

# CHAPTER 1

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# 1

## INTRODUCTION

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#### 1. PROBLEM STATEMENT

Plyometrics is a well-known training method that utilizes the stretch shortening cycle which occurs when the active muscle is stretched rapidly (eccentric muscle action) and the body responds by causing a reflexive concentric muscle action (Wilson, 2006:19). Plyometrics is primarily used by coaches and sport scientists to improve explosive power among athletes who participate in dynamic, high intensity type of sports (Luger & Pook, 2004:4). Plyometric training methods include, amongst others, variations of bounding, leaping, skipping, hopping and jumping drills; medicine ball throwing exercises as well as weightlifting and resistance exercise variations (Radcliffe & Farentinos, 1999:16; Dodd & Alvar, 2007:1177). One of the plyometric-related training methods that has received attention in recent years is loaded or resisted jump training (Newton & Kraemer, 1994:25). Limited research does, however, exist with regard to the benefits and use of this training method in conjunction with other training methods, especially among team sport participants.

Notwithstanding the scarcity of research that pertains to the benefits of resisted jump training, several researchers have supported the use of this training modality (Newton & Kraemer, 1994:25; Rhea *et al.*, 2008b:738). Rugby, which is one of the most popular team sports in the world today (Luger & Pook, 2004:viii), is a sport that will probably benefit from the use of resisted jump training. This is due to the high levels of muscular power players need to develop to perform the large number of tackling, lifting, pushing and pulling tasks that occur during a match effectively (Gabbett *et al.*, 2007:1127). Furthermore, players need to be able to break through tackles,

accelerate fast from a static position and change running direction fast and effectively during attacks (Luger & Pook, 2004:4). The broad spectrum of components rugby players need to develop to compete successfully in rugby games has forced rugby coaches and other conditioning experts to focus on combined rugby conditioning program which make use of a wide range of training methods rather than simplistic conditioning program which only focus on one training modality at a time (Newton & Kraemer, 1994:29). However, no researchers have investigated the effects of a combined sport-specific and resisted jump training program on the different components of team players. All the studies that have thus far investigated the effects of a resisted jump training program have focused on high school and Division 1 Collegiate athletes as well as students (Rhea *et al.*, 2008a:734; Rhea *et al.*, 2008b:738; McClenton *et al.*, 2008:322). In this regard a study on high school athletes of both genders demonstrated that a combined resistance, sprint, Vertimax (resisted jump training device) plyometric and a normal plyometric training program of 12 weeks was significantly better ( $p < 0.05$ ) in improving lower body peak power than a combined program which did not involve Vertimax training (Rhea *et al.*, 2008a:734). Similar results were also found in a study on Division 1 Collegiate Athletes of both genders. In this case the same type of combined Vertimax program, as mentioned before, led to significantly better ( $p < 0.05$ ) improvements in lower body peak power than a non-Vertimax plyometric-related combined program (Rhea *et al.*, 2008b:738).

In contrast with the previously mentioned study results, McClenton *et al.* (2008:322) reported no significant changes in vertical-jump height when a 6-week Vertimax plyometric jump training program was performed by recreationally trained kinesiology students of both genders. From the last-mentioned findings, it is clear that the benefits of resisted jump training as an additional exercise modality in a sport specific training program cannot be ignored.

Although no studies were found that have investigated the possible acute effects of resisted jump training on various physical and motor ability components, various studies have focused on the possible acute effects of a normal plyometric session. In this regard studies showed that an acute plyometric training session of less than an hour led to significant improvements in 20 metre sprint time, power output (bench press throws), lower and upper-body power (explosive push-ups and 5RM (repetition maximum) bench press) among professional rugby union, college aged rugby league players and volunteers with no apparent musculoskeletal disorders (Hrysonmallis & Kidgell, 2001:428; Matthews *et al.*, 2004:154; Baker & Newton, 2005:203). In contrast to the reported positive acute effects of plyometric training, Deutsch and Lloyd (2008:806) reported that sprint

performance was impaired when preceded by plyometric exercises in a group of elite rugby players. Similarly, Weber *et al.* (2008:727) found that squat jumps significantly decreased mean and peak jump height and elicited no change in the average peak ground reaction force in Division I male track and field athletes. Furthermore, the findings of Esformes *et al.* (2010:1914) showed that plyometric exercises which preceded counter movement jumps had no significant additional benefits compared to inactivity in competitive male athletes that were anaerobically trained.

It is, therefore, not clear whether a combined sport-specific and resisted jump training program should be implemented and whether the benefits could be extended to team sports such as rugby union. Furthermore, the possible acute effects of a resisted jump training session among team sport players have also not been investigated thus far. It is against this background that the following research questions were posed: Firstly, what are the effects of a 4-week combined rugby-conditioning and resisted jump training program compared to a combined rugby-conditioning and normal jump training program, on selected physical, motor ability and anthropometric components of university-level rugby players? Secondly, what are the acute effects of a resisted compared to a normal jump training session on selected physical and motor ability components of university-level rugby players? Answers to these questions should provide coaches, sport scientists and other sport-related professionals with information regarding the effectiveness of a four-week combined sport-specific and resisted jump program as well as an acute resisted jump training session for improving rugby players' physical, motor ability and anthropometric profile.

## **2. OBJECTIVES**

The objectives of this study are:

- To examine the effects of a 4-week combined rugby-conditioning and resisted jump training program compared to a combined rugby-conditioning and normal jump training program, on selected physical, motor ability and anthropometric components of university-level rugby players.
- To examine the acute effects of a resisted compared to a normal jump training session on selected physical and motor ability components of university-level rugby players.

### **3. HYPOTHESES**

The study is based on the following hypotheses:

- A 4-week combined rugby-conditioning and resisted jump training program will lead to significantly better changes in leg explosive power, speed, agility, lower body flexibility and muscle strength as well as body size, lean body, muscle, fat and skeletal mass as well as the somatotype of university-level rugby players compared to a combined rugby-conditioning and normal jump training program.
- An acute resisted jump training session will lead to significantly bigger changes in leg explosive power, speed, agility, lower-body flexibility and muscle strength, among university-level rugby players than a normal jump training session.

### **4. STRUCTURE OF DISSERTATION**

The dissertation is submitted in article format as approved by the Senate of the North-West University and is structured as follows:

- Chapter 1:** Introduction. References are provided at the end of the chapter in accordance with the guidelines of the North-West University.
- Chapter 2:** Literature review: Effects of different plyometric training programs on the physical, motor ability and anthropometric components of subjects. References are provided at the end of the chapter in accordance with the guidelines of the North-West University.
- Chapter 3:** Article 1 - The effects of a combined resisted jump training and rugby-conditioning program on selected physical, motor ability and anthropometric components of rugby players. The article will be presented to The Journal of Strength and Conditioning Research for possible publication. References are presented at the end of the chapter in accordance with the guidelines of the journal. Although not according to the guidelines of the journal, tables will be included within the text so as to make the article easier to read and understand. Furthermore, the line spacing of the article will be set at 1.5 lines instead of the prescribed 2 lines.
- Chapter 4:** Article 2 - Acute effects of a resisted compared to a normal jump training session on selected physical and motor ability components of university-level rugby players. The article will be presented to The European Journal of Sport Science for possible publication. References are presented at the end of the chapter in accordance with the guidelines of the journal.

Although not according to the guidelines of the journal, tables will be included within the text so as to make the article easier to read and understand. Furthermore, the line spacing of the article will be set at 1.5 lines instead of the prescribed 2 lines.

**Chapter 5:** Summary, conclusions, shortcomings and recommendations.

**Appendix A:** General information questionnaire, informed consent and raw data forms for more long-term vertimax project

**Appendix B:** General information questionnaire, informed consent and raw data forms for acute vertimax project

**Appendix C:** Submission guidelines for authors and article examples

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