SEASONAL TRAINING LOAD DIFFERENCES AMONG FEMALE DIVISION III SOCCER PLAYERS

[1]Andrew A. Pustina, [1]Ashley A. Johnson, [1]Kyle G. Rochau, [1]Kyle J. Robinson, [1]Dexter M. Molinaro

[1]Carthage College, Department of Exercise and Sport Science, Kenosha, WI

INTRODUCTION: Training load monitoring is essential to coaching soccer (Impellizzeri, Rampinini, Coutts, Sassi, & Marcora, 2004; Pustina et al., 2017). It has the potential to help reduce overtraining syndrome, reduce overuse injuries, prevent illness (Foster, 1998), and potentially ensure that all athletes are receiving a sufficient training stimulus (Gil-Rey, Lezaun, & Los Arcos, 2015). By closely monitoring training load coaches are able to deliver a periodized training schedule (Borresen & Lambert, 2009). Furthermore, they are better able to balance training between players that receive varying amounts of playing time during games. Therefore, the purpose of this study was to observe the total training load incurred over the course of a Division III Women's Soccer season and to determine whether it differed between high-minute players and low-minute players.

METHODS: This study involved retrospective analysis of archived monitoring data from an NCAA Division III women's soccer team. The team consisted of a total of 27 players. Three players became injured for more than two weeks and were excluded from analysis. Players were divided into groups based on their total playing time in competitive matches. The cutoff was placed at 720 minutes, which was half of the total game minutes during the season. Thus, players that played more than 720 minutes were placed in the high-minute group and players that played less than 720 minutes were placed in the low-minute group. In total, the sample consisted of 13 low-minute players (304 ± 229 minutes played during games, age 19.2 ± 0.9 years) and 11 high-minute players (1073 ± 227 minutes played during games, age 20.5 ± 0.9 years).

Figure 1. Modified Borg scale used in this study (Foster et al., 2001).

1	Really Easy
2	Easy
3	Moderate
4	Somewhat Hard
5	Hard
6	
7	Really Hard
8	
9	Really, Really Hard
10	Maximal

Rating of perceived exertion (RPE) was taken shortly after each training session as shown in Figure 1 (Foster et al., 2001). Players were asked to rate the difficulty of the training session. Each individual player's training load was calculated by multiplying RPE by duration (minutes) of training. The duration that was used to calculate practice training load began when players started their dynamic warm-up and ended before their post training cool-down. If players had to leave practice early, their practice durations were adjusted accordingly. To calculate training load during competitive soccer matches, RPE was multiplied by minutes

played, which has been shown to be a better representation of training load (Pustina et al., 2017). In total, 59 training sessions and 16 games were used for analysis.

A one-way analysis of variance (ANOVA) was used to determine whether there was a difference between high and low minute players for the game, practice, and total training load comparisons. Statistical Package for the Social Sciences (version 24.0 SPSS Inc. Chicago, IL) was used. In addition, Cohen's d was calculated for each variable and were categorized as: trivial < 0.2, small 0.2–0.6, moderate 0.6–1.2, large 1.2–2, and very large 2.0–4.0. (Cohen, 1988).

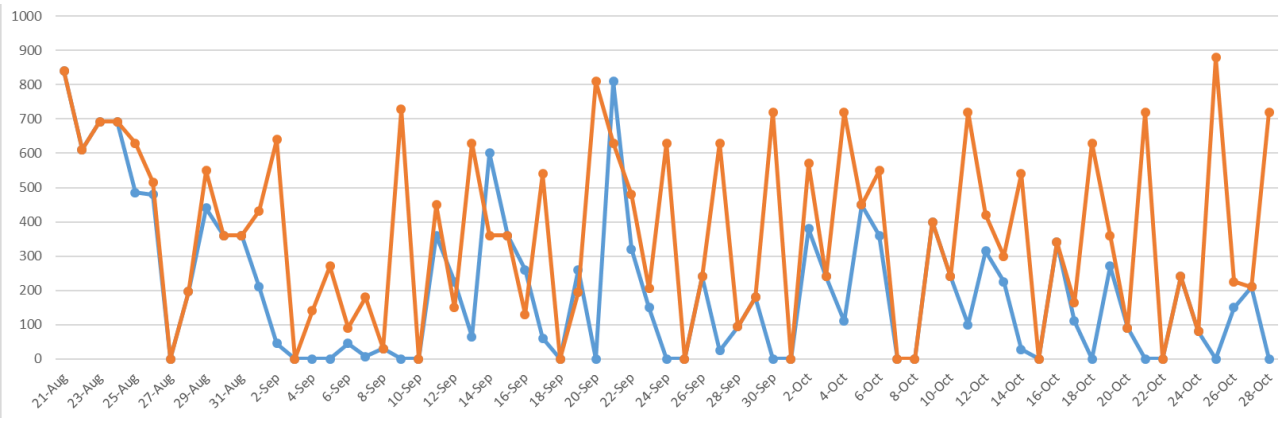
RESULTS: As shown in Table 1, analysis of grouped data indicated significant differences between game and total training load. No statistically significant difference was observed between the groups when considering training load from practice.

Table 1. Means and Standard deviations for high and low minute groups along with ANOVA and Cohen's d results.

	Practice	Game	Total
Low-minute	13749 ± 1219	2210 ± 2040	15959 ± 2737
High-minute	12735 ± 1206	8495 ± 1773	21231 ± 2724
p-value	0.053	0.001	0.001
Cohen's d	0.84	3.30	1.93
	Moderate	Very Large	Large

DISCUSSION: The purpose of this study was to determine the total training load incurred during one season of women's soccer, and to see if it differed between high-minute players and low-minute players. The main finding from this study was that high-minute players had significantly greater training loads than low-minute players, which aligns with previous research (Pustina, 2016). This was potentially due to the fact that low-minute players did not receive sufficient training after not participating or lightly participating in matches (Figure 2). Figure 2 shows that typically low-minute players received very little training load throughout the season with training loads peaking above 400 only 4-5 times throughout the regular season. Furthermore, from 9/1 to 9/10 training load was almost zero. Low training loads have been shown to impair improvement in aerobic fitness during competitive soccer seasons (Gil-Rey et al., 2015). Over 9-week, Gil-Rey et al. (2015) observed a group of twenty-eight elite and non-elite male soccer players. The elite group typically experienced higher weekly training loads (1548 ± 216) than the non-elite group (1318 ± 308). As a result, the non-elite group experienced a 1.8% decrease in performance of an endurance test, while the elite group had a 2.0% increase in performance. Typical weekly training loads for this study were 1965 ± 392 for the high-minute group and 1149 ± 316 for the low minute group. Therefore, it is likely that the low-minute players did not receive sufficient training load. Judging from this evidence, it is also possible that the high-minute group received excessive training load.

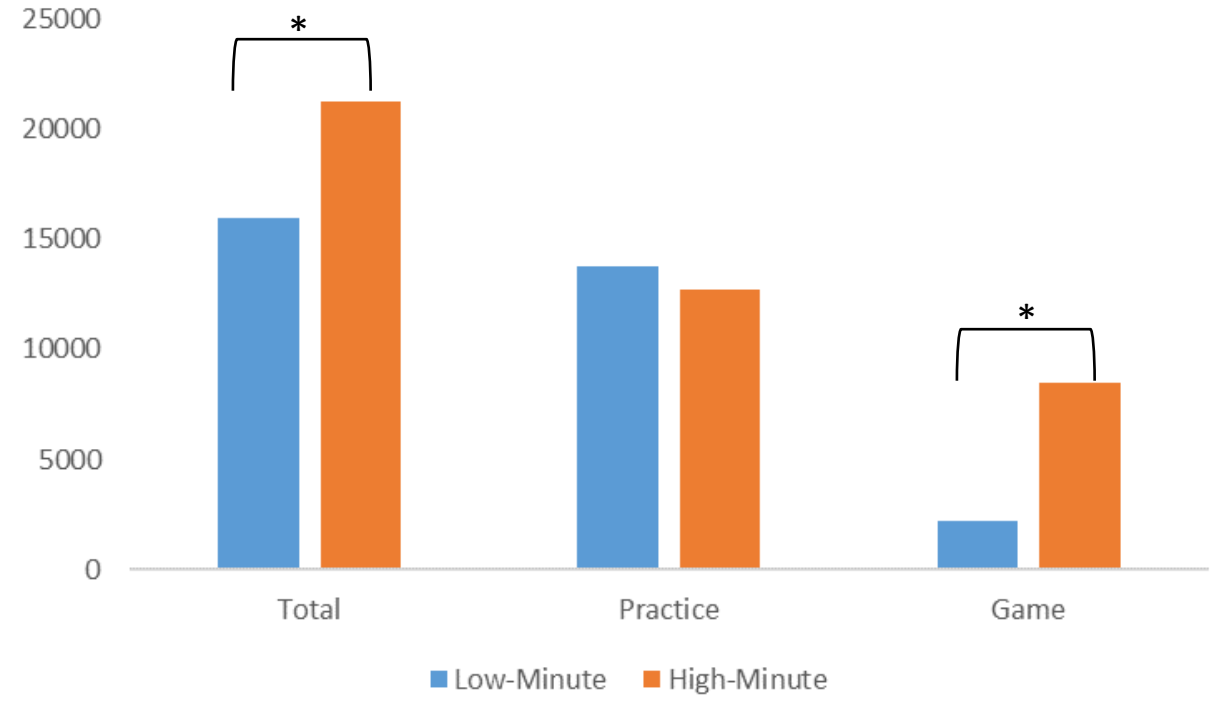
Figure 2. Training load throughout the season. Orange is a high-minute player and blue is a low-minute player.



During the preseason (First two weeks, Figure 2), training load was above 400 for approximately 6 days for both low and high-minute groups. Extended periods of high training intensity and volume with few rest days in between have been shown to increase risk for overtraining (Foster, 1998; Kraemer et al., 2004). There remains a possibility that the high-minute group received too much training load as the practice loads were not statistically different from the low-minute group. All in all, without performance measures like vertical jump, an overtraining phenomenon is difficult to discern.

When comparing high and low minute Division I male soccer players, Pustina (2016) found a statistically higher training load from soccer practice in the low-minute group. Results from Pustina et al. (2016) differ from the present study, which found a lower training load in low-minute players from soccer practice (Figure 3).

Figure 3. Mean training load between high and low minute players from games and practices.



PRACTICAL APPLICATIONS: These data present support for the differences between overall workloads of high and low minute players. Coaches should consider equalizing training loads for high and low minute players. This may be accomplished through higher practice training loads for low-minute players.

REFERENCES:

Borresen, J., & Lambert, M. I. (2009). The quantification of training load, the training response and the effect on performance. *Sports Med, 39*(9), 779-795. doi:10.2165/11317780-000000000-00000

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences. 2nd edn. Hillsdale, New Jersey: L: Erlbaum.

Foster, C. (1998). Monitoring training in athletes with reference to overtraining syndrome. *Med Sci Sports Exerc, 30*(7), 1164-1168.

Foster, C., Florhaug, J. A., Franklin, J., Gottschall, L., Hrovatin, L. A., Parker, S., . . . Dodge, C. (2001). A new approach to monitoring exercise training. *J Strength Cond Res, 15*(1), 109-115.

Gil-Rey, E., Lezaun, A., & Los Arcos, A. (2015). Quantification of the perceived training load and its relationship with changes in physical fitness performance in junior soccer players. *J Sports Sci, 33*(20), 2125-2132. doi:10.1080/02640414.2015.1069385

Impellizzeri, F. M., Rampinini, E., Coutts, A. J., Sassi, A., & Marcora, S. M. (2004). Use of RPE-based training load in soccer. *Medicine and science in sports and exercise, 36*(6), 1042-1047. doi:10.1249/01.Mss.0000128199.23901.2f

Kraemer, W. J., French, D. N., Paxton, N. J., Hakkinen, K., Volek, J. S., Sebastianelli, W. J., . . . Knuttgen, H. G. (2004). Changes in exercise performance and hormonal concentrations over a big ten soccer season in starters and nonstarters. *J Strength Cond Res, 18*(1), 121-128.

Pustina, A. A. (2016). Seasonal Perceived Training Load in NCAA DI Men's Soccer: Is There a Dose-Response Relationship?

Pustina, A. A., Sato, K., Liu, C., Kavanaugh, A. A., Sams, M. L., Liu, J., . . . Stone, M. H. (2017). Establishing a duration standard for the calculation of session rating of perceived exertion in NCAA division I men's soccer. *Journal of Trainology, 6*(1), 26-30.