

TASK: S-4 THE EFFECTS OF POSITIONING ON INDIVIDUALS WITH C5-C7 QUADRIPLÉGIA

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Rationale

Persons with high level spinal injury have been observed to develop postural deformities of their spines and pelvis after prolonged use of wheelchairs. This task addresses the questions as to whether the deformity progresses over time, causes pain, and whether it adversely effects pulmonary function and life satisfaction.

Goals

1. Determine the relationship of posture (kyphosis & scoliosis) between individuals with new onset of C5-C7 spinal cord injury versus long term onset of cervical spinal cord injury.
2. Determine the correlation of posture with pulmonary function, pain, and life satisfaction.

Methods Summary

Recruitment

Subjects were recruited through searching the patient database at a freestanding rehabilitation hospital. In order to qualify for the study individuals had to have a traumatic spinal cord injury (SCI) resulting in tetraplegia and use a wheelchair as their primary means of mobility. Two distinct groups were recruited: individuals 1 to 3 years post injury — relatively new tetraplegia (NT) and individuals 10 to 20 years post injury — relatively old tetraplegia (OT). The control subjects (C) were recruited after the testing on individuals with tetraplegia was completed. A deliberate attempt was made to recruit individuals matched with the tetraplegia groups for age, sex, height and weight.

Posture Assessment

All subjects were seated in a wheelchair specially modified to allow unobstructed A-P and lateral radiographs to be taken. Each radiograph was read

by a single investigator who was blinded to the group assignment of subjects. Scoliosis was measured using the Cobb technique { Weissman, et al. 1986}. Kyphosis was measured using the technique described by {Fon et al. 1980}. The control group was included to allow comparison in radiographic measures between individuals with and without paralysis.

Questionnaires

As part of each subject's evaluation a series of standardized questionnaires was completed. These questionnaires were reviewed with the subjects individually to insure adequate completion. In addition to the standardized questionnaires listed below, subjects were asked questions related to back and neck pain, decubitis formation and upper extremity pain. Each subject was given the Center for Epidemiological Studies - Depression Scale (CES-D), {Radloff, 1977}, the Life Satisfaction Index Assessment (LSIA) {Neugarten et al. 1961}, and the Craig Handicap Assessment and Reporting Technique (CHART) {Whiteneck et al, 1992}. In addition to asking yes and no questions related to back and arm pain, each subject was given the McGill Pain Questionnaire (MPQ).

Outcomes Summary

Characteristics

A total of 10 subjects were recruited into each group. Using an independent sample t-test, no significant differences were found with regards to age, height, and weight between the NT and OT groups. In addition, no significant differences with respect to age, height and weight were found between the combined NT and OT group and C group. The Mann-Whitney U test found no differences in injury level between OT and NT. As expected, a significant difference was seen between the NT and OT group with respect to years out from injury.

No differences were found between the NT and OT groups in either measures of kyphosis or scoliosis. The C group was found to have significantly less scoliosis and kyphosis than the combined NT and OT groups. The results are summarized in Table 2. Nine of the 20 subjects with tetraplegia reported back pain and 10 of the 20 subjects reported upper extremity pain. No significant differences were seen in kyphosis and scoliosis in those reporting pain and those not reporting pain. No significant relationship was found between pain and radiographic measures.

Discussion

This is the first reported study to radiographically measure kyphosis and scoliosis in a group of individuals with tetraplegia. Not surprisingly, individuals with tetraplegia were found to have a greater degree of seated kyphosis and scoliosis than a control group without paralysis. This study did not find a greater degree of spinal curvature in individuals further out from an SCI. This contradicts what has generally been accepted by professionals involved in seating and positioning. One possible explanation for this finding is that our subjects were not far enough out from their initial SCI to develop progressive spinal deformity. An important finding of this study is that individuals who were only two to three years out from an SCI had significant spinal deformity. It may be that a kyphotic and scoliotic posture are assumed early and then are not progressive. If this is the case, early interventions will be needed to prevent problems later.

This study found no association between spinal deformity and pain, perceived function or depression. Only one previous study has addressed the association between pain and spinal deformity. This study by Gertzbein did find an association between pain and kyphosis in individuals with a spinal fracture at the thoracic and lumbar levels, but it was not statistically significant. It is important to note that our subject population was relatively young and all less than 20 years out from SCI. In addition, all of the subjects were recruited from an outpatient SCI follow-up clinic. If the population had included individuals who were more than 20 years out from injury, or who

did not receive specialized routine care, the results may have been different.

Recommended Future Research

Larger longitudinal studies are needed to determine if pain does become a problem in individuals with significant kyphosis and scoliosis as they age, and to more definitively examine the progression of kyphosis and scoliosis with aging.

Publications

Boninger ML, Saur T, Trefler E, Hobson DA, Burdette R, and Cooper RA: Postural Changes with Aging in Tetraplegia, *Archives of Physical Medicine and Rehabilitation*, Vol. 79, No. 12, pp. 1577-1581, December 1998.

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