Introducing concussions from sport and recreational activities as significant in the pediatric population because of concerns with the developing brain following head trauma, recurrent and cumulative effects of concussion, recovery following concussion, as well as more global issues concerning academic performance and psychosocial issues (McCrory, ATM, 2005).

Concussion assessment batteries have focused on the impairment aspect of contemporary disability models (symptoms, cognition, balance); however, it is unclear at this time how concussion affects an individual’s health-related quality of life (HRQOL).

HRQOL is a global concept that takes into account the physical, psychological, and social domains of health. It considers the whole person and addresses disability and societal limitations (Ware, 1996).

Adolescent HRQOL revolves primarily around school, extracurricular activities, social interactions and family life. A decline in HRQOL may result in increased school absences and lower academic performance. Participation in normal activities and involvement with friends and family may also suffer with lower HRQOL (Brubaker, Stovel, 2001).

The purpose of this study was to examine the relationship between self-report concussion history and HRQOL in adolescent athletes.

Subjects

A convenience sample of adolescent male athletes from local high schools served as subjects. Subjects were grouped as having a “positive” or “negative” concussion history according to responses on a medical history form.

- Positive: n=168, age = 15.0±1.3 years, grade = 9.6±0.8
- Negative: n=135, age = 14.6±1.2 years, grade = 9.5±0.8

All subjects completed brief demographic information, a concussion history questionnaire based on the PPE, the Medical Outcomes Short Form (SF-36) and the Headache Impact Test (HIT-6). The questionnaire order was counterbalanced and all surveys were administered in a classroom or the athletic training facility at the high school.

Outcomes Measures

- Concussion History Status was assessed via a brief questionnaire based on the questions on a standard PPE (Valovich McLeod, CJSM, 2006). A “yes” response to any one of these questions was considered a positive concussion history.
  - “Have you had a concussion or head injury?”
  - “Have you been knocked out?”
  - “Have you had your bell rung or been dinged?”

Medical Outcomes Short Form (SF-36) is a 36-item generic HRQOL survey.

- 8 subscale scores: physical functioning (PF), role limitations due to physical health problems (RP), bodily pain (BP), general health perceptions (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (RE), and mental health (MH) and two composite scores: physical (PCS), mental (MCS) (Ware, McHorney, 1992).
- Lower scores on the SF-36 indicate lower HRQOL.
- Headache Impact Test (HIT-6) is a 6-item condition-specific scale that provides a broad overview of the impact of headache on HRQOL.
- Items cover various content areas reflected in HRQOL: pain, social functioning, role functioning, vitality, cognitive functioning and psychological distress. (Hayes & Branch, 2002).
- Higher scores indicate a greater impact of headaches on the daily life of a respondent.

- Statistical Analysis: All SF-36 raw data were converted to norm-based data via a linear z-score transformation (mean=50, sd=10) (Ware, 2003). The scores for each item of the HIT-6 were summed to produce a total HIT-6 score, ranging from 36 to 78. An initial K-S Test found that all dependent variables violated the assumption of normality. The Mann-Whitney U test (p<0.05) was used to determine group differences. A Bonferroni correction for multiple analyses was employed and significance determined to be p<0.008 for the SF-36. A separate Mann-Whitney U test (p<0.05) was used to determine group differences on the HIT-6 total score.

Results

The percentages of our entire sample reporting a positive concussion history to each of the PPE questions were: 16% concussion during sport, 3% concussion during recreational activities, 8% knocked out in sport, 7% knocked out in recreational activity, 43% bell rung/dinged in sport, and 19% bell rung/dinged in recreational activity.

On the SF-36, the concussion history group reported significantly lower subscale scores in the BP, GH, VT, and MH subscales and for the SF-36 MCS score (Table 1). No differences were noted on the PF, RP, SF, and RE subscales and PCS score.

On the HIT-6, the positive concussion history group reported a greater impact of headache on HRQOL (p<0.001) compared to the group with no concussion history (Table 2).

Conclusions

- Adolescents with a self-report concussion history demonstrated lower HRQOL on several SF-36 subscales, including those related to mental health, and a greater impact of headache on their general health.
- These findings differ from recent work in adolescents with a recent self-report musculoskeletal injury who reported lower HRQOL on subscales related to physical function, including the PF, RP, BP, SF subscales and the PCS score (Valovich McLeod, JAT, 2008).
- A study investigating the HRQOL of adolescents and adults with post-concussion symptoms 3 months and 1 year following mild TBI revealed lower SF-36 scores on all dimensions at both time points compared to a normative matched sample. Among TBI injured subjects lowest scores were noted on the VT, GH and BP subscales. A strong correlation was also found with an increased symptom report significantly correlated to decreased SF-36 scores (Eramo, Grant, Stover, 2003).
- Another study of chronic pain found that adolescents with headache demonstrated a negative relationship with HRQOL. Headache pain was also inversely related to reports of psychosocial functioning, functional status, physical status, and proportionally related to the number of school absences (Hustad, Copeland, 2001).
- These results suggest that a concussion history may have a lasting impact on adolescents’ HRQOL. Future prospective studies are warranted to investigate the short- and long-term impact of sport-related concussion on HRQOL to assist clinicians in developing management and rehabilitation strategies that better address the whole person health needs of concussed adolescent athletes.