

A COMPARISON OF THE NATIONAL FOOTBALL LEAGUE COACHES STRENGTH AND CONDITIONING PRACTICES 1997-1998 TO 2018

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This study describes the results of a survey of the strength and conditioning practices of the National Football League's strength and conditioning coaches. The survey response rate was 28.1% (9 of 32 NFL teams) agreeing to participate. Subjects test 6.83 ± 3.06 fitness variables using 9.00 ± 3.74 tests; compared to 7.0 fitness variables using 10.0 tests in '97-98. Subjects prescribe resistance training $2.33 \pm .81$ days per week when in-season; compared to 2.8 ± 0.8 days per week in '97-98. The average in-season training session duration was 37.50 ± 12.54 mins; compared to 48.5 ± 13.2 mins in '97-98. Findings indicate that there were statistically significant results for NFL coaching tenure ($p = .005$) and off-season resistance training frequency ($p = .007$). This study serves as a review as well as a source of applied information regarding training program design.

KEYWORDS: Program design, speed, power, survey, elite.

INTRODUCTION: The strength and conditioning (S&C) profession is deeply rooted in American football history (Hoffman, 2008). Intuitively it appears that from the nature of the sport, an effective and efficient training program is critical for team and individual success. Effective and efficient training program can be achieved by manipulating various training variables and interventions (Winkler, 2013). Coaches and sport scientists agree that various physical fitness variables (e.g. strength, power, speed, agility) are essential for performance in American football (Hoffman, Cooper, Wendell, & Kang, 2004).

Previous literature has analyzed the common and unique aspects of S&C practices for the NFL (Ebben & Blackard, 2001), National Basketball Association (Simenz, Dugan, & Ebben, 2005), National Hockey League (Ebben, Carroll, & Simenz, 2004), and Major League Baseball (Ebben, Hintz, & Simenz, 2005). Ebben and Blackard (2001) provide the most comprehensive and in-depth examination of the National Football League (NFL) S&C practices. However, this research study has not been replicated in nearly 20 years. The primary purpose of the current research study was to identify the common and unique aspects of the NFL S&C practices in 2018. A secondary purpose was to compare the common and unique aspects of the NFL S&C practices from 1997-1998 ('97-98) to 2018 to determine differences across years. We established the null hypotheses as there is no difference between the NFL S&C practices from '97-98 to 2018 with no variations in the common and unique aspects of the training programs.

METHODS: The survey instrument was developed, reviewed, and pilot tested. The survey for this study was adapted from the questionnaire previously used by Ebben and Blackard (2001); additionally the survey was modified to reflect the most current S&C research with extensive assistance from Dr. Ebben to allow for comparisons. To ensure clarity and validity, an informal advisory committee of current S&C coaches and academic professors with qualitative research experience reviewed the survey. The current survey instrument was a 150 item assessment examining: (i) Background information, (ii) Physical fitness testing, (iii) Flexibility development, (iv) Speed development, (v) Plyometric training, (vi) Resistance training, and (vii) Olympic weightlifting.

Question format included: open ended questions to allow for greater clarity and questions allowing multiple selection to analyze the training program in precise detail. The survey instrument was transferred into an electronic version through (Qualtrics, LLC research core TM) survey analysis software. Access to the survey instrument was password protected to ensure privacy and validity. Subjects were free to not answer or disclose any information they

wished on any particular question. All procedures were approved by the Institutional Review Board at Northern Michigan University (NMU) (HS18-919).

An introductory letter that described the research purposes and implications was mailed to all head NFL S&C coaches. Multiple mailing attempts were made to contact unresponsive head NFL S&C coaches. All subjects signed the informed consent to ensure understanding of the purpose and procedures along with all risks and benefits of the study. Upon approval, subjects received the electronic survey instrument via email access. A secondary email was sent to all subjects who did not respond or completed the survey after the initial email. Upon completion of the survey each subject received monetary compensation for their time. No subjects' names were associated with any results to retain anonymity. Researchers were trained and experienced with qualitative methods, sport science research, and content analysis (Ebben & Blackard, 2001).

All collected data were entered into SPSS (v. 24.0 IBM). Descriptive statistics provided means and standard deviations (i.e. demographics, aspects of physical fitness tests; frequencies and durations of the training interventions and training variable manipulation of the training program). Comprehensive data obtained through open-ended questions were content analyzed according to methods described by Patton (1990). Data between the two years were compared via one sample t- tests using the means from Ebben and Blackard (2001) as the population mean; as original data was not accessible. The alpha level was set at the $p < 0.05$.

RESULTS: Values for mean and standard deviation for dependent variables are shown in Table 1. The survey response rate was 28.1% (9 of 32 NFL teams) agreeing to participate; compared to 87% (26 of 30 NFL teams) in '97-98. Findings indicate that there were statistically significant differences for NFL coaching tenure ($p = .005$) and off-season resistance training frequency ($p = .007$). The average NFL coaching tenure was 14.28 ± 4.85 years; compared to 6.52 ± 6.25 years in '97-98. Subjects test 6.83 ± 3.06 fitness variables using 9.00 ± 3.74 tests; similar to 7.0 fitness variables using 10.0 tests in '97-98. Six (66.6%) subjects reported prescribing flexibility exercise compared to twenty-two (84.6%) coaches in '97-98. The duration of each static stretch was held for was 18.33 ± 9.83 seconds; similar to 18.0 ± 5.1 seconds in '97-98. No subjects reported prescribing ballistic stretches; as opposed to eight coaches in '97-98. Six (66.6%) subjects reported prescribing speed training compared to twenty-six (100%) in '97-98. One subject reported that offensive lineman, defensive lineman, kickers, and long snappers were excluded from speed training; this was not previously investigated in '97-98. Four subjects prescribed form running and resisted running; compared to twenty prescribing form running and seventeen coaches prescribing resisted running in '97-98. Six (66.6%) subjects reported prescribing plyometric exercises compared to nineteen (73%) coaches in '97-98. Subjects prescribed resistance training 2.33 ± 0.81 days per week when in-season; similar to 2.8 ± 0.8 days per week in '97-98. The average in-season training session duration was 37.50 ± 12.54 mins; similar to 48.5 ± 13.2 mins in '97-98. Subjects prescribed off-season resistance training 3.50 ± 0.83 days per week; similar to 2.0 ± 2.9 days per week in '97-98. Two subjects identified that "squat/ squat variations" were the most important exercises; similar to eight coaches in '97-98. Two subjects reported that "hips" were the most important muscle group to develop. Five (55.5%) subjects reported prescribing Olympic weightlifting similar to fourteen (53.8%) coaches in '97-98. One subject reported that kickers and long snappers did not perform Olympic weightlifting; this was not previously investigated in '97-98. One subject stated "we do not use classical Olympic weightlifting lifts, but variations".

Table 1. Values for mean and standard deviation for dependent variables

Training Variables	'97-98	2018	p
NFL Coaching tenure (yr)	6.52	14.28 ± 4.85	.005*
Fitness variables measured	7.0	6.83 ± 3.06	.899
Fitness tests utilized	10.0	9.00 ± 3.74	.582
Static stretch duration (sec)	18.0	18.33 ± 9.83	.937
In-season resistance training frequency (d/wk)	2.8	2.33 ± 0.81	.220
In-season training session duration (min)	48.5	37.50 ± 12.54	.085
Off-season resistance training frequency (d/wk)	2.0	3.50 ± 0.83	.007*

*represents a statistically significant finding at the alpha $p < 0.05$ level.

p- represents p-value at alpha $p < 0.05$ level

DISCUSSION: The current findings are in agreement with Rhea et al. (2006), who stated that the S&C profession has developed and advanced dramatically in recent years to include highly advanced and specialized training. Past research has surveyed professional level S&C practices and indicate the direction of development in the S&C profession (Ebben & Blackard, 2001; Simenz, Dugan, & Ebben, 2005; Ebben, Carroll, & Simenz, 2004; Ebben, Hintz, & Simenz, 2005).

The findings of this current study demonstrated that NFL S&C coaches tenure were significantly greater compared to '97-98. Additionally, this finding was greater than Lougas (1999), who found that NFL S&C coaches' tenure was 8.7 years. This was the first comprehensive survey to analyze position-specific variables at the NFL level.

The static stretch durations were very similar ($p = .937$). This finding is in agreement with Swanson (2006), who recommended that static stretches should be held for 10-30s to maximize potential improvements. It is critical to discuss that no NFL S&C coaches prescribed ballistic stretches; compared to eight coaches in '97-98. This finding corresponds with Nelson and Kokkonen (2001), who indicated that ballistic stretching increases the risk of injury and utilizing it before exercise decreased maximum muscular performance.

The most common speed exercises prescribed included form running and resisted running; while form running and speed-endurance were the most common speed exercises prescribed in '97-98. These findings correspond with Clark (2018), who stated that resistance sprinting exercises are superior compared to free-sprinting exercises. Furthermore, Sheppard and Young (2006) stated that running technique is critical for sprint performance.

The training volume of off-season resistance training increased significantly compared to '97-98. This increase in training volume during the off-season corresponds with Williams and Nicholas (1998), who found a positive relationship between training volume and strength adaptations. Although in-season training session duration ($p = 0.085$) was not statistically significant at the alpha $p < 0.05$ level, it was marginally close. The decrease in training session duration during the in-season suggests that training programs may be more effective and efficient. This finding is supported by Winkler (2013), who stated that the main objective for S&C coaches is to prescribe and implement an effective and efficient training program.

The squat and squat variations were the top ranked exercise in both years. Additionally, the hips were reported as the most important muscle group to develop; this was not previously investigated in '97-98. These findings correspond with Reed (2017), who stated that the lower-body is essential for sport performance and should be a priority during training.

The percentage of NFL S&C coaches prescribing Olympic weightlifting has increased slightly since '97-98; we expect that with a larger response rate this percentage would increase more. Additionally, one NFL S&C coach reported that kickers and long snappers did not perform Olympic weightlifting. Suggesting that at the professional level training programs emphasize positional-specific characteristics. Furthermore, one NFL S&C coach stated "we do not use classical Olympic weightlifting lifts, but variations". This finding supports Suchomel and Sato (2013), who found that Olympic weightlifting variations are less complex in technique and eliminate stress placed on the wrist and shoulders.

These findings have important implications for NFL teams and S&C coaches in designing their training programs. Possibly more importantly, these findings may have critical implications on future literature as researchers are able to continue to empirically investigate various aspects of training programming.

CONCLUSION: This article describes the common and unique aspects of the NFL S&C practices. This data may be useful for future research as a source for comparison. Additionally, current S&C coaches at all levels can review this data as a source for new ideas and consequently alter current traditional methods of training utilized in the past.

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