## Key Points

1. Research has shown that people with neck pain have abnormal muscle control (specifically of the trapezius muscle) during functional tasks
2. Study used EMG testing to examine muscle control of the trapezius and other neck muscles during a functional test for people with whiplash neck pain, idiopathic neck pain (unknown cause), and a control group
3. Subjects also answered the Neck Disability Index and a pain scale
4. Results showed that there was abnormal control of all 3 muscles studied during the task
5. There was also an association between the NDI score and abnormal muscle activity

## Figure 2

**Neck Disability Index (NDI)**

- Questionnaire designed to measure the impact of neck pain on everyday life
- 10 questions dealing with pain intensity, personal care, lifting, reading, headache, concentration, work, driving, sleeping, and recreation
- For each question, person selects 1 of 6 response that most closely matches their situation. For example: I can drive my car without neck pain; I can drive as long as I want with slight pain; I can't drive as long as I want because of pain; etc.
- Each question is scored 0-5 with 0 being no impact on that activity
- Total score is converted to a percent disability, for example 50%

## Figure 3

# New Insight Into The Mechanism Underlying Chronic Neck Pain

**[Editor's Note:** *Although this research does not directly address Chiari and syringomyelia, it caught my eye for a couple of reasons. First, the results were independent of the cause of the neck pain, so there is reason to believe that it would apply to the pain associated with CM/SM. Second, my personal experience with physical therapy matches almost exactly what the researchers found. I was told repeatedly that my muscles would activate when they shouldn't, they didn't relax properly, and it seemed like some muscles were compensating for others. Finally, my neck pain is aggravated not necessarily by lifting heavy objects, but by tasks which require more control, such as writing, driving, and using a computer.***]**

Researchers from Australia have found that people who suffer from chronic neck pain may be using their neck muscles improperly. That was one of the key findings in a study by Dr. Deborah Falla at the Department of Physiotherapy, University of Queensland. Dr. Falla and her colleagues, building on existing research, tested people with chronic neck pain to see if how they use their neck muscles differs from normal people. They published their results in the July 1, 2004 issue of the journal Spine.

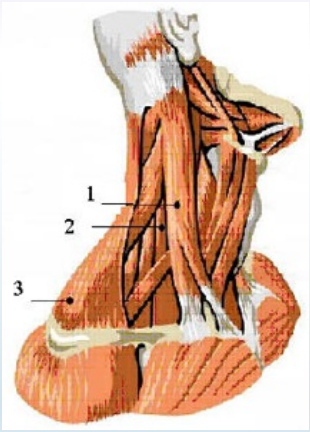
Previous research has shown that the trapezius muscle (see Figure 1 *sidebar*) does not activate properly when people with chronic neck pain are performing certain tasks. In building on this research, Falls wanted to determine if other neck muscles weren't activating properly as well, specifically, the sternocleidomastoid (SCM), and the anterior scales, two smaller muscles which help control the neck.

To investigate her hypothesis, Falla recruited 10 people with neck pain from whiplash injuries, 10 people with idiopathic neck pain - meaning due to no known cause, and 10 healthy control subjects with no history of neck problems. Prior to the actual test, the subjects filled out the Neck Disability Index (see Figure 2 *sidebar*), a measure of how much a person believes their pain interferes with their daily life, and a simple numerical pain scale.

The actual experiment utilized electromyograph testing (EMG) to measure muscle activity while the subjects performed a simple task. EMG (see Figure 3) is a diagnostic test which uses electricity to measure muscle response. The results are displayed as a waveform on a device called an oscilloscope.

**Figure 1**
**Neck Muscles**

**1 = Sternocleidomastoid**
**2 = Anterior Scalene**
**3 = Trapezius**




Source: www.fpnotebook.com

The task the subjects performed involved sitting at a desk and dotting pencil marks in circles with their right hands for 2.5 minutes. The task was performed in time with a metronome set to 88 beats per minute. EMG measurements were taken before the task, 10 seconds in, 60 seconds in, 120 seconds in, and 10 seconds after the task was complete.

**Electromyograph (EMG)**

**Definition:** test that measures muscle response to nervous stimulation (electrical activity within muscle fibers)

**How The Test Is Performed:**

1. A needle electrode is inserted through the skin into the muscle.
2. The electrical activity detected by this electrode is displayed on an oscilloscope (and may be displayed audibly through a speaker).
3. After placement of the electrode(s), the patient may be asked to contract the muscle (for example, by bending your arm). The presence, size, and shape of the wave form -- the action potential -- produced on the oscilloscope provide information about the ability of the muscle to respond when the nerves are stimulated.

**Oscilloscope:** a device that shows visually what an electrical waveform look like

**EMG Picture**


Source: National Institutes of Health Web Site

The researchers found that there was increased activity of the SCM, the anterior scales, and the upper *left* trapezius muscles in both the whiplash and the idiopathic pain group as compared to the control group. They also found that in the control group the *right* upper trapezius was more active than in the other groups - what you might expect given that the task was performed with the right hand. Finally, the researchers found that after the task was over, there was more activity in the right upper trapezius of both neck pain groups than the control group.

So what does all this mean? The first finding - increased activity of certain muscles in the pain groups - probably indicates that these muscles are compensating for a different muscle that is not being used properly (the right upper trapezius). The authors speculate that the compensation could be due to avoiding use of a painful muscle, or in response to the main muscle not working properly. The second finding supports this by demonstrating that healthy people used their right upper trapezius during the task more than the pain groups. The third finding also indicates a potential problem with the right trapezius in the pain groups (which the other muscles try to compensate for) by indicating that the muscle stays tight for the neck pain subjects, even when the task is over. For the normal subjects, the muscle relaxed quickly once they were done working.

In looking at the data further, the researchers found that there was an association between the Neck Disability Index score and the level of altered muscle activation. Specifically, people who scored higher on the NDI - meaning they perceived themselves as being more limited - demonstrated higher levels of altered muscle activation on the EMG. While the authors offered no concrete reason for this, they did offer a possible explanation: people who perceive themselves as being limited use muscle compensation strategies to a greater degree. In addition to further investigation into this link, the authors point out that more work is needed to understand the exact connection between altered muscle activation and the actual neck pain that people feel.

While this research does not necessarily apply to CM/SM patients, it is easy to see that it might. A syrinx, often in the cervical region, can cause nerve damage which can weaken a muscle like the trapezius (the trapezius muscles are the largest muscles in the cape area which defines so much of SM pain). A weakened, or damaged, trapezius muscle can lead to other muscles in the neck - which may be weak themselves due to surgery or the disease - compensating during certain activities. Combined with abnormal pain responses, the end result could easily be the chronic, intractable neck pain that many suffer from.

If this turns out to be accurate, perhaps with a better understanding of the underlying problem, will come more effective treatments and therapies for those CM/SM people who suffer from neck pain.