Biomedical Versus Biopsychosocial Treatment Approach of Athletic Therapists Regarding Low Back Pain

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**Introduction:** The treatment of low back pain has always focused on the biomedical aspect of the patient, but recent research has started to examine the beliefs of the therapist. Biomedical and biopsychosocial orientation of the clinician can alter treatment outcomes. Most research has measured the orientation of physical therapists in the treatment of low back pain, but there is no existing data on athletic therapists.

**Rationale:** The purpose of this study was to measure athletic therapists’ biomedical and biopsychosocial orientation toward low back pain treatment.

**Methods:** Participants completed a modified version of the Pain Attitudes and Beliefs Scale for Athletic Therapists online. In addition, the authors measured demographic information, which included sex, age, years of experience, average number of patients with back pain a year, and job setting. Descriptive statistics were used to characterize respondents, and independent Student’s t or ANOVA tests were used to identify any differences in scores.

**Results:** Four hundred eighty-four people responded to the survey and 407 were analyzed. Participants comprised 137 men and 262 women whose ages ranged from 21 to 69 (35.3 ± 9.1) years. The number of respondents per job setting were 81 "college/university," 20 "secondary schools," 151 "private clinics," 44 "specialty clinics," 54 "sports teams," 3 "hospital," 7 "emerging settings," 14 "academic setting," and 12 "other." The mean biomedical score (32.1 ± 6.5) was statistically higher (P = .03) than the mean biopsychosocial score (31.3 ± 4.2). There was a significant decrease in biomedical score between individuals treating up to 5 patients per year (34.91 ± 6.01) and 100 to 500 patients per year (30.6 ± 6.8, P = .005), with a trend (P = .068) between the former and 30 to 100 patients (31.6 ± 6.84). Therapists treating the general public had statistically higher (P = .04) biopsychosocial scores (31.8 ± 4.1) than those therapists treating amateur elite athletes (30.1 ± 4.1). Therapists having 0 to 4 years of experience (34.4 ± 5.3) had significantly higher (P > .001) biomedical scores than those having 10 to 20 years of experience (30.4 ± 7.1).

**Discussion:** Previous studies have suggested that a higher biomedical orientation in physiotherapists leads to worse treatment outcomes in patients with chronic low back pain. These findings indicate that athletic therapists maintain biomedical beliefs comparable to physical therapists. Furthermore, athletic therapists with less experience who treat lower numbers of patients with low back pain and who primarily treat athletes have a more biomedical orientation.

**Importance:** Although a more biopsychosocial approach to low back pain treatment is recommended, athletic therapists retain biomedical practices. More research is needed on the education of best practices and biopsychosocial treatment for patients with low back pain in athletic therapy.

**Dynamic Single-Leg Balance Control Between Youth Hockey Players With or Without Previous Concussion During a Visuomotor Task**

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**Introduction:** The current return-to-play (RTP) protocol does not include an objective measure for the assessment of visuomotor function and dynamic stability to determine if youth athletes have truly recovered from a concussion. Baker and Cinelli (2014) identified persistent visuomotor deficits during a collision avoidance task in athletes beyond 30 days post-concussion. Furthermore, Cross et al. (2015) found that professional rugby players had a 60% increased risk of sustaining any injury following full RTP and suggested this may be due to persisting sensorimotor deficits.

**Rationale:** The purpose of the current study was to determine whether a visuomotor dynamic balance task could objectively identify differences between youth hockey players with and without a history of concussion.

**Methods:** Youth hockey players (N = 45; age: 12 to 17 years) were recruited from a private hockey academy. Athletes who reported sustaining ≤ 5 concussions (CONC group = 11) or no history of concussions (CONT group = 34) were included. Participants stood in single support on a Nintendo Wii Balance board sampled at 100 Hz while a Fitlight Trainer system administered a concurrent response time task. Five Fitlights were arranged on the floor anterior...
Effects of Isolated Core Stability Training on Standing Static Postural Control, Recovery of Standing Postural Control, and Kicking Velocity in Soccer Athletes

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Introduction: The ability to maintain the position and motion of the trunk over the pelvis and lower extremities is predominantly accomplished via quick postural responses to forces. These pre-programmed postural responses are integrated within the neuromuscular system. Theoretically, poor core stability is a result of a failure in this system to support the trunk and pelvis over the lower extremities. This may also negatively impact performance and increase risk of injury.

Methods: Twenty collegiate soccer athletes (male: 10; female: 10) participated in the study. The experimental group performed progressively more challenging core stabilization exercises over 8 weeks. Center of pressure (COP) derivatives (MAXx, MAXy, RMSx, RMSy, PATH) and normalized muscle electromyography of six trunk muscle groups (transversus abdominus/internal oblique muscle, external oblique muscle, rectus abdominus, multifidi, lumbar, and thoracic erector spinae muscles) were obtained to quantify static standing postural control using single limb stance (SLS) and tandem stance (TS) for both lower extremities. Recovery of control was measured using a jump–land protocol to quantify time to stabilization (TTS) in both the medial-lateral and anterior-posterior (TTSx and TTSy, respectively) directions for both lower extremities. Kicking velocity was used as a measure of soccer performance. Short-term reliability of the measurements was also obtained.

Results: There was good (> .75), but mostly excellent (> .9) intraclass coefficients with relatively small minimal detectable change and standard error of measurements for all variables. Following training, the experimental group demonstrated significant (P < .05) reductions in COP deviation of all derivatives and decreased normalized trunk muscle activation of 4 of 6 muscle groups (all but the oblique and thoracic erector spinae muscles) during SLS and TS under both eyes open and eyes closed conditions post-training and as compared to controls. There were significant improvements in TTS (RTTx by 0.45 s, RTTSy by 0.55 s, LTTSx by 0.7 s, LTTSy by 0.8 s, P < .05) and increased kicking velocity (6 km/hr, P < .05) post-training and as compared to controls.

Conclusion: Completion of the core stabilization program resulted in improved static and dynamic standing postural control and kicking velocity. These results begin to elucidate the role of the core and the effects of training on postural control and performance.

Importance: These results have direct implications on clinical intervention for healthy and possibly injured athletes. Training the core may have benefits for performance other than what was reported. There is evidence that poor trunk control may be related to incidence of LE injuries. This program may be used to achieve early trunk control in later stages of rehabilitation when more dynamic/integrated exercises are performed or when weight-bearing exercises are contraindicated.

Identifying Factors Affecting Overall Cerebral Blood Flow—A Pilot Study

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Introduction: Concussion injuries are considered one of the least understood injuries facing the sports medicine
and neuroscience communities today. The majority of cases resolve within 7 to 10 days, but persistent symptoms (> 10 days) are reported in 10% to 15% of concussions. These symptoms can last from weeks to years, leaving individuals incapacitated. Currently, diagnostic imaging techniques are unable to definitively identify concussion injuries; most are diagnosed based on subjective symptom evaluation and treatment is focused on techniques targeted at decreasing the symptoms. Although new and innovative treatment interventions have shown positive outcomes, the understanding of how these therapies assist in the recovery of concussions is still poorly understood.

**Rationale:** Cerebral vasoreactivity and hemodynamics have been shown to be different for individuals with a history of head trauma compared to individuals without. The majority of cerebral blood flow studies utilizes transcranial Doppler (TCD) of the middle cerebral artery (MCA) without regard to potential changes in the cerebral blood supply contribution from the internal carotid and vertebral arteries as they ascend the neck. The purpose of this study was to develop a valid protocol to measure blood flow velocities and volumes of the common carotid (CCA), internal carotid (ICA), vertebral (VA), and middle cerebral arteries using Doppler ultrasound and magnetic resonance imaging (MRI) and to compare the techniques for accuracy.

**Methods:** Five healthy, physically active, university-aged participants free of concussion completed screening questionnaires (NPDI and SCAT3) prior to undergoing Doppler ultrasound (Logiq e Ultrasound System, GE Healthcare) and MRI (Siemens, 3T Systems) evaluation.

**Results:** Overall, measures of vessel diameter, blood flow velocities, and volumes demonstrated weak correlations for CCA, (0.73, 0.18, and 0.38, respectively), ICA (-0.14, -0.21, and -0.1, respectively) and VA (-0.12, 0.20, and -0.09, respectively) measurements between ultrasound and MRI methods. A weak negative correlation resulted between MCA time average mean (TAMEAN) and diameter between ultrasound and MRI (-0.38 and -0.37, respectively) were obtained.

**Discussion:** The small sample size of this pilot investigation coupled with the novelty of the approach to include contributing vasculature for the overall estimate of cerebral blood flow velocities and volumes contributed to the low correlation values obtained. The current protocol is consequently being revised to allow for stronger objective measures and the preliminary data are showing promising results.

**Importance:** Efforts to better understand the underlying mechanisms of prolonged concussion symptoms must continue to be explored utilizing accessible, inexpensive, and objective methods of evaluation. The use of Doppler ultrasound to help identify areas of impeded blood flow that contribute to overall cerebral vascularization are critical to understanding and establishing effective treatments that can optimize recovery for patients.

**Use of Computer-Based Virtual Scripts to Assess Competency and Clinical Reasoning Outcomes in Undergraduate Athletic Training Students**

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**Objective:** To assess summative outcomes in acute and emergent care competency in undergraduate athletic training students using a computer-based series of virtual scripts.

**Subjects:** Thirteen undergraduate students completing a CAATE accredited degree in athletic training completed a two-part online assessment module during their final semester of study.

**Methods:** Using Qualtrics, four experienced educator-clinicians designed progressive virtual illness scripts to assess student competency in emergent care. Each script was written to assess summative outcomes in clinical decision-making and management of exertional heat illness and commotio cordis, and to assess knowledge of risk factors, pathoetiology, and evidence to assess thinking and knowledge application.

**Data Analysis:** Each script presented a field scenario followed by a series of open text-response thinking and application based questions. Students were asked to list their top 3 differential diagnoses, identify a primary diagnosis, and to support their responses. Answers were codified and cross-analyzed by 3 reviewers for accuracy and scaling.

**Results:** For commotio cordis, respondents provided accurate differential diagnoses (85%), identified the primary diagnosis (100%), properly identified key features (100%), provided proper management (85%), identified the pathoetiology (85%), and knew that AED application was critical (92%). Summarily, 100% of respondents received an “A” (85%) or “B” (15%) grade, indicating competency. For exertional heat illness, respondents accurately listed possible diagnoses (90%), identified the primary diagnosis (85%), provided proper overall care (85%), and identified risk factors (76%). However, 15% did not list
immediate cold-water immersion as the first step and 23% failed to indicate proper core temperature levels prior to transport. Eleven were graded competent (A = 36%, B = 54%), and 2 (18%) graded incompetent for this script.

**Conclusions:** Health care educators are challenged with documenting competency in various domains to support educational effectiveness and promote patient safety. Increasingly, educators in athletic training/therapy are responsible for developing and disseminating methods that document student progress and entry-level competency. Effective and valid documentation in the many domains of professional practice are required for accreditation, institutional and program compliance, and ethical/civic responsibility, and can be time consuming and laborious. All of our graduates were assessed as competent with commotio cordis scripts, 85% were competent with EHI scripts, and 100% passed the BOC examination on the first attempt. Computer-based virtual scripts have been used effectively in medical education and offer promise for athletic training educators looking for effective, efficient, and manageable methods for assessing clinically based cognitive capabilities.

**Sport and Recreation Injury Incidence in Female Irish Primary School Children**

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**Introduction:** Participation of females in sport and recreation is increasing due to many national/international initiatives. However, an inherent injury risk exists when participating in sport and recreation. Therefore, injury preventative programs must be implemented to circumvent these negative effects that will ultimately place an unnecessary burden on society.

**Rationale:** Research into injury incidence in females is lacking in Ireland, particularly in the youth population, with no research in female primary school children. Therefore, this study aimed to instigate the sequence of injury prevention by examining sport and recreation injury incidence in female Irish primary school children.

**Methods:** Ethical approval was granted by the institute’s research ethics committee. Primary school females (N = 507, 9.41 ± 1.68; 6 to 13 years) completed a retrospective questionnaire that examined average weekly hours in sport and recreation, injury occurrence, and details surrounding any musculoskeletal injury received in the past 12 months. Incidence proportion, repeat incidence proportion, and injuries per 1,000 hours with a 95% confidence interval (CI) using Poisson regression were calculated.

**Results:** Participants took part in an average of 6.3 ± 5.41 and 3.7 ± 2.51 hours per week of recreation and sport, respectively. In the past 12 months, 25.4% (95% CI: 21.4% to 30.2%) of participants sustained an injury, with 34.1% (95% CI: 25.4% to 45.8%) sustaining a subsequent injury. Although participants reported higher recreation hours, sport injuries (0.13 [range: 0.11 to 0.16] injuries per 1,000 hours) were significantly more common than recreation injuries (0.06 [range; 0.05 to 0.07] injuries per 1,000 hours). Gaelic football (33.3%), gymnastics (10.3%), athletics (6.4%), and camogie (6.4%) accounted for the majority of sport-related injuries, with contact sports resulting in more injuries (59%) than non-contact sports (41%). In sport and recreation, respectively, 15.3% and 17% of injuries had occurred previously. Injuries to the ankle (16.3%), knee (14%), and fingers (12.4%) were most common. Of those injured, 56% went to a medical professional for examination or treatment. Injury resulted in an average of 31.9 ± 97.2, 18.4 ± 18.5, and 3.0 ± 3.2 days of sport, recreation, and school being missed, respectively.

**Discussion:** Despite time spent in recreation being significantly higher than in sport, twice as many injuries occurred in sport than in recreation. Contact sports accounted for the majority of injuries. Lower extremity injuries were predominant, in particular to the ankle and knee; therefore, these sites should be prioritized in injury prevention programs.

**Importance:** Injury prevention strategies should be developed and implemented to reduce musculoskeletal injury risk at a young age, which would reduce the economic and injury burden throughout the life span.

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