Analysis of Training Loads in Elite Under 18 Australian Rule Football Players

Cust, Emily, Elsworthy, Nathan and Robertson, Samuel (2018) Analysis of Training Loads in Elite Under 18 Australian Rule Football Players. Journal of Strength and Conditioning Research, 32 (9). 2521 - 2528. ISSN 1064-8011

Journal of Strength and Conditioning Research Publish Ahead of Print
DOI: 10.1519/JSC.0000000000002392

An analysis of training loads in elite under 18 Australian Rule football players

Emily E. Cust[1,2], Nathan Elsworthy[1], & Sam Robertson[1, 2]

[1]Institute of Sport, Exercise and Active Living (ISEAL),

Victoria University,

Ballarat Road,

Melbourne,

Victoria,

Australia, 8001

[2]Western Bulldogs Football Club,

Whitten Oval,

Barkly Street,

West Footscray,

Melbourne,

Victoria,

Australia, 3210

Running title: U18 Australian football training loads
Submission type: Original Investigation
Key words: team sports; session RPE; talent identification; internal loads; junior athlete

Address for correspondence:
Emily Cust
Victoria University,
Footscray Park.
Ballarat Road,
Melbourne,
Victoria,
Australia 8001
Email: emily.cust1@live.vu.edu.au
Telephone: +61 (0)448810237

Word count: 3,598
Abstract word count: 249
Number of tables: 2
Number of figures: 2

Abstract

Differences in training loads (TL) between under 18 (U18) Australian Rules football (AF) State Academy selected and non-selected players were investigated. Players were categorised relating to their highest representative level; State Academy selected (n = 9) and TAC Cup level players (n = 38). Data were obtained from an online training-monitoring tool implemented to collect player training and match information across a 20 - week period during the regular season. Parameters modelled included AF skills, strength, and other sport training sessions. Descriptive statistics (mean ± SD) and between-group comparisons (Cohen's d) were computed. A J48 decision tree modelled which TL variables could predict selection level. Pooled data showed 60% of weekly training duration consisted of AF training sessions. Similar AF TL were reported between State Academy and TAC Cup players (1578 ± 1264 arbitrary units (AU) v 1368 ± 872 AU; d = .05). While higher TL were reported for State selected players comparative to TAC Cup in total training (d = .20), core stability (d = .36), flexibility (d = .44), on-feet conditioning (d = .26), and off-feet conditioning (d = .26). Decision tree analysis showed core stability duration and flexibility TL the most influential parameters in classifying group selection (97.7% accuracy TAC Cup level; 35.8% accuracy State Academy level). Insights of U18 AF players' weekly training structures, loads, and characteristics of higher achieving players are provided. This study supports the application of training diaries and session rating of perceived exertion (sRPE) for TL monitoring in junior athletes.

Key Words: team sports; session RPE; talent identification; internal loads; junior athletes

INTRODUCTION

The Australian Football League (AFL) has established a talent development pathway for junior players aimed at identifying, fostering, and progressing players towards an elite Australian Rules football (AF) career. Levels including State Academies and National Championships for age groups ranging from Under 14 to Under 18 years (U14 - U18 years), are implemented nationwide and run along-side each State's participation pathways. In key relevance to this study, the Transport Accident Commission (TAC) Cup is a Victoria state-wide U18 representative competition for players to compete in high quality football and developmental opportunities. The competition acts as one of the primary recruitment grounds for selection into the Victorian State Metropolitan or Country teams, National Academy, and scouting process for AFL clubs and semi-professional State league clubs.

Talent development and training practices for junior elite AF players are evolving to incorporate a more scientific and measured approach as seen in the senior elite competitions. The increased use of global positioning system (GPS) technology, individual athlete load monitoring [25], and online athlete self-reporting applications reflects a greater focus on grass root development of AF players. An increased understanding of physical demands on players from previous studies looking into junior elite AF match profiles [2, 21, 22] and athlete loads [12, 13] has also allowed for ongoing refinement of coaching practices and athlete management. For example, match physical and technical differences between elite U16 and U18 AF players have been reported [24], including contested marks, clearances, total marks, and relative distance ($m.min^{-1}$). Greater statistical information of junior players could contribute to improving progression and retention of talented players into the senior elite leagues. Apart from the use of this data for match play performance enhancement, coaches could further adapt training to suit age level, developmental stage, and playing position. Again, ensuring appropriate loads are administered and effectively monitored.

Talented players may be exposed to higher training load (TL) in order to complete the required tasks for selection at various levels of sport talent pathways [10]. For example, U18 TAC Cup players may be involved in local club and school football competitions, or other sports (e.g., basketball), whilst potentially being selected in State and National Academies. The impacts of these additional training loads specifically on U18 AF player development is not yet fully known. By using self-reported training measures, this study will examine the training characteristics of U18 TAC Cup players throughout the 2016 playing season. Previous studies have reported on the physical and match demands of TAC Cup players [12, 13]. But it is not yet known the breakdown of total TL including extra training activities such as participating in other organised sports simultaneously. Previous research on junior rugby union players concluded that commitment to several levels of rugby teams, training and matches, combined with outside sports participation created numerous high-load and impact sessions throughout a week [10].

A previous systematic review [7] of the major football codes (American, AF, Gaelic, rugby codes and soccer) examining the relationship between workloads, performance, injury, and illness in adolescent male players acknowledged the need for further research in the area. Particularly, training does-response relationships and effects of additional training. Results indicated significant positive relationships between physical stress and traumatic injury, furthermore that training duration was significantly associated with illness [7]. Consistent study results from multiple youth sports indicate a linear relationship between hours participated and injury risk; greater than 16 hours per weeks specifically [4]. Yet there are changing views with evidence to suggest that appropriately prescribed and monitored high TL will develop physical qualities in athletes that provide a protective effect against injury [8].

The aim of this study was to determine whether differences in TL existed between the selection level of U18 AF players during the regular playing season. Furthermore, to determine which combination of training type parameters would classify a player's training week and level as either a TAC Cup player or higher selected State-team player. It was hypothesized that higher selected State Academy players would record greater AF specific training and associated developmental training such as strength sessions. This would be accompanied by lower other outside sport involvement comparative to TAC Cup level players.

METHODS

Subjects

A sample of 47 players registered with two TAC Cup clubs was available for participation in the study (n = 17 club 1; n = 30 club 2). Participants were categorised into two groups based on their highest representative level as supplied by the TAC Cup clubs; State Academy selected (n = 9; male, age: 16.9 ± 0.3 years) or TAC Cup level (n = 38; male, age: 16.8 ± .8 years) therefore not selected in the higher State Academy level. The players trained and competed in matches for their TAC Cup club, school team, local team, or State squad based on coaches' selection, prior commitment requirements, and player availability during the data collection period. Training sessions for both TAC Cup clubs were held on Monday, Tuesday and Thursday evenings. The study and its methods were approved by the relevant Human Research Ethics Committee. Parental or guardian signed consent was obtained for all players under 18 years of age.

Experimental Approach to the Problem

Data were collected over a 20-week period during the regular playing season of the 2016 TAC Cup competition from rounds one to 16 inclusive (including four bye rounds). Participants were provided with access to an online training monitoring tool (Smartabase: Version 4.835, Fusion Sport, Queensland, Australia) for the purpose of self-reporting daily training activity. Prior to the season, players were educated on how to correctly fill out the diaries, including categorising training types and recording RPE scores. Players were instructed to enter individual data each day related to all training undertaken throughout the 2016 TAC Cup competition (March to August) in the set questionnaire. The completion of the diaries was self-directed from a player's perspective which may have created possibility for players to misclassify certain sessions based on their own subjective interpretation of the education mentioned above. The training load parameters included for modelling were: AF training – scheduled sessions with their AF team; other sport training – any training or competition undertaken with another sport outside AF; core stability – specific core work conducted in an athlete's own time from a recommended program provided by the club's strength coach; strength training – dedicated strength sessions either with their AF club or on own; flexibility – dedicated flexibility sessions conducted on own from a recommended program provided by the club's strength coach; on-feet conditioning – all dynamic conditioning (e.g. run intervals, plyometrics); off-feet conditioning – all static or passive conditioning work (e.g. stretching); total training – sum of all training conducted from each training type.

Procedures

Internal TL was calculated through the session rating of perceived exertion (sRPE) method by multiplying the total training duration (min) by the sRPE rating from the CR10 scale (AU) [5]. All raw data exported from the Smartabase software was imported into a custom designed

Microsoft Excel™ spreadsheet (Microsoft Corporation, Redmond, USA), and pre-processed [17]. Any identified abnormalities such as incorrectly entered time format data (reporting in hours instead of minutes), or inconsistencies in recording a zero or leaving blank in entries were rectified. Players were coded with an assigned identification number to de-identify the data; and then level coded based on highest squad selection, State Academy (1) or TAC Cup level (2). Cleaned data were organized to show all measures across a single row for each player on each day of data entry provided, and weekly averages calculated. This resulted in 726 individual weekly load profiles for analysis.

Statistical Analysis

Descriptive data are presented as mean ± standard deviation (SD). The effect size (ES) for each measure for between group distances was calculated using Cohen's *d* statistic on a customised Microsoft Excel™ spreadsheet, indicating a small or trivial (d = 0 - .2), moderate (d = .2 - .5), large (d = .5 - .8), and very large (d > .8) effect [3]. The confidence interval (CI) was expressed as 90% representing the uncertainty in each effect and as probability that the true effect was considerably positive or negative [14].

In addition to quantifying the differences between the two groups, a supervised learning model was developed to provide a classification prediction for State Academy selected and non-selected participants based on TL parameters. Given the uneven group numbers, multiple blank events for some categories as well as 'zeroes' recorded in some weeks, a number of data transformation techniques were attempted in order to normalise the data. All of these were unsuccessful however, meaning that a non-parametric, machine learning approach was implemented. Specifically, using the 'RWeka' package in R (R Computing Environment) [15, 23]. A J48 decision tree modelled each of the weekly load profiles included in the dataset to classify player selection level in relation to TL measures.

All eight load parameters were included in the model, whilst a confidence value of 0.25 was set and a minimum support of 10 instances required in order for a node to split. Model performance was reported as classification accuracy of both groups and compared to the null model.

RESULTS

The breakdown of weekly training duration types indicated that the majority of training for this cohort was AF based sessions followed by strength training (Table 1); which is also reflected in weekly sRPE TL (Table 1).

****Table 1 near here****

****Table 2 near here****

State Academy selected players in comparison to TAC Cup players had higher weekly training durations in core stability (ES = 0.40; CI = -0.16 to -0.64), strength (0.23; 001 to -0.47), flexibility (0.37; -0.13 to -0.61), on-feet conditioning (0.28; -0.04 to -0.52), and off-feet conditioning (0.26; -0.02 to -0.50) (Table 2). State Academy selected players also showed higher weekly training loads in total training (ES = 0.20; CI = 0.04 to -0.44), core stability (0.36; -0.12 to -0.60), flexibility (0.44; -0.20 to -0.68), on-feet conditioning (0.26; -0.02 to -0.50), and off-feet conditioning (0.26; -0.02 to -0.50) (Table 2). In breaking down training sRPE loads for each training type across four-week blocks between the two groups, marked TL differences showed TAC Cup level players has larger loads in weeks 13, 14 and 15 compared to State selected players (Figures 1a and 1b). Other sports reported in the training diaries included volleyball, rowing, swimming, soccer, hockey, tennis, athletics, basketball, bike riding, own gym sessions, and netball.

****Figures 1a, 1b, and 1c near here****

Decision tree evaluation analysed a total of 567 training weeks (78.1% of total sample) including TAC Cup level players, and 159 weeks were reported including State Academy selected participants. Results indicate that core stability duration and flexibility TL are the most important interaction in parameters to classifying the two groups (Figure 2). This is shown by the tree terminating down the right side at nodes 1 and 2 after just one branch from the root node, weekly core stability duration greater than 33 minutes to weekly flexibility TL. On the left side of the figure, the interaction between higher weekly off-feet conditioning durations and weekly AF TL is also suggested as a strong predictor of player selection level, classifying TAC Cup level 23 out of the 31 weeks (node 4) and State Academy 10 out of the 12 weeks (node 5). The asymmetry in the decision tree output indicates that TAC Cup level and State Academy training behaviour have different nuances. There are greater interactions in parameters to classify TAC Cup level players based on their training characteristics (nodes 2 – 4, 6, 7, 9) than State level players (nodes 1, 5, 8, 10). Model performance was reported as 83.3%, which constituted only a moderate improvement on the 78.1% null model. Of this, the model displayed an accuracy of 97.7% in classifying TAC Cup level players (554 of 557 weeks) and 35.8% accuracy in classifying State Academy players (51 of 157 weeks).

****Figure 2 near here****

DISCUSSION

This study provides an insight into the internal TL of two elite U18 AF teams during the regular playing season. These data provide a greater understanding of TL completed by elite U18 AF players, which is currently underrepresented within the scientific literature. The main findings were that State Academy selected players in comparison to TAC Cup level players showed greater total weekly TL (AU) for total training, core stability, flexibility, on- and off-feet conditioning ($d \geq .2$). Furthermore, greater total weekly training durations (min) for core stability, strength, flexibility, on- and off-feet conditioning ($d \geq .2$).

This study's results are in agreement with previous studies showing that higher selected players have greater AF weekly training durations and higher total training weekly durations [12, 13]. Similarities also exist showing that higher selected players had lower other football activity loads and training type variation [13]. It is common practice for players not selected in their TAC Cup team for a weekend match to return to their local or school team (football or other sports) and subsequently complete extra training sessions. This study furthers the current knowledge by firstly examining selected State Academy level TAC Cup players against non-State selected TAC Cup level players; and secondly breaking down their training types for more descriptive measures.

Comparing sRPE loads between senior and junior elite players can be difficult pertaining to a range of factors including differences in physiology, performance indicators [2], and experience resulting in exertion perception variations [9]. Also, that senior elite AFL clubs are professionally run entities with players employed as full-time athletes under strict periodised training regimes. Previous study results [1] add that RPE is not linear in occurrence and therefore each player's TL responses should take into account the context of previous, current and future loading patterns.

Gaining information on training loads of junior players looking to progress into senior elite tiers may be useful in assessing player development requirements in preparing for the demands of senior AF.

Higher loads in the early in-season may be a continuation of pre-season loads as reflected in periodisation strategies adopted by senior AFL teams [18]. This periodisation strategy sees higher conditioning and skills loading during the pre-season as preparation for the playing season; which in contrast sees a majority of loading from weekly matches and training focus shift to recovery, technical skills and conditioning maintenance [18]. Higher early in-season TL is also in part due to increased "other sports" TL (Figure 1b), which may suggest players are still training and competing in their chosen summer sports, such as rowing and soccer. Lower mid-season loads may have occurred for several reasons. It may represent the league bye weekends in weeks eight, nine, 12, 17. Furthermore, State selected players would likely have been competing in the National U18 Championship tournament played during this time, which may imply minimal training was performed. Another reason could be part due to compliance issues, and levels of education and guidance throughout the season. Players may have been keen to complete the diaries early at its implementation, then experienced a decline in motivation during the year. This lack of compliance and accuracy in reporting may impact on the significance of the findings for the current study. Scope for further investigation may be required to assess the accuracy and implementation complexity of self-reported training diaries in U18 AF players. The use of external measures would provide an objective measure for comparison to self-reported data. This would highlight any problems with over- or under-estimating durations.

By comparing State Academy selected players to TAC Cup level players, the Academy group engaged in a greater proportion of AF specific training, although the non-State selected group showed slightly greater mean weekly AF TL, albeit trivial (d = .05).

An explanation for this may be the Academy players having greater on-feet conditioning durations and lower RPE. Completing more conditioning work would imply that the Academy players are more physically fit and therefore cope better with training demands, hence rating sessions lower on the RPE scale [9, 20, 26]. Notions of specialisation amongst State Academy selected players is reflected in their greater emphasis and loading in AF training considering the next stage of the talent pathway would be National Academy and Draft selection in pursuit of a professional AFL career. Research results looking at junior elite rugby union suggested evidence of deliberate practice in higher-level players could be seen in the higher proportion of weekly training activities related to rugby [11]. In relation to training load management and injury prevention, the importance of strength, conditioning and functional movement training for both pre-and in-season aids to reduce the cited risk factors for injury [4]. These include lack of lean tissue mass, increased joint hypermobility and imbalances from growth, have been emphasised for youth player development [4].

Applying a machine learning approach decision tree analysis showed multiple rules capable of classifying selection level based on the TL measures (Figure 2). Weekly core stability durations appeared to be an influencing factor in facilitating higher selection classification, particularly showing a strong relationship with a weekly flexibility sRPE load greater than 115 AU. It was not a stipulated requirement for State Academy players to be completing extra core training outside of their TAC Cup or Academy team sessions. These results suggest that higher selected players may take it upon themselves to complete these extra conditioning sessions due to their motivation to achieve success within the sport. Other rules included, if core stability duration is ≤ 33 min, weekly off-feet conditioning duration is ≤ 40 min, flexibility load is > 115 min, but other sport duration is > 0 min will likely result in TAC Cup level (12 out of 13 weeks identified). Decision trees provide a means to model non-linear trends and provide visual representation for ease of interpretation [19].

This method for classification has previously been applied in senior AF to explain match outcome (win/loss) based on team performance indicators [19]. Previously it has been acknowledged that addressing the research gaps in respects to effects of workloads by incorporating non-linear models and/or machine learning techniques, internal and external measurements, would lend to more efficient training practices for youth athletes [7]. In this study however, the poor performance of the model with respect to classification of State Academy players suggests that further parameters are needed to improve the accuracy in future research. This also suggests that it is likely that additional non-training load related factors contribute to discriminating the two cohorts. With respect to the decision tree design, although the minimum support instances could be increased, this would have resulted in a reduced decision tree size, which may not have provided a full representation of the data. Further work is also required to assess the generalisability of the model to subsequent years and AF cohorts, as the results from this model are only applicable to the 2016 training data collected from the participants included in this study.

Despite the findings, it is acknowledged that analysis only included two of the 12 teams competing within the TAC Cup competition; and therefore, the findings may be specific to each team's training structure and coaching philosophy. A greater data input may have been prevented due to a lack of compliance from athletes regularly filling out or failing to correctly fill out training dairies on a regular basis during the season. Furthermore, although both clubs received education on how to complete the training diaries including using the RPE scale, the level of individual athlete understanding and consistency in self-reporting throughout the year may have varied. Although the use of external load measures such as GPS would have provided a more in-depth insight into these athletes' TL, resource limitations and logistical practicality prevented the acquisition of significant data levels for the analysis required.

Future work investigating the association between sRPE TL and external load measures in juniors elite AF by similar methods as seen the professional AFL [1] would be beneficial in moving towards individualised athlete monitoring and training structures to maximise performance.

CONCLUSIONS

This study has quantified the TL of elite U18 Australian Rules football players across extra multiple session types. Also, assessed differences between State Academy selected and non-State Academy selected TAC Cup level players. The results from this study showed State Academy selected players are completing more AF specific training and accumulating greater weekly loads. TAC Cup level U18 players are accumulating greater other sport weekly TL. TAC Cup players rate (RPE method) their AF training harder as reflected in having lower durations and higher sRPE TL compared to Academy players. Further analysis indicated that core stability duration and flexibility TL were important factors in modelled classification for group level selection. These findings add to the growing body of research in junior AF and specifically provide greater insight into the player's weekly training structures.

PRACTICAL APPLICATIONS

The methods and outcomes of this study may assist coaching staff in making more informed decisions on training structures in-line with a player's selection status. It may encourage coaches to review player training management in terms of factoring in outside sport and TL to ensure their players are training and competing at optimal levels for their TAC Cup club. Furthermore, the results highlight the training characteristics of higher selected players.

This study reflects the practical application of self-reported training diaries and sRPE TL in junior sports as an effective low-cost method. Training diaries may provide complimentary information alongside objective measures, such as GPS. Or serve as a tool for player TL insight when objective measures may not be readily available in junior AF teams. Several studies have supported the use of the RPE method and training diaries for junior team-sport athletes [16], junior AF [12, 13], junior soccer [6] and junior rugby union [10, 11].

Acknowledgements

The authors would like to thank both Oakleigh Chargers and Western Jets Football Clubs for their cooperation and input to this article. And also, the assistance gained from Nathan Heaney and Paul Sealey of AFL Victoria, and Dr. Paul Larkin of Victoria University.

Disclosure of Interest

The authors report no conflicts of interest.

References

1. Bartlett, J, O'Connor, F, Pitchford, N, Torres-Ronda, L, and Robertson, S. Relationships between internal and external training load in team sport athletes: evidence for an individual approach. Int J Sports Physiol Perform 12: 230-234, 2017.
2. Burgess, D, Naughton, G, and Norton, K. Quantifying the gap between under 18 and senior AFL football: 2003 and 2009. Int J Sports Physiol Perform 7: 53-58, 2012.
3. Cohen J. Behavioral Sciences. New Jersey: Lawrence Erlbaum Associates, 1988.
4. Difiori, JP, Benjamin, HJ, Brenner, J, Gregory, A, Jayanthi, N, Landry, GL, and Luke, A. Overuse injuries and burnout in youth sports: A position statement from the American Medical Society of Sports Medicine. Clin J Sport Med 24: 3-20, 2014.
5. Foster, C, Florhaug, JA, Franklin, J, Gottschall, L, Hrovatin, LA, Parker, S, Doleshal, P, and Dodge, C. A new approach to monitoring exercise training. J Strength Cond Res 15: 109-115, 2001.
6. Freitas, C, and Aoki, M. Psychphysiological responses to overloading and tapering phases in elite young soccer players. Pediatr Exerc Sci 70: 367-372, 2014.
7. Gabbett, TJ, Whyte, DG, Hartwig, TB, Wescome, H, and Naughton, GA. The relationship between workloads, physical performance, injury and illness in adolescent male football players. Sport Med 44: 989-1003, 2014.
8. Gabbett, TJ. The training-injury prevention paradox: Should athletes be training smarter and harder? Br J Sports Med 50: 273-280, 2016.
9. Gallo, T, Cormack, S, Gabbett, T, Williams, M, and Lorenzen, C. Characteristics

impacting on session rating of perceived exertion training load in Australian footballers. J Sports Sci 33: 467-475, 2015.

10. Hartwig, TB, Naughton, G, and Searl J. Defining the volume and intensity of sport participation in adolescent rugby union players. Int J Sports Physiol Perform 3: 94-106, 2008.
11. Hartwig, TB, Naughton, G, and Searl, J. Load, stress, and recovery in adolescent rugby union players during a competitive season. J Sports Sci 27: 1087-1094, 2009.
12. Henderson, B, Cook, J, Kidgell, DJ, and Gastin, PB. Game and training load differences in elite junior Australian football. J Sports Sci Med 14: 494-500, 2015.
13. Henderson, B, Gastin, PB, Cook, J, and Kidgell, D. Quantification of physical load in elite junior Australian football players. J Sci Med Sport 12: e138, 2010.
14. Hopkins, WG, Marshall, SW, Batterham, AM, and Hanin, J. Progressive statistics for studies in sports medicine and exercise science. Med Sci Sports Exerc 41: 3–12, 2009.
15. Hornik, K, Buchta, C, and Zeileis, A. Open-source machine learning: R meets Weka. Comput Stat 24: 225-232, 2009.
16. Malisoux, L, Frisch, A, Urhausen, A, Seil, R, and Theisen, D. Monitoring of sport and participation and injury risk in young athletes. J Sci Med Sport 16: 504-508, 2013.
17. Ofoghi, B, Zeleznikow, J, MacMahon, C, and Raab, M. Data mining in elite sports: A review and a framework. Meas Phys Educ Exerc Sci 17: 171-186, 2013.
18. Ritchie, D, Hopkins, WG, Buchheit, M, Cordy, J, and Bartlett, JD. Quantification of training and competition load across a season in an elite Australian football club. Int J Sports Physiol Perform 11: 474-479, 2015.
19. Robertson, S, Back, N, and Bartlett, J. Explaining match outcome in elite Australian Rules football using team performance indicators. J Sports Sci 34: 637-644, 2015.
20. Robertson, S, Woods, C, Gastin, PB. Predicting higher selection in elite junior Australian Rules football: The influence of physical performance and anthropometric attributes. J Sci Med Sport 18: 601-606, 2015.
21. Veale, J, and Pearce, A. Physiological responses of elite junior Australian Rules footballers during match-play. J Sci Med 8: 314-319, 2009.
22. Veale, J, and Pearce, A. Profile of position movement demands in elite junior Australian rules footballers. J Sports Sci Med 8: 320-326, 2009.
23. Witten, IH, and Frank, E. Data Mining: Practical Machine Learning Tools and Techniques, 2nd Edition. San Francisco: Morgan Kaufmann, 2005.
24. Woods, CT, Bruce, L, Veale, JP, and Robertson, S. The relationship between game-based performance indicators and developmental level in junior Australian football: Implications for coaching. J Sports Sci 34: 2165-2169, 2016.
25. Woods, CT, Joyce, C, and Robertson, S. What are talent scouts actually identifying? Investigating the physical and technical skill match activity profiles of drafted and non-drafted U18 Australian footballers. J Sci Med Sport 19: 419-423, 2015.
26. Woods, CT, Raynor, A, Bruce, L, McDonald, Z, and Robertson, S. The application of a multi-dimensional assessment approach to talent identification in Australian Football. J Sports Sci 34: 1340-1345, 2016.
27. Wrigley, R, Drust, B, Stratton, G, Scott, M, and Gregson, W. Quantification of the typical weekly in-season training load in elite junior soccer players. J Sports Sci 30: 1573-1580, 2012.

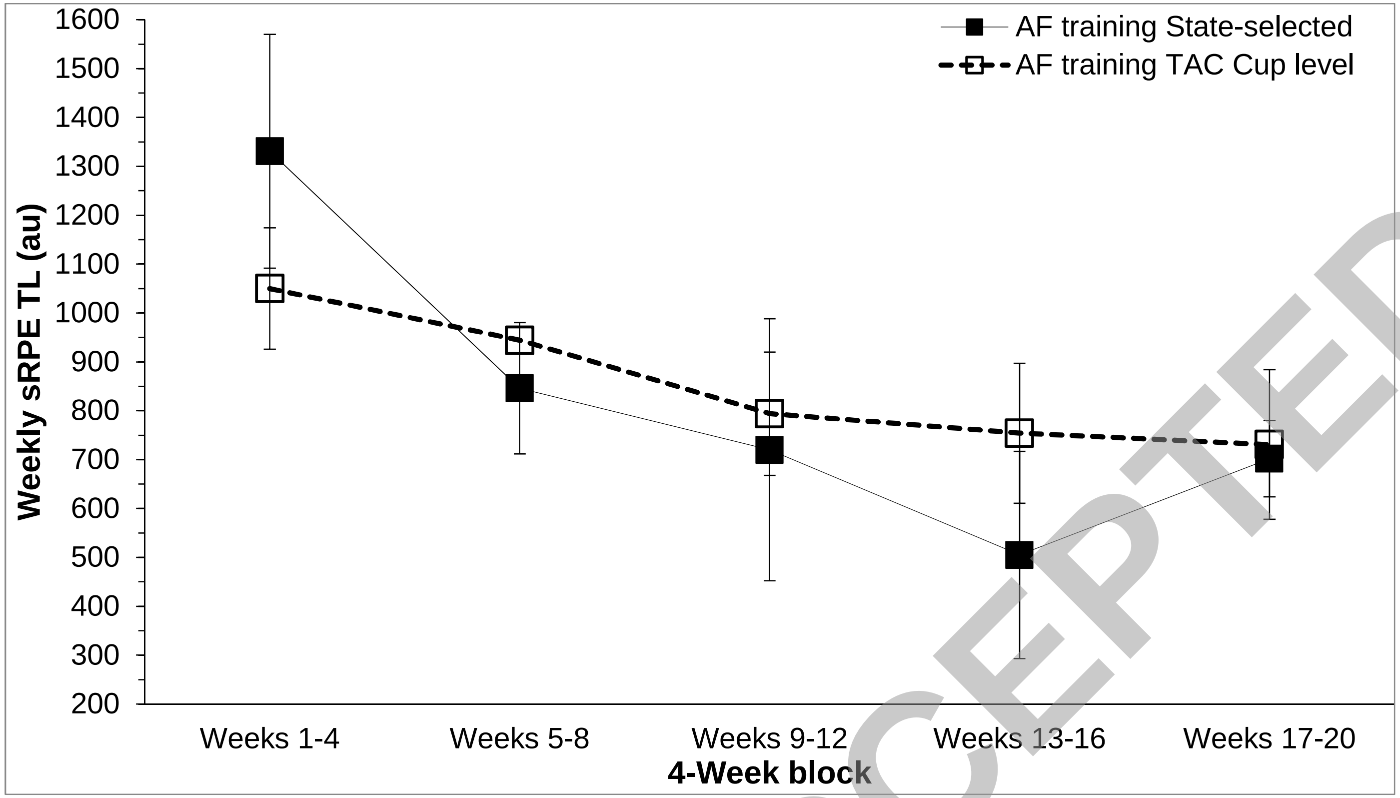
Table 1. Weekly training durations and sRPE TL of U18 TAC Cup players across both levels.

Training Type	Training Duration		sRPE Training Loads	
	Mean ± SD (min)	**% of total weekly training duration**	**Mean ± SD (AU)**	**% of total weekly TL**
Weekly total training	241 ± 153		1414 ± 940	
Weekly AF training	144 ± 91	59.8	861 ± 592	60.9
Weekly other sport training	8 ± 27	3.4	49 ± 173	3.5
Weekly core stability training	6 ± 16	2.6	36 ± 98	2.6
Weekly strength training	39 ± 63	16.4	250 ± 431	17.7
Weekly flexibility training	15 ± 27	6.2	55 ± 110	3.9
Weekly on-feet conditioning	23 ± 50	9.4	132 ± 312	9.4
Weekly off-feet conditioning	5 ± 21	2.2	30 ± 128	2.1

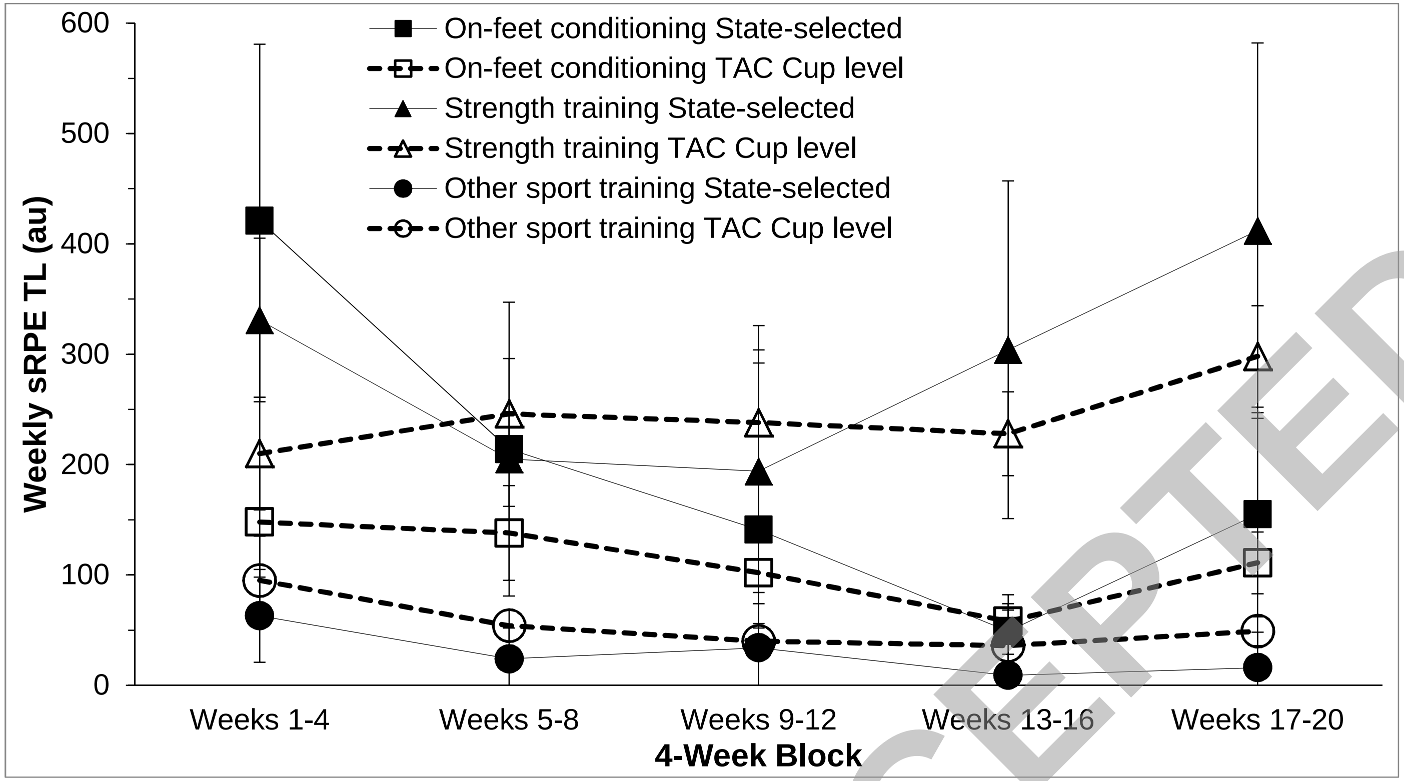
Table 2. Descriptive statistics of weekly TL and duration for each training type, TAC level and State Academy selected players. Data presented as mean ± SD. The between group differences is presented as an effect size (Cohen's *d*), with 90% confidence intervals.

TL measure	**State Academy selected**	**TAC Cup Level**	***d* (90% CI)**
Weekly total training sRPE load (AU)	1578 ± 1264	1368 ± 822	.20 (.04 to -.44)
Weekly AF sRPE TL (AU)	835 ± 674	868 ± 567	-.05 (.29 to -.19)
Weekly other sport sRPE TL (AU)	31 ± 131	55 ± 183	-.15 (.39 to -.09)
Weekly core stability sRPE TL (AU)	69 ± 148	27 ± 76	.36 (-.12 to -.60)
Weekly strength sRPE TL (AU)	284 ± 427	241 ± 432	.10 (.14 to -.34)
Weekly flexibility sRPE TL (AU)	95 ± 128	44 ± 101	.44 (-.20 to -.68)
Weekly on-feet conditioning sRPE TL (AU)	203 ± 418	113 ± 272	.26 (-.02 to -.50)
Weekly off-feet conditioning sRPE TL (AU)	62 ± 202	22 ± 97	.26 (-.02 to -.50)
Weekly total training duration (min)	285 ± 214	228 ± 128	.32 (-.08 to -.56)
Weekly AF training duration (min)	147 ± 106	143 ± 87	.05 (.19 to -.28)
Weekly other sport training duration (min)	6 ± 24	9 ± 28	-.12 (.36 to -.12)
Weekly core stability training duration (min)	13 ± 25	5 ± 12	.40 (-.16 to -.64)
Weekly strength training duration (min)	51 ± 75	36 ± 58	.23 (001 to -.47)
Weekly flexibility training duration (min)	23 ± 33	13 ± 25	.37 (-.13 to -.61)
Weekly on-feet conditioning duration (min)	35 ± 65	19 ± 45	.28 (-.04 to -.52)
Weekly off-feet conditioning duration (min)	11 ± 33	4 ± 15	.26 (-.02 to -.50)

d **is Cohen's effect size relative to the State selected players; Calculated using Cohen's d statistic, where an effect size of d = .20 was considered small, d = .50 moderate and d ≥ .80 large (Cohen 1988).**



AF training State-selected
AF training TAC Cup level
Weekly sRPE TL (au)
1600
1500
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
Weeks 1-4
Weeks 5-8
Weeks 9-12
Weeks 13-16
Weeks 17-20
4-Week block



On-feet conditioning State-selected
On-feet conditioning TAC Cup level
Strength training State-selected
Strength training TAC Cup level
Other sport training State-selected
Other sport training TAC Cup level
Weekly sRPE TL (au)
600
500
400
300
200
100
0
Weeks 1-4
Weeks 5-8
Weeks 9-12
Weeks 13-16
Weeks 17-20
4-Week Block

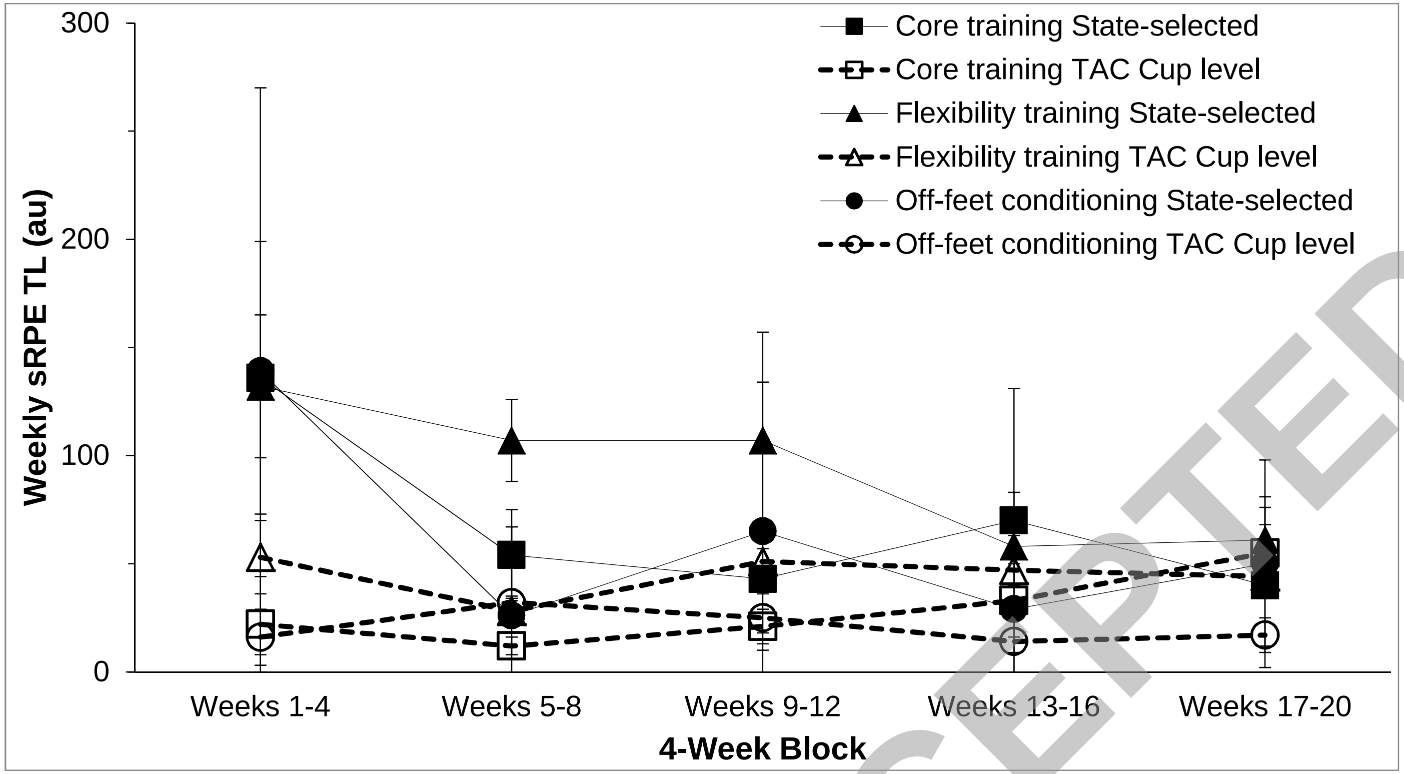


Figure 1. Weekly sRPE TL grouped in 4-week blocks for various training parameters between State-selected and TAC Cup level players. **Figure 1a:** AF training. **Figure 1b:** On-feet conditioning, Strength training, Other training. **Figure 1c:** Core stability, Flexibility training, Off-feet training. Data presented as mean ± SD bars.

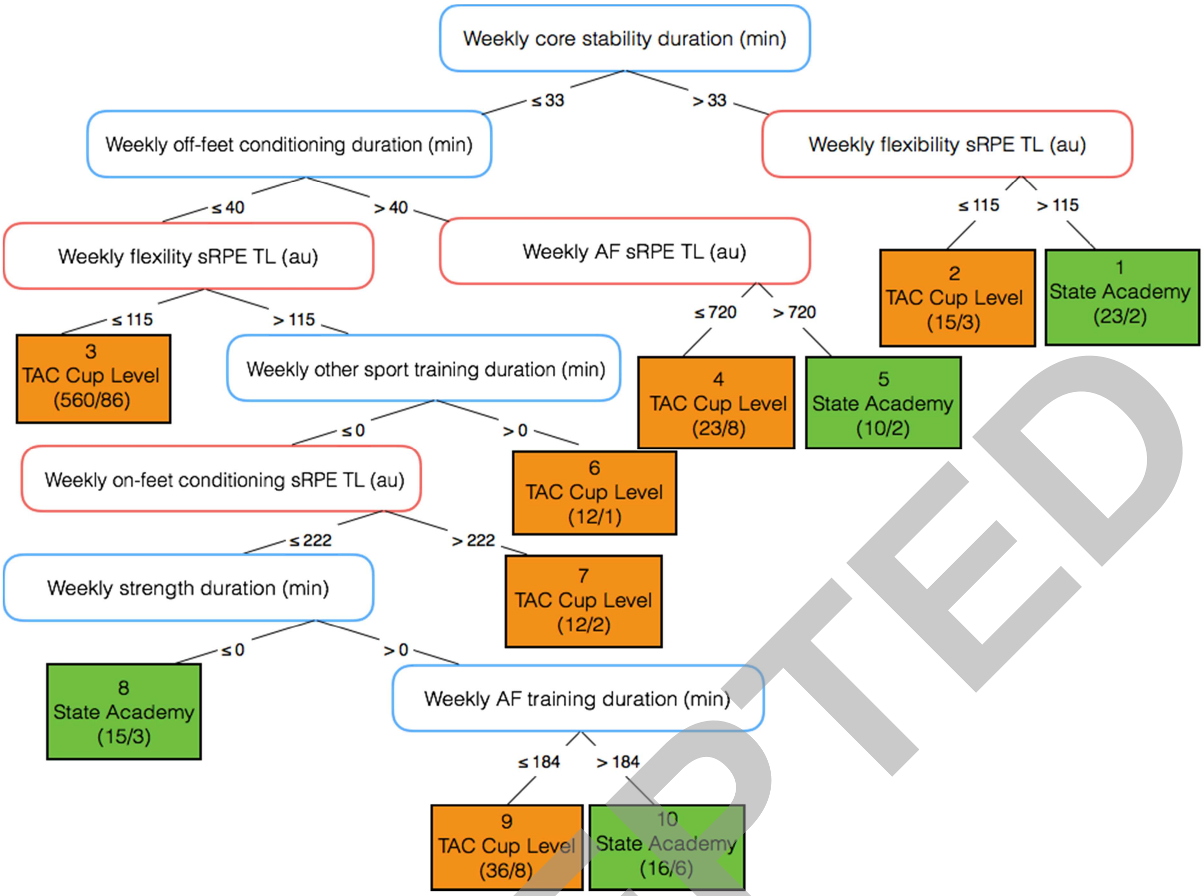


Figure 2. Decision tree analysis output explaining selection outcome based on reported training parameters. Leaf node class output reports correct/incorrect weeks reported according to identified player level, i.e. node 2: 15/3 classified TAC Cup level for 15 of the 18 weeks.