

The consequences of shoulder pain intensity on quality of life and community participation in paraplegic wheelchair users

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Abstract. Background/Objective: Shoulder overuse due weight-bearing loads – wheelchair propulsion and transfers – are supposed to cause shoulder pain in active wheelchair users. Consequently, shoulder pain has been found to have a high prevalence in the spinal cord-injured population. Severity of pain levels in individuals with spinal cord injury has been shown to impact quality of life. Aim of this study was to describe the consequences of shoulder pain intensity on quality of life, physical activity, and community activities in spinal cord-injured paraplegic wheelchair users. **Materials and Methods:** It was a qualitative, analytical one moment study where was involved persons after spinal cord injury below Th1 with lower paraplegia, who used manually operated wheelchairs for mobility at least 50% of the time. Main outcomes measure: SF-36[®] Health Survey, Physical Activity Scale for Individuals With Physical Disabilities, Community Activities Checklist, Wheelchair User's Shoulder Pain Index, Functional Independence Measure, Goniometry for shoulder joint. **Results and analysis:** 40 participants (9 female, 31 male) after spinal cord injury (SCI), mean age – 30,8 years, one to twenty years after spinal cord injury. 20 participants had pain in shoulder, 20 participants without pain in shoulder. The intensity of shoulder pain was not related to duration of SCI or the duration of shoulder pain. Shoulder pain intensity scores were inversely related to quality of life. There was a moderate, inverse relationship between shoulder pain intensity and physical activity. There was no relationship, however, between shoulder pain intensity and community activities. The level of community activity was positively related to quality of life. **Conclusions:** Persons with spinal cord injury who reported lower subjective quality of life and physical activity scores experienced significantly higher levels of shoulder pain. Shoulder pain intensity did not relate to their participation in community activities.

Key words: *spinal cord injuries, paraplegia, shoulder pain, wheelchair, quality of life*

Independence in independent daily activities is a major goal in rehabilitation of patients with paraplegia due to a spinal cord injury (SCI). Whereas the ability to move and transfer is most central in the independence process and necessary to compensate for, the manual wheelchair becomes an important assistive device. However, the wheelchair user with paraplegia due to SCI puts an intense load upon the muscles and joints of the upper trunk and extremities during wheelchair propulsion, and in almost every other daily activity such as transfer, driving and household activities (Mulroy et al., 1996; 2004; Kulig et al., 1998; 2001). Due to this potential intense load in the upper extremities, musculoskeletal pain is a common complication in the spinal cord-injured paraplegic wheelchair user.

Wheelchair propulsion as well as transfers are supposed to cause and increase upper extremity pain, such as shoulder pain in active wheelchair users. Consequently, shoulder pain has been found to have a high prevalence in the spinal cord-injured population (Gellman et al., 1988; Dalyan et al., 1999; Sie et al., 1992; Jensen et al., 2005). While the primary injury itself limits individual independence, any further functional limitation due to secondary complications, could cause a marked decrease or even total loss in remaining functional independence (Walker-Bone, Cooper, 2005; Svendsen et al., 2004).

Improvements in acute care of persons with SCI have resulted in increasing life expectancies (National Spinal Cord Injury Statistical Center, 2004). As a result, research in the area of quality of

life (QOL) has become increasingly prominent in SCI literature. In persons who have recently been injured, QOL has been reported to, at least temporarily, decrease (Dijkers, 2005). Over time (within 2 to 5 y), psychosocial issues tend to stabilize and QOL tends to improve (Tate et al., 2002). Whether QOL returns to levels comparable to the nondisabled population is inconclusive (Dijkers, 2005). In a recent meta-analysis, however, Dijkers examined 22 studies and determined that the QOL of people with SCI was lower than in a non-SCI group in most instances (Dijkers, 1997). There is a consensus among researchers that QOL is negatively impacted when individuals with SCI experience generalized bodily pain that limits their daily activities (Tate et al., 2002; Putzke, 2002). Severity of pain levels in individuals with SCI has been shown to impact QOL (Dijkers, 2005). Despite the high prevalence of shoulder pain in this population, the relationship between shoulder pain intensity and quality of life, physical activity, and community involvement has not been established.

Therefore, the purpose of this study was to describe the consequences of shoulder pain intensity on quality of life, physical activity, and community activities in spinal cord-injured paraplegic wheelchair users. There was hypothesized that increased shoulder pain intensity would be associated with decreased quality of life, decreased physical activity, and decreased community activity.

Materials and methods

Forty persons with traumatic paraplegia following a SCI participated in the study. Of the 40 participants recruited, 31 were men and 9 were women (77.5% and 22.5%, respectively), mean age of the participants was 30.8 years (range 18-54 y), mean duration of spinal cord injury was 5.3 years (range 1-19 y). Inclusion criteria for study participants were paraplegia as a result of a complete or incomplete SCI below Th1 with duration of injury of at least one year, who used manually operated wheelchairs for mobility at least 50% of the time. Thirty-two study participants (80% of our sample) utilized a manual wheelchair 100% of the time. Only 5 participants utilized a manual wheelchair 75 to 99% of the time, and 3 participants used a manual wheelchair 50 to 74% of the time. Of the 8 participants who did not use a manual wheelchair 100% of the time, 2 relied on a power wheelchair, and 6 ambulated part time. Exclusion criteria were hospitalization within the last month for any medical condition, fracture within the last year to upper extremities bones, a surgical procedure within the last year to the upper extremities, new injury within the last year to upper extremities, a diagnosis of adhesive capsulitis in the last year, a diagnosis of rheumatoid arthritis, a cortisone injection to the painful shoulder within the last 4 months, and any serious medical condition. Participants completed a series of questionnaires (SF-36[®] Health Survey, Physical Activity Scale for Individuals With Physical Disabilities, Community Activities Checklist, Wheelchair User's Shoulder Pain Index) administered by an interview process and were evaluated by using specific measurements (Functional Independence Measure, Goniometry for shoulder joint). These instruments were administered in a consistent order and all questionnaires and measurements were completed during the same visit.

Subjective quality of life status was recorded using the SF-36[®] Health Survey – 36-item instrument for measuring health status and outcomes from the patient's point of view. The SF-36[®] Health Survey measures eight health concepts, which are relevant across age, disease and treatment groups: physical functioning, role limitations due to physical health problems, bodily pain, general health, vitality (energy/fatigue), social functioning, role limitations due to emotional problems and mental health (psychological distress and psychological well being) (Ware et al., 1994).

The Physical Activity Scale for Individuals With Physical Disabilities (PASIPD) queries information about the number of days and average hours in a day spent in a variety of activities (13 in total, including leisure, household, and work-related activities) over the last 7 days. The total score is the product of the average hours spent in an activity daily and the metabolic equivalents (MET) summed over each item for questions 2 through 13 (question 1 functions as a practice question) (Washburn et al., 2002).

Community involvement was determined using the Community Activities Checklist (CAC) (Kemp, Ettelson, 2001). This 16-item questionnaire asks the individual to identify the number of times he or she participated in activities that pertain to social activities (7 questions), mobility items (4 questions), and attention-to-self activities (5 questions) within the last 7 days. These values are then summed for one overall score.

Shoulder pain was assessed utilizing the Wheelchair User's Shoulder Pain Index score (WUSPI), if participants were experiencing bilateral shoulder pain, the more painful shoulder was studied. The WUSPI provides an aggregate index of the intensity of shoulder pain during transfers, activities of daily living, and mobility performed from a wheelchair (Curtis et al., 1995). The average WUSPI-score is calculated by dividing the total score by the number of completed items. (Curtis et al., 1999). The WUSPI has shown high reliability and internal consistency (Curtis et al., 1995).

The Functional Independence Measure were rated by a multidisciplinary rehabilitation team comprising a nurse, physiotherapist, occupational therapist, psychologist to each study participant concurrently by observing persons ability to perform everyday tasks. It rates 18 activities of daily living on a 7 point scale ranging from fully dependent (1) to independent with no aids (7). The items are grouped into two themes; 13 motor items (personal care, sphincter control, mobility, and locomotion), and five cognitive items (communication and social cognition). Each task has an operational definition and no special equipment is required (Granger et al., 1986).

The universal goniometer was used to measure study participants shoulder joints active range of motion (AROM) and passive range of motion (PROM) – flexion, extension, abduction, adduction, internal rotation and external rotation.

Statistical analysis was made using the SPSS, Version 17.0. Data from the initial survey were analysed using descriptive and comparative statistics. Comparative statistical analysis was performed using Student's *t*-test. Level of significance was set at $P \leq 0.05$. Correlations between shoulder pain intensity scores and subjective QOL, physical function, and community activities were determined using the Spearman's correlation test.

Results

From all 40 study participants 20 participants had complains about pain in the shoulder, 20 participants were without pain in shoulder. Subjects who reported shoulder pain did not differ from those subjects having no shoulder pain concerning age, gender, years of wheelchair use, weekly hours of work, amount of wheelchair transfers per day, participation in sport activities or time spent in wheelchair/day (Table 1).

The mean duration of shoulder pain experienced by the participants was 5.4 years (range: 1 month-18 years). The overall median shoulder pain index score (WUSPI) for study participant group with pain was 69.3 (interquartile range: 24.7–112.2).

The median physical activity score (PASIPD score) of all participants was 12.4 average metabolic equivalent (MET) hours per day, interquartile range: 6.8-24.0 h/d (participants with shoulder pain 10.3 vs participants without shoulder pain 15.4; $P = 0.025$). The median community involvement (CAC) of the all participants was a frequency of 40 activities per week (interquartile range: 23.3-98.0). There was no significant difference in community activities (participants with shoulder pain 65.8 vs participants without shoulder pain 70.5; $P = 0.085$), functional independence motor and cognitive items (participants with shoulder pain 80.0 and 34.4 vs participants without shoulder pain 81.6 and 33.5; $P = 0.296$) between both study participants groups. There was significant difference in self reported physical functioning, bodily pain, general health and social functioning between both study participants groups ($P \leq 0.05$) (Table 2).

The intensity of shoulder pain was not related to duration of SCI ($r_s = -0.15$; $P = 0.385$) or the duration of shoulder pain ($r_s = -0.04$; $P = 0.827$). Shoulder pain intensity scores were inversely related to quality of life ($r_s = -0.45$; $P = 0.002$). There was a moderate, inverse relationship between shoulder pain intensity and physical activity, as measured by the PASIPD ($r_s = -0.42$; $P = 0.001$). There was

Table 1. Characteristics of study participants.

| | 1. group (with shoulder pain) n=20 | 2.group (without shoulder pain) n=20 |
|--|---|---|
| Gender: | | |
| ■ male | 17 (85%) | 14 (70%) |
| ■ female | 3 (15%) | 6 (30%) |
| | 31,9 ± 8,8 | 29,6 ± 9,1 |
| Age (years) | (min – 19, max – 54) | (min – 17, max – 54) |
| Time after SCI (years) | 6,1 ± 5,1 (min – 1, max - 20) | 4,5 ± 4,4 (min – 1, max - 18) |
| SCI cause: | | |
| ■ car accident | 10 (50%) | 11 (55%) |
| ■ fall | 10 (50%) | 9 (45%) |
| Range of motion (ROM) in shoulder (active, passive) | full active ROM full active ROM | full passive ROM full passive ROM |
| Amount of transfer/day | 17.2±2.1 | 15.4±8.9 |
| Time in wheelchair/day (h) | 11.8±4.0 | 11.3±3.5 |
| Hours at work/week | 13.8±9.3 | 16.9±8.9 |
| Participation in sport activities | 6/20 (30%) | 8/20 (40%) |
| No significant difference was found between groups on any of the descriptive variable (P > 0.05) | | |

Table 2. Median data for the variables in study participants.

| Variable | 1. group (with shoulder pain) n=20 | 2.group (without shoulder pain) n=20 |
|---|---|---|
| Pain intensity | 69.3± 17.3 | N/A |
| Physical activity | 10.3† | 15.4† |
| Community activities | 65,8 ± 20,3 | 70,5 ± 21,1 |
| SF 36 Physical Functioning | 34,7 ± 11,9 † | 69,3 ± 13,2 † |
| SF 36 Role-Physical | 37,5 ± 26,3 † | 80 ± 19,2 † |
| SF 36 Bodily Pain | 39,2 ± 15,6 † | 100 ± 0 † |
| SF 36 General Health | 56,5 ± 14,8 † | 20,7 ± 8,3 † |
| SF 36 Vitality | 66,8 ± 16,2 | 50 ± 0 |
| SF 36 Social Functioning | 54,4 ± 19,1 † | 91,2 ± 11,5 † |
| SF 36 Role-Emotional | 72,7 ± 10,9 | 79,3 ± 8,7 |
| SF 36 Mental Health | 50 ± 46,5† | 100 ± 0† |
| Functional independence (motor items A-N) | 80.0 ± 4,2 | 81,6 ± 3,8 |
| Functional independence (cognitive items N-S) | 34,4 ± 0,9 | 33,5 ± 1,8 |

* Pain intensity = WUSPI; physical activity = PASIPD; community activities = CAC; quality of life = SF36, functional independence = FIM

† Difference between groups was significant (P ≤ 0.05). N/A – not applicable.

Table 3. Correlation matrix for variables.

| | Pain intensity | Physical activity | Community activities | Quality of life | Functional independence (motor items A-N) |
|---|-----------------------|--------------------------|-----------------------------|------------------------|--|
| Pain intensity (WSUP) | 1.0 | -0.42 * | -0.07 | -0.45 * | -0.12 |
| Physical activity (PASIPID) | | 1.0 | 0.34 | 0.12 | 0.19 |
| Community activities (CAC) | | | 1.0 | 0.47 * | 0.25 |
| Quality of life (SF 36) | | | | 1.0 | 0.14 |
| Functional independence measure (motor items A-N) | | | | | 1.0 |

* $P \leq 0.05$.

no relationship, however, between shoulder pain intensity and community activities ($r_s = -0.07$; $P = 0.526$). The level of community activity was positively related to quality of life ($r_s = 0.47$; $P = 0.02$) (Table 3).

Discussion

The results of this study supported hypothesis that higher levels of shoulder pain intensity is associated with lower levels of subjective quality of life and reduced levels of physical activity for persons with paraplegia following SCI.

Higher levels of shoulder pain intensity for spinal cord injured persons involved in this study were not associated with reduced involvement in the community. There is limitation of using Community Activities Checklist (CAC) for study participants with shoulder pain – many of items in this questionnaire are social activities and don't need any mobility of joint. Therefore individuals with shoulder pain may be able to participate in social activities that do not require increased use of the arms.

In this study was used a global quality of life measure – SF36, which asks the participant to view life as a whole and does not guide users to think of particular domains of their lives (physical function, socioeconomic status). With this there was unknown which domain was used to determine their overall quality of life. The relationship between shoulder pain and subjective quality of life established in this investigation highlights the importance of addressing physical impairment in persons with SCI to improve overall quality of life.

Controversial is PASIPD measurement tool used in this study is that it utilizes a standard (average) MET for each activity that does not distinguish how the activity was actually performed, thereby resulting in similar scores for individuals who might have performed the activity at quite different intensity levels.

An additional limitation of this study is small amount of participants and impossibility to identified significant gender differences in spinal cord injured persons shoulder pain. Previously reported study results from researchers are unambiguous. In the SCI literature, Cardenas et al determined that gender differences did not exist in the severity of generalized bodily pain (Cardenas, 2004). Higher levels of shoulder pain have been demonstrated in women with paraplegia compared to matched able-bodied women (Pentland, Twomey, 2010).

The correlation between shoulder pain intensity and physical activity for spinal cord injured persons indicates that persons experiencing greater shoulder pain had lower levels of physical activity. Higher intensities of shoulder pain in study population were not related to the level of involvement in the community. However, the level of community activity was related to subjective quality of life. Our data suggest that some individuals are able to maintain high levels of community activity despite shoulder pain.

These findings on the relationship of shoulder pain to quality of life and physical activity demonstrate the need to explore effective treatments to reduce or prevent shoulder pain in wheelchair users who have suffered a SCI.

Conclusions

Persons with spinal cord injury who reported lower subjective quality of life and physical activity scores experienced significantly higher levels of shoulder pain. Shoulder pain intensity did not relate to their participation in community activities.

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