the office. Only 
patients who answered at least one question affirmatively are reported.
MEASUREMENT INSTRUMENT

Please circle yes or no for each of the following questions. Thank You!

1. Have you ever received formalized training (at least 1 year of one lesson per week or more) in piano or organ?       YES    NO

2. Have you ever received formalized training (at least 1 class hour per day for 9 weeks or more) in type writer or keyboard (computer) skills?       YES    NO

3. Have you ever or do you now spend more than 1 hour per day of continuous keyboard entry or keyboard playing?       YES    NO

4. Have you ever had, or do you now have any of the following symptoms that last (off and on) for more than two days: arm/hand numbness or tingling, weakness in grip strength, pain in arm, forearm or hand.       YES    NO
DATA ANALYSIS

214 forms were collected during the period. 95 had at least one affirmative answer and were used for this study. Only affirmative answers were considered.

Two groups were identified. Group A was the group who answered yes to question #1 or #2 signaling formal training in keyboarding. There were 31 of these.

Group B, 64 had no formal training. In group A, only 4 had complaints indicated by question #4 while 25 answered #3 in the affirmative. In group B, 8 had no symptoms but answered #3 positively.

SAMPLE RESULTS:

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<th>TOTAL SAMPLE</th>
<th>?s 1,2,3 or 4</th>
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<tbody>
<tr>
<td>KEYBOARDERS</td>
<td>95</td>
<td>?s 1,2 or 3</td>
</tr>
<tr>
<td>NON-KEYBOARDERS</td>
<td>119</td>
<td>? 4</td>
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<table>
<thead>
<tr>
<th></th>
<th>GROUP A</th>
<th>Training</th>
<th>33%</th>
</tr>
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<tbody>
<tr>
<td>A1</td>
<td>4</td>
<td>symptoms</td>
<td>4%</td>
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Of the people who perform keyboard activities during the day, only 33% of them had formalized training in the skill. Of the entire keyboarding group, only
4% of those had symptoms who had formal training.

<table>
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<th>GROUP B</th>
<th>64</th>
<th>No Training</th>
<th>67%</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1</td>
<td>56</td>
<td>symptoms</td>
<td>88%</td>
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Of the people who perform keyboard activities during the day, 67% of them had no formalized training in the skill. Of the entire keyboarding group, 88% of those who had symptoms had no formal training.

Several conclusions can be drawn from the data. The pertinent revelations are that formal training in keyboarding would reduce the likelihood of having ACS by around 80%. There may be many aspects to the likely conclusions such as the fact that formal training entails a lot more than just postural advice. In fact, the postural aspect of the study may be quite a leap. It is, however, one distinct possibility and should not be ignored.

**CONCLUSIONS**

A conclusion is postulated that formal training in keyboard behaviors includes strict attention to sitting posture. Independent investigation of high school keyboarding curricula as well as piano instruction reveals some emphasis on posture although it is suspected that the emphasis has eased of late and should certainly be stressed again. The data collected in this limited study indicates a correlation between anterior compression type symptoms and the lack of attention to posture.
SUMMARY AND RECOMMENDATIONS

No studies found considered the spinal posture as a variable in the prevalence of anterior compression disorders. This limited study indicates a distinct possibility of the direct relationship between incorrect posture during activities and the eventual overuse type misdiagnosis. It is suggested that other studies be done and include the seating posture as a factor. Perhaps it is a primary determinant in the popular overuse syndrome arena. Perhaps it is also possible that the countless supermarket and similar ergonomic situations employees, and keyboard operators who wear wrist orthotics to no avail or who buy keyboard pads to change angles, could do well to consider the spinal posture during these repetitive activities.

In the management of an anterior compression syndrome, the treatment and correction of spinal posture may prove to be the one aspect of popular medical attention that is most often overlooked and perhaps the key to success. Add this part of the management to your approach and see if you are not much more successful in the outcome assessment with ACS.
References

1. Armstrong, TJ - Foulke, JA - Martin, BJ - Gerson, J - Rempel, DM
   “Investigation of applied forces in alphanumeric keyboard work” Am Ind Hyg
   Assoc J 1994 Jan ISSN:0002-8894

2. Durham, JR - Yao, JS - Pearce, WH - Nuber, GM - McCarthy, WJ 3rd
   “Arterial injuries in the thoracic outlet syndrome” J Vasc Surg 1995 Jan
   ISSN:07415214

3. Fernstrom, E - Ericson, MO - Malker, H “Electromyographic activity during
typewriter and keyboard use” Ergonomics 1994 Mar ISSN:0014-0139

   negative slope keyboard system and full motion forearm supports”
   Ergonomics 1995 Mar ISSN 0014-0139

5. Kasdan, ML - Wolens, D - Leis, VM - Kasdan, AS - Stallings, SP “Carpal
tunnel syndrome not always work related” J Ky Med Assoc 1994 Aug
   ISSN:0023-0294

   1994 May 1 ISSN:0002-838X

7. Korrick, SA - Rest, KM - Davis, LK - Christiani, DC “Use of state workers’
   compensation data for occupational carpal tunnel syndrome surveillance: a
feasibility study in Massachusetts” Am J Ind Med 1994 Jun ISSN:0271-3586


12. Marschall,M - Harrington, AC - Steele, JR “Effect of work station design on sitting posture in young children” Ergonomics 1995 Sep ISSN:0014-0139


15. Nakatsuchi, Y - Saitoh, S - Hosaka, M - Mastsuda, S “Conservative


17. Pistorius, MA - Planchon, B “Incidence of thoracic outlet syndrome on the epidemiology and clinical presentation of apparently primary Raynaud’s phenomenon. A prospective study in 570 patients” Int Angiol 1995 Mar ISSN:0392-9590


21. Sucher, BM “Palpatory diagnosis and manipulative management of carpal

22. Valente, R - Gibson, H “Chiropractic manipulation in carpal tunnel syndrome” J Manipulative Physiol Ther 1994 May ISSN:0161-4754

23. Walsh, MT “Therapist management of thoracic outlet syndrome” J Hand Ther 1994 Apr-Jun ISSN:0894-1130