QUANTIFICATION OF RESISTANCE TRAINING DOSAGE: A ONE-YEAR RETROSPECTIVE REVIEW

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INTRODUCTION: The most logical and simplistic area of monitoring a training process is to quantify training dosage (Stone, Stone, & Sands, 2007). Resistance training provides several easily measured dosage variables such as exercise type, number of repetitions, number of sets, exercise intensity, etc. Examining the training process in its entirety (i.e. macrocycle) through characterizing and quantifying training dosage provides an overall view of the demands placed on the athlete. These demands can then be related back to the intended goals and/or outcomes of the training plan. Furthermore, this form of analysis can provide practitioners with an overview of where/how, on a macro-level, training time and resources are being used. The purpose of this analysis was to provide a retrospective review of one macrocycle (year) of periodized resistance training performed by a team of National Collegiate Athletic Association (NCAA) Division I women's volleyball athletes.

METHODS: To perform this review, the training year was broken down based on the common resistance training dosage variables. Briefly, following the completion of the training year all annual training was compiled and the following dosage variables were calculated: total number of sets and total number of repetitions. Variables were then further divided based on the period of the training year, set and repetition scheme, relative intensity, and per exercise. This particular training plan utilized training intensities not based on percent of one-rep maximum but rather based on the set-rep-best method as outlined by (Stone & O'Bryant, 1987). Additionally, variables such as total training sessions and average number of exercises per training session were calculated.

RESULTS: Over the course of fifty-two weeks, 156 resistance training sessions occurred. The team performed a total of 1,851 individual sets and 9,227 repetitions. Resistance training sessions occurred at an average of three times per week, with an average of 3.5 exercises performed during each session. Figure 1 displays the frequency per set and repetition scheme for both in- and out-of-season training. Figure 2 displays the frequency per relative intensity for both in- and out-of-season training. Figure 3 displays a breakdown of exercises per classifications (i.e. upper-body push, lower-body push, etc.). When examining specific exercises, the five most frequently performed were the back squat (1,370 repetitions, 14.8% of total repetitions), followed by hang power-clean (502 repetitions, 5.4% of total repetitions), bench press (463 repetitions, 5.0% of total repetitions), mid-thigh pull (409 repetitions, 4.4% of total repetitions), and stiff-leg deadlift (459 repetitions, 5.0% of total repetitions).

DISCUSSION: The purpose of this analysis was to provide a retrospective review of one macrocycle (year) of resistance training performed by an NCAA Division I women's volleyball team. When examining the year in its entirety, we can see that 65% of the annual training was spent in preparation for the remaining in-season play. During this preparatory period, 28% of the training load was performed at 85% relative intensity. During this time, the predominant set and repetition schemes were 3x5 and 3x3 (Figure 1). However, in-season, time- and fatigue-management direct a shift in training intensity and volume (Figure 2). Time spent training at 85% relative intensity increased, while other high relative intensities (i.e. 80, 90%) were replaced with lighter loads intended for recovery and/or power-development (Haff & Nimphius, 2012). Concurrently, sets and repetitions were manipulated by inverting the prescription of 5-repetition to 3-repetition sets.

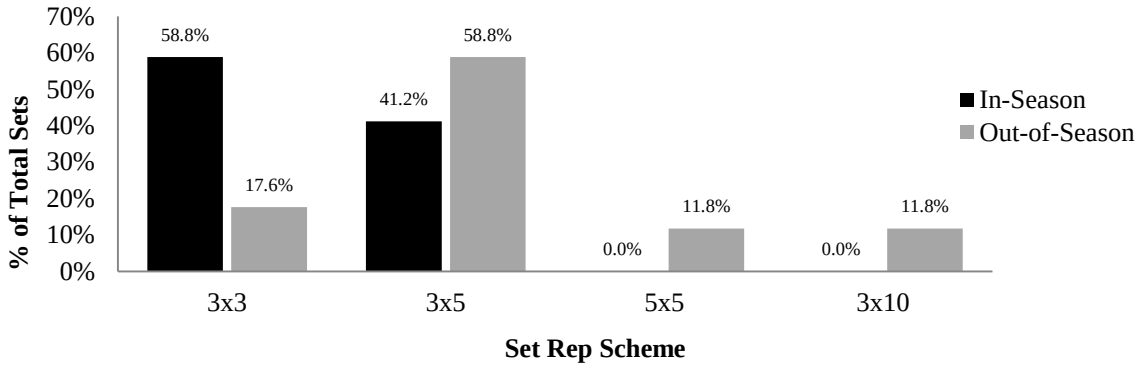

Figure 1. The frequency per set and repetition scheme based on percentage of total sets for both in- and out-of-season training periods.

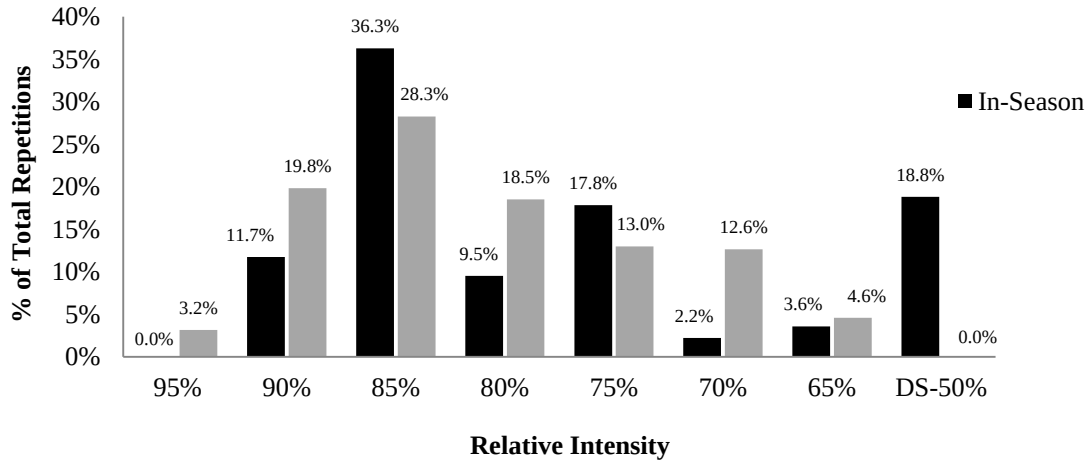

Figure 2. The frequency per relative intensity for both in- and out-of-season training periods expressed as a percentage of total repetitions by training period. *Note: DS = Down-set.*

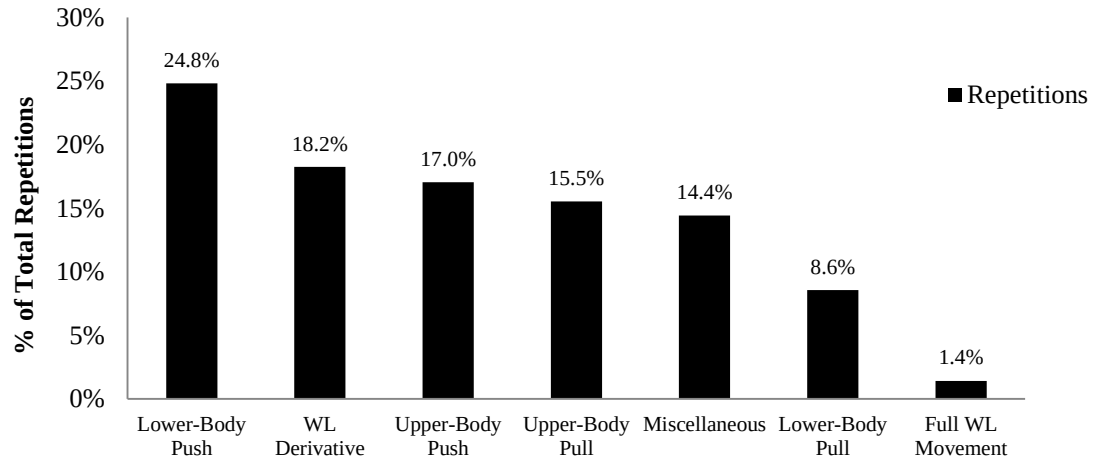

Figure 3. Number of repetitions per exercise classification expressed as percentage of total repetitions. *Note: WL = Weightlifting.*

When reviewing the breakdown of individual exercises (Figure 3), it can be seen that the most frequently performed exercises were of the lower-body push classification, with the majority being the back squat exercise (14.8% out of 24.8% total). The second most prevalent exercise classification was weightlifting derivatives. This classification accounted for 1,683 repetitions, 18.2% of total repetitions. Interestingly, although weightlifting movements were frequently performed during the training year, full weightlifting movements accounted for less than 1.5% of the total repetitions performed. When examining the exercise frequency distribution (Figure 3), the exercises follow a push-pull-push-pull pattern, at least for the first four exercise classifications. Interestingly, when all exercises are taken into consideration, the breakdown between pushing and pulling movements was exactly 50-50%.

Overall, this initial investigation was effective in determining the resistance training dosage on the macro-level in the form of total sets and repetitions as well as identifying the predominant set and repetition schemes, relative intensities, and exercises performed. This type of analysis could prove useful to practitioners in several ways. First, it can provide the practitioner with an overall view of stressors being placed on the athlete. Secondly, practitioners are provided with a method of determining where the majority of their training resources (e.g. time) are being directed, and more importantly determine if this direction is in agreement with the overall goal(s) of the training process. Similarly, practitioners are able to determine how specific aspects of the annual plan, such as individual exercises, compare relative to the entire training year. For example, of the 9,227 total repetitions performed during this macrocycle, the countermovement mid-thigh pull accounted for only 63 total repetitions (0.7%). Considering there are so few exposures, it is likely that the training time spent on this exercise could have been more meaningfully applied to other exercises in order to maximize the training process. In conclusion, evaluating training data on a macro-level may provide practitioners with unique method of determining the overall direction of training time and resources.

References:

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