

PURPOSE: To assess H:Q ratios in National Collegiate Athletic Association (NCAA) Division I women's soccer players and compare them to non-athlete controls.

METHODS: Eighteen healthy NCAA Division I women's soccer players (mean age \pm SD = 20 \pm 1 yrs; height = 168 \pm 5 cm; body mass = 65 \pm 5 kg) and thirteen healthy female controls (age = 21 \pm 2 yrs; height = 163 \pm 6 cm; body mass = 64 \pm 8 kg) performed voluntary maximal concentric isokinetic leg extension and flexion muscle actions on a Biodex System 3 dynamometer (Biodex Medical Systems, Inc., Shirley, NY, USA) at 180°s⁻¹. The highest peak torque (PT) value from three consecutive leg extension and flexion repetitions were used to calculate the traditional H:Q ratio. Independent t-tests were used to compare means between the athletes and non-athletes for leg extension peak torque (PT_E), leg flexion peak torque (PT_F), and H:Q ratio. Microsoft Excel was used for all statistical analyses, and a type I error rate of \leq 5% was considered statistically significant for all comparisons.

RESULTS: Mean \pm SD values for PT_E were 79 \pm 12 Nm and 69 \pm 5 Nm, the PT_F were 48 \pm 9 Nm and 32 \pm 3 Nm, and the H:Q ratios were 0.60 \pm 0.08 and 0.47 \pm .03 for the athletes and non-athletes, respectively. There was no difference in mean PT_E (P = 0.08), but mean PT_F and H:Q ratios were significantly lower (P < 0.01) for the non-athletes than the athletes.

CONCLUSION: The H:Q ratios in NCAA Division I women's soccer players were greater than the non-athlete controls and were equivalent to the minimum ratio suggested to avoid knee- and hamstring-related injuries (H:Q = 0.60). These findings also emphasize the importance of hamstring strength as a factor for improving the H:Q ratio and potentially reducing the

risk of injuries. Finally, perhaps important delineating characteristics between NCAA women's athletes and non-athletes are PT_F and the H:Q ratio, which may result from competition and training demands.

692 June 2 10:00 AM - 10:15 AM
The Relationship Between Sports Conditioning and Success in Professional Soccer

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(No relationships reported)

Expert suggest that since 1990's there has been a steady increase in performance demand as well as performance level in professional soccer players. The endurance conditioning level of the German national players in the 1990's is similar to the conditioning of the 3rd division players today. In contrast to endurance performance, the sprint performance level of the national players in the 1990's is achieved only in the 1st professional soccer division today.

PURPOSE: Based on multiyear record keeping, data collection, and observations, we investigated how to improve, maintain, and enhance the sport specific endurance, speed, and strength that are prerequisites for successful professional soccer players.

METHODS: We conducted numerous seasonal tests with a group of professional soccer players. The tests were soccer specific endurance, sprints, jumps and strength training of specific muscle groups. In addition to soccer specific demands, we designed and implemented individually tailored strength and interval training. This type of training was conducted 3-4 hours per week. **RESULTS:** There were statistically significant improvements in soccer specific endurance from the beginning of the 3rd division 4.11+0.19 m/s to 4.26+0.2 (P<0.01) at entry to 2nd division and improved to 4.62+0.25 m/s (P<0.001) at the start of the 1st division. Similar results were observed for 30m sprints. They improved their sprint performance time from the beginning of the 3rd division to 2nd division from 4.27+0.23s to 4.1+0.14s (P<0.01). At entry to 1st division they improved their sprint time to 4.0+0.15s (P<0.001). However, there was no significant difference for counter movement jumps (38.0 \pm 3.5cm to 39.2 \pm 4.2cm).

CONCLUSIONS: The performance of a professional soccer team depends on multitude of factors. The results suggest that systematic and individualized improvements in soccer specific endurance and sprint performance greatly contribute to the success in professional soccer. In addition, our results suggest that players possess physiological abilities that can be harvested and thus can greatly benefit individually and collectively from training methods employed in this investigation.

693 June 2 10:15 AM - 10:30 AM
Changes in Measures of Power in NCAA Division I Female Soccer Athletes Through Competitive Seasons

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(No relationships reported)

PURPOSE: The purpose of this work was to use jump analysis as a practical method of measuring athletic performance and improvements.

METHODS: Females athletes were assessed during maximal effort countermovement (CMJ) and static jumps (SJ), in both unloaded and loaded conditions. Testing occurred prior to and 5 weeks into two consecutive competitive seasons. Testing also included

anthropometric assessments (height, body mass, % body fat) and hydration status (urinary specific gravity; USG). Variables considered for each maximal jump trial were: jump height (cm), peak force (N), peak velocity (m/sec), peak power (Watts), net impulse (N*sec), force @ peak power (N), & velocity @ peak power (m/sec) were analyzed during the jumps. Any differences between time points were assessed via a series of one-way ANOVAs. The nature of any between group differences was highlighted using a Bonferroni post hoc test. A significance level of $p \leq 0.05$ was set a priori.

RESULTS: Results indicated statistically significant increases in the following jump attributes: USG ($p = 0.005$; fall pre to fall post), 0kg CMJ peak velocity ($p = 0.031$; spring post to fall post), 0kg CMJ net impulse ($p = 0.019$; spring post fall post), 0kg CMJ velocity @ peak power ($p = 0.017$; spring post to fall post), 11kg CMJ peak velocity ($p = 0.050$; spring post to fall post), 11kg CMJ net impulse ($p = 0.036$; spring post to fall post), and 11kg CMJ velocity @ peak power ($p = 0.029$; spring post to fall post).

CONCLUSIONS: Results indicate that there is a substantial decrease in measurable athletic attributes during the NCAA mandated period of restricted coaching hours that could lead not only to a decrease in performance, but also to a possible increase in incidence of injury. The lack of allowance of structured training will only exacerbate the issue, leaving the athletes, at best, vulnerable to injury upon re-entering regimented, albeit scientifically sound programmed, planned, and executed training and competition schedules.

694 June 2 10:30 AM - 10:45 AM
Pre-season Training And Cardiac Autonomic Indices In Elite Spanish Soccer Players

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PURPOSE: To evaluate changes in performance and cardiac autonomic control (i.e. heart rate [HR] variability [HRV]) in elite soccer players during their pre-season training regime.

METHODS: Eight Spanish Premier League soccer players were examined at the first (week 1) and the last week (week 8) of the pre-season period (July-September). Nocturnal HR recordings on 4 days per week were averaged to evaluate the weekly HRV. Players also completed the Yo-Yo intermittent recovery test level 1 (Yo-Yo IR1) for the assessment of specific fitness.

RESULTS: During the pre-season period, there was no significant change (4.5 \pm 23.9%) in Yo-Yo IR1 performance (2,475 \pm 421 vs. 2,600 \pm 786 m, $p=0.55$), while there was a significant decrement (6.3 \pm 4.3%) in maximal HR (HRmax) recorded during the test (191 \pm 7 vs. 179 \pm 8 bpm, $p = 0.004$). Over the 8-week pre-season, significant increases in the standard deviation of the long-term continuous HRV (SD2) (174 \pm 56 vs. 212 \pm 53 ms, $p = 0.017$), and in the standard deviation of all HR intervals (SDNN) (135 \pm 50 vs. 163 \pm 41 ms, $p = 0.023$) were noted. No significant correlations were identified between Yo-Yo IR1 and HRV measures at week 1. In contrast, Yo-Yo IR1 performance was significantly correlated with SDNN ($r = 0.89$, $p=0.007$) and SD2 (0.92 , $p=0.003$) at week 8. Greater values in HRV at week 1 were substantially associated with lower HRV changes at the end of pre-season (r values ranged from -0.79 to -0.98, $p < 0.05$). Furthermore, HRV changes were significantly correlated with decreases in HRmax during the pre-season (r values from 0.83 to 0.94, $p < 0.05$).

CONCLUSIONS: The current results confirm that despite minimal changes in specific fitness (i.e. Yo-Yo IR1), pre-season training significantly improved various HRV indices in elite soccer players with greater changes evident for those with lower initial HRV levels. Nocturnal HRV may provide an important monitoring tool for identification of cardiovascular function changes in top-class soccer players during pre-season regimes.

695 June 2 10:45 AM - 11:00 AM
The Effect Of high and low intensity Half Time Re-warm-up Strategies On Second Half Sprint Performance In Soccer.

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(No relationships reported)

Soccer players perform less high-intensity running during the opening phase of the 2nd half (Krustrup & Bangsbo, 2001: *JSS*, 19(11), 881-891). Although the cause is unknown, research suggests the conventional routine of resting for the entire half-time interval may not provide optimal preparation for the second half (Mohr *et al.*, 2005: *Journal of Sports Sciences*, 23(6), 593-599). Both Ozyener, Rossiter, Ward, & Whipp (2001: *Journal of Physiology*, 533, 891-902) and Mohr *et al.* (2004: *Scandinavian Journal of Medicine and Science in Sports*, 14(3), 156-162) have demonstrated benefits of a high intensity re-warm up (70% VO_{2max} and 70% peak HR, respectively), it remains to be seen whether low intensity re-warm up is also effective.

PURPOSE: To determine whether low intensity re-warm up is effective in maintaining sprint performance.