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

METHODS: Eighteen healthy NCAA Division I women’s soccer players (mean age ± SD = 20 ± 1 yr; height = 168 ± 5 cm; body mass = 65 ± 5 kg) and thirteen healthy female controls (age = 21 ± 2 yr; height = 163 ± 6 cm; body mass = 64 ± 8 kg) performed voluntary maximal concentric isokinetic leg extension and flexion muscle actions on a Biodes System 3 dynamometer (Biodex Medical Systems, Inc., Shirley, NY, USA) at 180°/s. 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 (PTₑ), leg flexion peak torque (PTᵢ), and H:Q ratio.

Microsoft Excel was used for all statistical analyses, and a type I error rate of ≤ 0.05 was considered statistically significant for all comparisons.

RESULTS: Mean ± SD values for PTₑ were 79 ± 12 Nm and 69 ± 5 Nm, the PTᵢ were 48 ± 9 Nm and 32 ± 3 Nm, and the H:Q ratios were 0.60 ± 0.08 and 0.47 ± 0.03 for the athletes and non-athletes, respectively. There was no difference in mean PTₑ (P = 0.80), mean PTᵢ, 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-athletes 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 PTₑ and the H:Q ratio, which may result from competition and training demands.

June 2 10:00 AM - 10:15 AM
The Relationship Between Sports Conditioning and Success in Professional Soccer
Ruediger Reer1, Daniela Stein1, Kai Wellmann2, Serge P. von Duvillard3, FACSM, Klaus-Michael Braumann1.1University of Hamburg, Hamburg, Germany, 2University of Salzburg, Salzburg, Austria.

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 testing. 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 the athletes and non-athletes, respectively. There was no difference in mean PTE (P = 0.08), but mean PTF 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-athletes 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 PTₑ and the H:Q ratio, which may result from competition and training demands.

June 2 10:15 AM - 10:30 AM
Changes in Measures of Power in NCAA Division I Female Soccer Athletes Through Competitive Seasons
Christopher MacDonald, Ryan Alexander, Adam Sayers, Howard Gray, Michael Israelat, Jeremy Gentles, Aaron Casey, Matt Samms, Hugh Lamont, Michael Rarreyse, Michael Stone. East Tennessee State University, Johnson City, TN.

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

METHODS: Females 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 these jumps 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 ≤ 0.05 was set a priori.

RESULTS: Results indicated statistically significant increases in the following jump attributes: USG (p = 0.05; fall pre to post fall), 6kg CMJ peak velocity (p = 0.031; spring post to fall post), 6kg CMJ peak force (p = 0.019; spring post to fall post), 6kg CMJ peak velocity (p = 0.007; spring post to fall post), 11kg CMJ peak velocity (p = 0.011; spring post to fall post), 11kg CMJ net impulse (p = 0.006; spring post to fall post), and 11kg CMJ velocity @ peak power (p = 0.029; spring post to fall post). No protocols indicated that there is a substantial decrease in measurable athletic attributes during the NCAA mandated period of restricted coaching hours that could lead 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.

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 (6) of the pre-season (week 4-5). Nocturnal HR recordings on 4 days per week were averaged to evaluate the weekly HRV. Players also completed the Yo-Yo intermittency 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±2.9% in Yo-Yo IR1 performance (2,475 ± 421 vs. 2,600 ± 786 m, p=0.55), while there was a significant decrement (6.3 ± 4.3%) in maximal HR (HRmax) recorded in the treatment (191 ± 7 vs. 179 ± 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 ± 56 vs. 212 ± 53 vs. p < 0.017), and in the standard deviation of all HR intervals (SDNN) (135 ± 50 vs. 163 ± 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 (r 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.