THE EFFECT OF TRAINING MONOTONY ON SENSITIVITY TO POTENTIAL TRAINING STRAIN AMONG ELITE MALAYSIAN RUGBY PLAYERS

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UNIVERSITI PENDIDIKAN SULTAN IDRIS

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ABSTRACT

The purpose of this study is to determine the sensitivity of a potential to strain measure to acute training load accumulated over the weeks, during a competitive period among Malaysia Rugby (MR) players. Twenty-eight (n=28) elite Malaysia Rugby 15's players completed eight-weeks training program [six weeks of intensive training (IT) and two weeks of reduced training (RT)]. During the process, Bronco speed-endurance test were administered at before (T0), after (T1), and after the RT (T2) phase. The session's Rating of Perceived Exertion (sRPE) was used to quantify the perceived training load and strain during each training session. Wellness questionnaire was used to determine player's daily wellness level. Results showed that higher Acute-Chronic Workload Ratio (ACWR) during first and second week of training, and slightly reduced before entering pre competition phase and its followings week (competition phase). Bronco test result indicated significant improvement starting from the first week of training, fourth week of training, before entering competition phase and sixth week of training (competition phase). Cumulatively, moderate level of wellness recorded among all players during the whole duration of training program. Findings of this study suggested ACWR can be used successfully as a load-monitoring tool in assisting training load and strain monitoring and modification among elite national rugby players. This allows for the training program to be adjusted from time to time, and finally allows for performance improvement as indicated by the Bronco test results, with reduced risk of injury. In conclusion, the study has provided evidence of effectiveness of sRPE and ACWR as monitoring and performance enhancement tool for strength and conditioning coach, helping coaches to avoid overreaching or overtraining. Future studies were suggested to include medical personnel and their medical monitoring devices in synchronization with strength and conditioning coach's load monitoring and programming, allowing for a more detailed biofeedback.

KESAN MONOTONI LATIHAN TERHADAP SENSITIVITI KEPADA POTENSI KETEGANGAN LATIHAN TERHADAP PEMAIN ELIT RAGBI MALAYSIA

ABSTRAK

Tujuan kajian ini adalah untuk menentukan ukuran sensitiviti yang berpotensi untuk tekanan kepada beban latihan akut yang terkumpul sepanjang minggu, semasa fasa pertandingan di kalangan pemain elit Ragbi Malaysia (MR). Dua puluh lapan (n=28) pemain elit Malaysia Ragbi 15 telah menamatkan program latihan selama lapan minggu [enam minggu latihan intensif (IT) dan dua minggu latihan berkurangan (RT)]. Semasa proses itu, ujian ketahanan kelajuan Bronco telah diberikan pada sebelum (T0), selepas (T1), dan selepas fasa RT (T2). Penarafan Anggaran Intensiti (sRPE) sesi telah digunakan untuk mengukur beban dan ketegangan latihan yang dirasakan semasa setiap sesi latihan. Soal selidik kesihatan digunakan untuk menentukan tahap kesihatan harian pemain. Keputusan menunjukkan bahawa Nisbah Beban Kerja Akut-Kronik (ACWR) yang lebih tinggi semasa minggu pertama dan kedua latihan, dan sedikit berkurangan sebelum memasuki fasa pra pertandingan dan minggu berikutnya (fasa pertandingan). Keputusan ujian Bronco menunjukkan peningkatan yang ketara bermula dari minggu pertama latihan, minggu keempat latihan, sebelum memasuki fasa pertandingan dan minggu keenam latihan (fasa pertandingan). Secara kumulatif, tahap kesihatan sederhana direkodkan dalam kalangan semua pemain sepanjang tempoh program latihan. Dapatan kajian ini mencadangkan ACWR boleh digunakan dengan jayanya sebagai alat pemantauan beban dalam membantu pemantauan beban latihan dan ketegangan serta pengubahsuaian dalam kalangan pemain ragbi negara elit. Ini membolehkan program latihan diselaraskan dari semasa ke semasa, dan akhirnya membolehkan peningkatan prestasi seperti yang ditunjukkan oleh keputusan ujian Bronco, dengan pengurangan risiko kecederaan. Kesimpulannya, kajian ini telah memberikan bukti keberkesanan sRPE dan ACWR sebagai alat pemantauan dan peningkatan prestasi untuk jurulatih suaian fizikal, membantu jurulatih mengelak daripada melampaui batas atau latihan berlebihan. Kajian masa depan dicadangkan untuk memasukkan kakitangan perubatan dan peranti pemantauan perubatan mereka dalam penyegerakan dengan pemantauan dan perancangan beban jurulatih suaian fizikal, membolehkan biomaklum balas yang lebih terperinci.

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LIST OF ABBREVIATION

ACWR	Acute to Chronic Training Load Ratio
ANOVA	Analysis of Variance
ATL	Acute Training Load
BM	Body Mass
BRONCO	Bronco Sprint Test
CTL	Chronic Training Load
CV	Coefficient of Variance
MAS	Maximum Aerobic Speed
sRPE	Session Rate of Perceived Exertion
TL	Training Load

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CHAPTER 1

INTRODUCTION

1.1   Introduction

Performance monitoring can be said as the front line of science application in high-performance sports. Changes and adaptations occurred can be determined and corrected at any stages of training, as long as effective and efficient monitoring system was in place. To success in competition and participate in sport, athletes need an essential training. Different sport needs different skills and physical abilities. Due to these differences essential training were needed to success in any sports and its need

variety of training modes, (Smith, 2003). Such as, different component of physical fitness will measure different outcome; be it progession of physical fitness performance or progression of tenchinal capabilities. For team sports, to level up technical skills, the team need a substantial portion of training time to be committed, (William and Hidges, 2005), as well as physical fitness, (Gabbett, 2004).

Athlete's can improve their physical, physiological and performance characteristic through physical training, (Impellizzeri et al., 2005). Training load that players have to develop through the volume and intensity was important that this was quantified by coaches and players support personnel to make sure that the players were ready to compete and perform, (Halson, 2014). In order to develop both skills and physical qualities for sport, it was already established that high performance players need to train with high intensities and high volumes where appropriate, (Smith, 2003).

Training load can be described as the strain or stress that imposed on a player when perform training rountine or competing, and it can be internal or external; external load best describes as the effort that given by the player, and internal load can be describe as the player's specific response or physiological stress towards the effort given (Wallace et al., 2009). Training load can be manipulated by players, coaches and support staff involved when designing, monitoring and implementing training programs. It can be applied to an individual in a single training session or over a period of time (Halson, 2014). "The relationship between training load injury, fitness and performance was critical", (Gabbett, 2013). The definition of training load has been a lack of consistency. Quarrie et al., (2016), contend that training load should be

defined as all stressors and demands placed on players in preparation for competition. All sport-related and non-sport related inputs were compromises. Training load can be considered as either internal or external as previous stated. External load was an athlete physiological characteristic that work carried out by their independent, (Wallace et al., 2009).

The external load includes weight that been lifted, total distance run, or the number and intensity of speed, numbers of jumps or collisions, (Impellizzeri et al., 2004). The physiological and psychological stress imposed by or as a result of training was referred to as internal load (Halson, 2014). So, while two people may be exposed to the different internal load response but their external load may be having similar outcome, a trained runner and a sedentary adult could both run one kilometre but despite both being exposed to the same external load their internal response could be very different, (Gabbett, 2016). It was important to have valid and reliable measure due to this difference in internal response to external training load, as it was this relative physiological stress, which was the stimulus for training induced adaptations, (Impellizzeri et al., 2004). There were several techniques for assessing internal and external training load at the moment. Session rate of perceived exertion (sRPE) was used to measure internal training load subjectively, (Foster et al., 2001). It also can be measured by use of subjective measures such as testosterone (T), cortisol (C) and their ratio (TC), (Handziski et al., 2006). Power output in sports like cycling was used to measure objectively on external training load, (Jobson et al., 2009), but this type of monitoring was practically difficult for football codes such as rugby union due to the use of equipment needed. Athletes participating in team sports were subjected to a range of external pressures, including field-based skills training, on-foot fitness, and

resistance training (Halson, 2014). As such there were different methods to monitor each; resistance training may be measured using tonnage, volume, intensity or time under tension, (Hiscock et al, 2015). However, during sport specific training the external training load may be more difficult to quantify. External training load can be monitored by several methods in team sport such as quantifying the movement demands of training and match play. Traditionally, this was completed by way of video-based time-motion analysis (TMA), however, it was a time intensive process that it depended on subjective interpretation of the activities, and it analysed only one player at a time, (Dwyer and Gabbett, 2012; Roberts et al., 2006).

When designing a training program, coaches and support personel need to consider the relationship between the external training load and the physiological response (internal load) to optimize performance, (Borresen and Lambert, 2009). Practitioners need to also be aware that the relationship between a given measure of internal load and the external training load can vary with the training mode. For example, the extensive rest periods in skills and speed training sessions may reduce the perceived exertion associated with that session, (Scott et al., 2013). It has been proposed that a combination of internal and external load measures need to be employed and that the training mode needs to be considered when deciding on what training load measure to use, (Weaving et al., 2014).

Training load may also be measured objectively or subjectively, (Saw et al., 2015). Throgh well being questionnaires and sRPE for training sessions can be use as subjective measures of training load and may be reported by athletes itself as perceived physical and psychological well-being, and due to their ease of

implementation and relative low cost they were valuable tools, (Saw et al., 2015; Meeusen et al., 2013). Objective measures of training load response include physiological, biochemical and performance testing. The best indicator for physical and physiological response to training was performance, however, some performance would be impractical to test athlete's performance daily tests such as VO2max, (Currell and Jeukendrup, 2008).

This study will look at the relationship between external and internal load measurements that may be utilised in training load monitoring, as well as how rugby teams react to one another. This study will aim to determine if training load measures may change in intergrate to each other over the course of a period of competition and how they may change in integrate to each other.

The validity and reliability of the different measures play an importance role. It has been proven that session rate of perceived exertion (sRPE) to be a valid predictor to measure physiological response to training ($p > 0.05$) as an internal load according to Foster et al., (2001). Session RPE was indication of intensity of a training session and was reported in this case on a scale of one to 10 and it was self-reported by players. To report training load, arbitrary units (AU) were utilised, which were the session RPE times or multiple by the session time or length. Session RPEs demonstrate a strong relationship with training impulse (TRIMP) ($p < 0.05$), which uses the duration of exercise and heart rate reserve to determine the intensity of the exercise. While it was developed for use in endurance sports it has been validated for use in team sports, (Impellizzeri et al., 2004), with a correlation of $r = 0.71$ ($p < 0.001$) found between TRIMP and sRPE in soccer players. Lambert and Borensen, (2010),

suggested that session RPE in collision sports such as rugby league may not account for the physiological stress of frequent collisions and the high-intensity, intermittent nature of the sport. However, Lovell et al., (2013), suggested that as part of a combination of measures it can be used effectively in these sports. Training load, as assessed by session RPE, has been proven to be an indicator of pontential on rise in injury risk in elite rugby union players, with high training loads routine having a substantial association with injury rates (Cross et al., 2016). Gabbett, (2016) suggested, that it may be leading a player getting injured, if there were large fluctuations of workload in weekly loads as been evaluated by session RPE.

The benefits of having accurate and reliable techniques for measuring and monitoring both external and internal training loads were obvious. In the scope of sports performance programs, it was essential and should be applied by strength and conditioning coaches and sport scientists to develop rough players, who can contribute during games with minimal risk of injury and at the best performance. The objective of this study was to further the understanding of training load monitoring in Malaysia rugby through the use of sRPE, internally measures of training workload and externally measures of training workload.

1.2   Background of the Study

Sport performance that related to health problems such as over training, overreaching, under training, illness and injuries were widespread issues in competitive sports. It has been reported rugby players were injured every year. There were so many factors that

contribute to this problem, but recent finding has identified that poor workload management or unplanned workload as a contributor to this problem. (Foster, 1996., Gabbet, 2016., Gallo., 2015).

Key role in sports injuries in an excessive fatigue. It may impair athlete's motor ability in term of decision making, coordination and neuromuscular control. Athlete may get an injury an injury risk will be raise when external load exceeds the limits of athlete. Most injuries and illness related to sports occur when the athletes psychologically and physiologically unfit to performance given workout or exercises. Sometimes athlete fit enough but of rest. Well planned workload management program helps to reduce the risk injuries by figure out potential of excessive fatigue, find out its causes and adapting rest, recovery, training, and competitions load constantly based on the athlete's currents level of fatigues based on physiological and psychological, wellness, fitness and health.

This research will find out evidence-based workload management and sensitivity range to daily training load accumulate over five to seven days during competition phase in Malaysia Rugby competition.

1.3   Problem Statement

The concept of training loads applied in Malaysia allows for one whole year training program implementation. This allows coaches and managers involved to properly plan training programs. However, planned training program was nothing except, a plan.

Execution of the training program, and its effectiveness normally judged based on athlete's actual performance during competition. Current practices already have basic fitness assessment, used to monitor fitness level changes and adaptations. However, main problems that can be identified after so many years of existence of rugby in Malaysia was the influence of workload which sometimes too high or in certain cases to low on athlete's performance. Current practices were somewhat lacking in term of systematic training workload management and sensitivity range to daily training load, especially during competition phase.

As far as the researcher's knoweldge, there was no or highly limited research and publication on workload profile and management among athletes in Malaysia, whatmore among the elite groups. Without any of this profile, any further studies in isssues related to workload management and monitoring in Malaysia by elite or development group will face dificulties, as the profile can served as the foundtaion baseline data to be compared with.

Another problem was that, selecting the appropriate workload management system or method must be made based on proven analysis or findings (evident based practice), but with not many or near nonexistence of study available locally, this adds on as another barrier for the coaching process to do this practice.

Finally, workload management system should always consider and be used on specific need of each player or position of play. But currently, this also hard to be determine as no studeis so far has quantify the difference in output produced between

position of play among elite or even non-elite rugby players in Malaysia. These were the problem that will be the highlight of this study

1.4   Purpose of the Study

The purpose of this study can be divided into three parts. First part was to determine current level of workload for monitoring profile among Malaysian rugby players during the competition phase of their training periodization. Second of the study was to investigated correlation between actual performance and predicted performance based on selected load monitoring variables among Malaysian rugby players during the competition phase of their training periodization. The third phase of the study involved differences between forward and backlines position in Bronco test and Wellness / Wellbeing Score.

1.5   Research Objectives

The research objectives are:

a) To determine current level of workload for monitoring profile among Malaysian rugby players during the competition phase of their training periodization.

b) To investigate correlation between actual performance and predicted performance based on selected load monitoring variables among Malaysian rugby players during the competition phase of their training periodization.

c) To determine the differences between forward and back lines positions based on Bronco test and Wellness / Wellbeing Score.

1.6 Research Questions

The study addresses the research questions as below:

a) What was the current level of training workload among Malaysian rugby players during the competition phase of their training periodization?

b) Are there any significant correlation between actual performance and predicted performance based on selected load monitoring variables among Malaysian rugby players during the competition phase of their training periodization

c) Are there any significant differences between forward positions and back lines positions on Bronco test and Wellness / Wellbeing Score?

1.7   Research Hypotheses

Below were the hypotheses contructed for this study:

H_{01} : There will be no significant differences between forward position and back lines position in time on Bronco Test.

H_{02} : There will be no significant differences between week 1, week 2, week 3 and week 4 in training strain.

H_{03} : There will be no significant differences between forward position and back lines position in speed on Bronco Test.

1.8   Conceptual Framework of Research

The independent variables of this study were the Malaysia rugby players, and the dependent variables of this study were monitoring of training loads, session rate perceived exertion and bronco test (Shuttle Run).

1.9   Significance of the Study

The study was significance in a way that it will provide beneficial information to player, head coach and assistant coaches including technical coach and strength and

conditioning coach, management, medical and sports science personnel through evaluation and quantification of players.

This study also significance in contribution to reducing injury and illness-sports related and enhance physical and physical performance.

1.10 Limitations of the Study

This study limit was the workload given by coach. It was also focused on players who were selected in Malaysia Rugby 15's Elite Team, and it was not represent for all categories of development players at another places. The delimitation of these studies was the findings were delimited to serve only purpose of the study. The study and its content were only applicable for assessment design with similar method and might be not applicable for other group of people or players.

1.11 Operational Definition

For the purpose of this study, words and below will be operationally defined as:

Workload referring to the cumulative numbers of sets, repetitions, session's rate of perceived exertion (sRPE), heart rate, recorded and calculated after each training sessions (days, weeks, and months).

Training strain was the sum of how hard individu worked or exercise. It assesses the individual's total stress level over the training week. The total training load for the training week was multiplied by the training monotony to compute training strain.

Training monotony was referres as the uniformity of everyday training. It was representation of how much individuals training stimulus changes over time.

sRPE or session's rate of perceived exertion will be referring to the 1-10 rating scale for intensity of the training as experience and perceived by the athletes during each training sessions.

ACWR referring to Acute: Chronic Workload Ratio which means immediate (acute) responses or workload in comparison with longitudinal cumulative workload recorded. The chronic workload was calculated as the average of the entire acute workload measured. Similar definition with what has been introduced by Carey, Blanch, Ong, Crossley, Crow, and Morris, (2016). Comparing between what they have recorded so far with what was planned in future

Wellbeing was referring to managing life efficiently and forming happy relationships and physical well-being were two characteristics of wellness (recognizing the need for physical activity, healthy foods, and sleep).