Cardiff School of Sport

DISSERTATION ASSESSMENT PROFORMA:

Empirical [1]

Student name:	Matthew Murray	***Student ID:***	09002425
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Dissertation title:	The effects of kinesiology tape and dynamic tape on the Y balance test results in rugby players		
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Comments	Section
	Title and Abstract Title to include: A concise indication of the research question/problem. Abstract to include: A concise summary of the empirical study undertaken.
	Introduction and literature review To include: outline of context (theoretical/conceptual/applied) for the question; analysis of findings of previous related research including gaps in the literature and relevant contributions; logical flow to, and clear presentation of the research problem/ question; an indication of any research expectations, (i.e., hypotheses if applicable).
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CARDIFF SCHOOL OF SPORT

DEGREE OF BACHELOR OF SCIENCE (HONOURS)

SPORT CONDITIONING, REHABILITATION AND MASSAGE

TITLE

THE EFFECTS OF KINESIOLOGY TAPE AND DYNAMIC TAPE ON THE Y BALANCE TEST RESULTS IN RUGBY PLAYERS

Dissertation submitted under the discipline of..

SPORT CONDITIONING, REHABILITATION AND MASSAGE

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The effects of Kinesiology tape and Dynamic tape on the Y balance test results in rugby players

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Acknowledgements

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Abstract

The purpose of this study was to identify whether Kinesiology tape or dynamic tape had an effect on Y balance test (YBT) results in rugby players. A group of 17 male semi professional rugby players who play for Aberavon RFC participated in the study. The YBT was used to measure all the participant's dynamic balance. All participants completed the YBT, to provide baseline data; they were then randomly split in to three groups. Once tested, each participant was randomly allocated into one of three groups: A control group, Kinesiology group or dynamic tape group. The participants were retested two weeks later, however groups two and three had the respective tape applied during the test. The tape was applied laterally down the leg from the greater trochanter to the underside of the 5^{th} metatarsal. The results showed that there was no statistical significance between the group interaction ($p>0.05$). Despite this, It is suggested that from the trends of the results that the kinesiology tape has an affect on YBT results in rugby players (not in general). These results therefore are similar to previous research that stated that side lateral taping of the lower leg has a positive affect on balance in the medial/lateral plane (Euparadorn and Karpatkin, (2012). Further research needs to be carried out in this area to give greater theoretical underpinning to the effects of taping on balance. This is due to balance playing a major role within rugby and also general day to day tasks

CHAPTER I

INTRODUCTION

1.0 Introduction

Rugby Union is increasing in popularity around the world, with 100 teams currently competing for world ranking points (IRB.com). This increase in popularity has also seen rugby union 7s being entered as a sport in the 2016 Rio Olympic games (RIO2016.com)

Rugby consists of a number of different physically demanding tasks including; tackling, pushing, running, and jumping (Johnson, 2009). These physical demands require the athletes to have a basic level or various components of fitness. Luger and Pook (2004) identify these components of fitness as strength, power, speed, agility and the ability to recover from repeated movements throughout the game. When these fitness components are used within the game of rugby, they could be used in a range of different directions and performed at different speeds. To ensure that these movements are controlled and carried out to the best of the athlete's ability, they must have good balance (Behm and Anderson 2006).

Balance has been defined as the body's ability to maintain its centre of mass over the base of support (Wesson, Wiggins-James, Thompson, Hartigan, 2005). There are two difference categories of balance static and dynamic. Dynamic balance is the ability to control a movement to perform a skill effectively (Foran, 2001) whereas Static balance is the body's ability to hold a position where there is no physiological movement present. When relating balance to rugby union, there are very few static phases within each phase of play, therefore a player's ability to sustain dynamic balance is predominantly challenged. Agility is a good example of where balance plays a major role. The sudden directional changes associated with agility requires an athlete's centre of mass and also their base of support to change. Balance and stability has also been identified to play a role within proprioception where a individual is able to be aware of position and movement at a given joint (Freeman, Dean, Hanham (1965) (Brukner and Khan, 2012). Therefore if an athlete is able to improve their balance, this will result in better stability and proprioception.

Taping has been identified to help improve an athlete's proprioceptive capabilities (Hume and Gerard, 1998). However, there have been very few studies that have looked at the affects of taping on dynamic balance. A study by Cortesi et al., (2011), identified that side lateral taping improves balance in a medial lateral plane. Capobianco and van den Dries (2009), backed up this evidence , they identified lateral chain taping helps improve balance. The tapes that were used in these studies were Kinesiology tape.

Kinesiology tape is becoming increasingly popular within sport. It is said to reduce pain, and improve muscular performance (Kaltenborn 2007). It works by raising the skin to provide the underlying soft tissue more room to function (Moore, 2012). Dynamic tape is similar to kinesiology tape with its elastic properties, however dynamic tape supports the muscle it is applied to, taking tension off the muscle during a contraction. As a result of this principle, there are number of physiological benefits to taping, reduced pain, better muscle healing and improved muscular performance Capobianco and van den Dries (2009).

There are a number of different ways in which dynamic balance can be tested. The star excursion balance test (SEBT) measures balance in eight different directions (Hertel, Miller, Denegar, (2000). The SEBT was identified by Kinzey and Armstrong (1998) as a reliable test however Hertel *et al.,* (2000) suggested the test lacked validity. As a result of this, the Y balance test (YBT) was produced to measure dynamic balance. This test only took measurements in three directions compared to the SEBT's eight. The YBT adopted a protocol, which increased the validity and reliability of the test (Plisky et al., (2006)). The validity of the test and therefore results was results increased with the use of standardising the measuring apparatus that came with the YBT equipment.

Taking all of the above information in to consideration this study's title was produced. The current study will look at the effects of kinesiology tape and dynamic tape on Y balance test results in rugby union players. The Y balance

test was used to measure dynamic balance in the participants. Tape was applied laterally down the leg from the greater trochanter to the underside of the 5th metatarsal (Appendix C). By applying this tape to the lower limbs, it was hoped that balance test results with the participants should improve. Providing the tape with theoretical underpinning.

CHAPTER II

LITERATURE REVIEW

2.0 Literature Review

2.1 Rugby

Rugby is played between two teams of 15 players; the main objective of rugby is to score more points than your opponents (Luger and Pook, 2004). A game of rugby lasts for 80 minutes, 40 minutes each half (Johnson, 2009). To be able to play rugby there are a number of components of fitness that are required, strength, power, speed, agility and the ability to recover from repeated movements throughout the game (Luger and Pook, 2004). These components allow the players to perform common rugby movements such as pass, tackle, run and kick (Johnson 2009). Footwork skills play a major role within the game of rugby union as it is used in both attack and defence. In attack it could be used to be a defender with a combination of speed and a side step (Drewett and Biscombe, 2010). In defence it could be to quickly change direction in order to tackle and opponent (Drewett and Biscombe, 2010). These directional changes will result in the athlete's centre of mass continually moving out side their base of support. To ensure these movements are effective the athletes must have adequate dynamic balance (Behm and Anderson, 2006). If the athlete is unable to maintain balance as a result of these directional changes then it could result in the opposing team gaining an advantage (Drewett and Biscombe, 2010; Behm and Anderson, 2006).

2.2 Anatomy of the leg

The lower limb is made up of a number of different bones, femur, tibia, fibular, patella, tarsals, metatarsals and phalanges (Jarmey 2006). These bones are comprised to form three main joints, the hip, knee, and ankle. The hip is a ball and socket joint; it allows a range of movements, flexion, extension, abduction, adduction, rotation and circumduction. It is a deep joint with a large amount of muscle mass, which helps with joint stabilisation. This joint is therefore the most moveable joint in the body (Jarmey 2006). There are two main ligaments at the hip joint; the lliofemoral and pubofemoral ligament

(Cash 2000). The knee joint is otherwise known as a hinge joint, it allows flexion and extension (Cash 2000). There are a number of different ligaments within the knee, anterior cruciate, lateral collateral, and medial collateral ligament (Cash, 2000). There are three joints that make up the ankle joint, talocrural**,** inferior tibiofibular and subtalar (Brukner and Khan, 2012). Dorsiflexion and plantarflexion are the main two movements that occur at the ankle joint (Roeland and Leendert*,* 2010). The talocrural and subtalar joints provide the foot with the ability adapt to the contours on the ground when landing. The subtalar joint also allows inversion and eversion to occur (Houglum, 2005). The main ligaments of the ankle are the posterior talofibular, calacaneoflibular and anterior talofibular ligaments (Cash, 2000).

2.3 What is balance?

Balance can be both static or moving (dynamic), it is the ability to maintain centre of mass over the base of support (Wesson et al., 2005). A book by Cook (2003) has identified balance as more of the symmetry between the right and left sides of the body. Cook (2003) also looks at stability as having contributing factors to balance. Like balance, stability is categorised in to dynamic and static. Static stability is the body's maintenance of posture and balance, and dynamic stability is the production and control of certain movements. These movements include coordination, muscular endurance, mobility, balance, flexibility and strength (Foran, 2001). Foran (2001) identifies that balance is one of the main underlying components of agility.

Agility plays a big role within the game of rugby, however to be agile the athlete must have adequate dynamic balance (Behm and Anderson, 2006). When looking at balance it is important to identify the athlete's centre of gravity in relation to their base of support. When sprinting on a track an athlete's centre of gravity needs to be high and slightly in front of the body allowing the athlete to run in a forward direction. However within rugby you may be required to quickly change direction as well as maintaining balance (Behm and Anderson, 2006). Therefore a rugby player's centre of gravity

should be a lot lower which increases their balancing ability (Behm and Anderson, 2006).

Dynamic balance is the body's ability to stabilise and align all joints to allow kinetic chains to reduce or produce movement (Foran, 2001). Athletes push their bodies to their limits, resulting in them gaining and losing balance, this produces a the fluid moments we see in sport. Side stepping is a good example that see athletes use agility to produce a movement to beat a defender (Drewett and Biscombe, 2010).

2.4 Proprioception

Proprioception is the body's process of identifying movements, joint position, vibrations and pressures by processing signals from the central nervous system (CNS) (Brukner and Khan, 2012). These signals then result in the body producing response (muscle contraction). The impulse signals are produced from sensation changes detected within receptors within the skin, muscles, tendons, ligaments and joints (Anderson, Parr, Hall, 2009). If an injury is sustained to a player then the proprioceptive pathways could be affected resulting in signals not being transmitted effectively (Brukner and Khan, 2012). Impaired neural or proprioceptive transmission could result there being an inability to identify joint position, therefore affecting the players balance and poor coordination (Brukner and Khan, 2012; Peterson and Renstrom, 2001). This then could cause an injury or re injury to occur.

It has been identified that proprioception training may help in reducing the risks of injury at certain joints. Most studies look at the ankle joint as this is where most injuries in sport occur (McKay., 2001; Woods *et al*., 2002; Bridgman *et al*., 2003). To allow an ankle to be stable on an uneven surface muscles around the surrounding joint have to contract to counteract forces exerted on the ankle (Harris and Ranson, 2008). The use of proprioception training is said to help the body produce these contractions resulting in the ankle being more stable (Freeman *et al*., 1965; Tropp *et al*., 1985). Joint

stability is required for an athlete to effectively perform balance related movements such as jumping, and running.

2.5 Lateral taping for balance

A study by Cortesi et al., (2011) looked at the benefits of therapeutic tape on balance with people who have MS. They tested the participant's balance in anterior, posterior, and medial lateral directions. They applied therapeutic tape to the calves and identified that the participants balance improved in the anterior and posterior plane, however there was no improvements in the medial and lateral plane. An article by Euparadorn and Karpatkin (2012) then looked at taping of the lateral surface of the participant's lower limb. They were trying to identify if this would increase the proprioceptive ability of the participants in the medial/ lateral plane. The study discovered that this lateral application of tape laterally improved the participants balance performance in the medial and lateral plane. The studies also identifies that the application of therapeutic tape to muscles in a proximal to distal direction supports the muscle through ranges of movement. They state that this has helped with the movement of dorsiflexion when applied to the tibialis anterior and also with extension at the hip during gate when the gluteal were taped.

A book by Capobianco and van den Dries (2009) looks at taping specific sporting chains that are executed with power and form. The application of tape is said to reduce fatigue within working muscle groups and also to provide tactical stimulation via the skin that helps athletes perceive inefficiencies in their form (Capobianco and van den Dries (2009). The performance lateral chain when taped is said to have a number of different functions, one of which is that it helps balance in the front and back chain. This improved the structural integrity by connecting the front and back chain. This improvement in the front and back chain creates a shock-absorbing platform that enables better control and stability when running.

2.6 Kinesiology tape

Kinesiology tape is being used increasingly more in the world of sport. Kinesiology tape is made of elastic cotton fibres that are tightly woven together, with adhesive glue on the back (Coker 2012). When the tape is applied with tension it produces a longitudinal stretch on the skin. It is thought that this results in the epidermis being lifted increasing the space between the skin and the underlying tissue, i.e. muscles and vessels (Moore, 2012). The increase in space is believed to improve lymphatic and venous movement as well as increase mobility of muscles. It is also thought that pain is reduced, an increase in muscular performance and a decrease in susceptibility to the mitochondria. To improve the reliability and underpinning of these the tapes in relation to the above findings further research needs to be carried out (Kaltenborn 2007). Kinesiology tape can last from 48-72 hours without losing its function compared to other tapes that only last around 10 minutes (J Kaltenborn, 2007 and R Brandon, 2011). Kinesiology tape can be worn in a range of environments both on and off the field with out losing its effectiveness (Brandon 20011). This lends itself well to the game of rugby as each game of rugby lasts for 80 minutes and can be subject to a number of different weather conditions.

2.7 Dynamic tape

Dynamic tape is one of the newest types tape to be introduced to the market. The tape works by mimicking the action of the muscle or tendon. The tape is applied with a stretch when the joint is in a shortened position. As a result when the muscle or joint lengthens, an additional stretch is applied to the tape (Dynamic tape, 2013). This increased stretch absorbs the load on the muscle and acts like a bungee.

Once the tape is on full stretch, the absorbed energy is stored as elastic potential energy. Then as the muscle shortens the stored energy is then transferred back in to the biomechanical chain as kinetic energy (Dynamic tape, 2013). This assists the movement of the muscle. As a result of this

energy transfer there is a decreased workload, and improved biomechanical efficiency. Resulting in decreased metabolic demands and improved fatigue tolerance by the muscle (Dynamic tape, 2013).

The tapes ability to reduce the load on a muscle may result in better healing (less stress on the muscles), improved endurance, reduced pain and improved performance (Dynamic tape, 2013). Additional improvements to circulation and lymphatic system have been identified as to see improvements, when tape has been used.

2.8 Psychological effects of taping

As well as the physiological effects of taping, it is suggested that there are many psychological factors to take in to consideration. A study by Hunt and short (2006), looked at athletes perceptions, on the application of tape if an injury hadn't been sustained or if an injury had previously been sustained. They identified that coach or trainers were prior to games instructing some athletes, to tape their ankles even if there was no previous ankle injury. Comments on the psychological affects of taping, were only mentioned by athletes who had no previous history of ankle injury. They stated that the taping made them more confident, whereas previously injured athletes commented on the injured areas and how the ankle felt (physiological factors) (Hunt and short 2006). The study concluded by saying the use of taping or bracing, reduced the risk of reinjure, in previously injured athletes by 50%. However if the injury has not previously been sustained then this is not the same. Hunt and Short (2006), have identified a number of psychological perceptions, as a result of the application of tape, "increased confidence, increased strength, decreased anxiety for injury or re-injury, mental preparation prior to performance, part of performance routines, and even part of superstitious behaviours". Pre match routines are then adapted to incorporate ankle taping as playing with it is their norm.

2.9 Testing Methods

There are a number of different ways in which balance can be tested. Stabiliometer is a test that is used to measure balance, it is a valid and reliable however like may others it only measures static balance (Era *et al.,* 1997 and Ageberg *et al.,* 1998). However these methods of testing are not specific to everyday life as this form of balance is generally categorized as dynamic balance. This is due to the movement of the centre of gravity moving as a result of a muscular contraction (Kinzey and Armstrong. 1998). Previously Dynamic balance has been looked at with the use of the functional reach test, and the berg balance scale. These test were produced for paediatrics (Donahoe, Turner, Worrell. 1994), geriatrics (Berg, Wood-Dauphinee, Williams. 1995) and neurological patents (Weiner, Bongiorni, Studenski, Duncan, Kocherseberg. 1993). However these tests lack validity, reliability and are therefore not practical methods of looking at dynamic balance.

In recent years the Star excursion balance test (SEBT), was produced as a test specifically for dynamic balance (Hertel *et al.,* 2000). However, as previously stated, this test still lacks validity and reliably and possibly should not be considered within a clinical setting.

A study by Valovich et al 2009 used the SEBT accompanied by the balance error scoring system (BESS) to look at the results of a proprioception training program. The BESS is six, 20 second balance test, that are preformed on different surfaces and in different stances. They identified that the SEBT and BESS was a reliable methods to use and identified that that there were improvements in results. A further study also identified that the SEBT was a reliable test to use (Kinzey and Armstrong 1998).

The above studies have identified that the SEBT and the BESS, are good methods to generate valid and reliable results, however, there is virtually no testing equipment required and can therefore be carried out in most places. In

addition to this in 2009 Plisky et al., (2006) looked at a modified SEBT. The test was called the Y Balance test (YBT), which was an adaptation on the SEBT. When it was produced Plisky et al., (2006) identified a number of situations, where errors could occur in the SEBT. They include where the standing foot should be positioned, if the reach foot is able to touch down between reaches, identification of pass and fails, and any movement in the standing foot. In addition to these findings the SEBT has no set protocol, this resulting in the YBT being developed further. The YBT allows for improved repeatability, and also provided researchers with better and more constant results (Kinzey and Armstrong 1998). The YBT only uses three of the eight movements used in the SEBT, Anterior, posteriolateral and posteromedial. A study by Hertel *et al*., (2006), identified these three movements as the most appropriate directions for looking at ankle stability. The test can be carried out on both legs so data can be compared and analysed. The protocol that was produce by Plisky et al., (2006) is, the participants stand on the one leg on the centre platform, with their distal part of their toe on the line. Then while maintaining a one legged stance, the participant reaches with the free foot in all three directions, pushing a marker to identify the distance. This distance is then recorded and the athlete completes the test a further two occasions (three in total) and the furthest distance is taken (Plisky, Rauh, Kaminski, Underwood., 2006). The validity and reliability of the test is improved as the markers identifying the distance rather then the administrator visually identifying it (Kinzey and Armstrong, 1998). The YBT can be carried out in most places, as only the YBT equipment needed for results to be produced.

2.91 Rationale

To conclude, it is clear to see that there is a significant lack of evidence looking at the effects of tape on balance. As well as this there is very little evidence, identifying the roles and uses of kinesiology tape. Dynamic tape on the other hand has almost no literature on it as it is a new product to the market.

Previous research has proven that laterally taping the lower limb has positive effects on the ankle stabilisation. From this information this study will look at the effects of kinesiology and dynamic tape on YBT results in rugby players. The tape will be applied laterally down the leg from the greater trochanter to the 1^{ST} and 5^{TH} metatarsal base.

Semi professional ruby players will be used as they are more excusable, from professional athletes. They will age from 18-32, and all partake in the same training sessions with the club. Rugby players will be used as balance plays a big role within many aspects of the game. As the YBT has been proven to have reliable results, accurate effects of kinesiology and dynamic tape on balance can be identified.

The two different types of tape that will be used within this study have been identified, as Kinesiology and Dynamic tape. The YBT will be conducted without tape producing baseline data. The group will be randomly split in to three smaller groups, of these three groups one will be assigned no tape, one the kinesiology tape and the final group dynamic group. The YBT will then be completed again, and results recorded. Both sets of results will then be compared to see if there is any significant differences which could be attributed to the application of tape. These results will then be presented with the use of graphs and a conclusion on the effects of kinesiology tape and dynamic tape on YBT

Chapter III

METHODOLOGY

3.0 Methodology

3.1 Participants

30 semi professional rugby players from the Principality Welsh Premiership took part in the study. A semi professional rugby player takes part in approximately three rugby sessions a week, two training sessions and the third is a match day. All participants were male and aged between 18-38. These participants were chosen due to their availability and their enthusiasm to participate.

3.2 Ethical Considerations

Prior to the study all of the participants received a participant information form (Appendix A), this ensured that they understood what the study entailed and that they were eligible to take part. Injured participants who were unable to participate in training or matches were excluded from the study. This ensured that the results which were obtained were not being affected by any mechanisms from a previous injury (Kolt & Snyder-Mackler, 2003). Those participants who we eligible and able to take part were asked to sign a consent form (Appendix B). This ensured that they were willing to take part and also explained that they could withdraw at any time during the study (See Appendix A&B). An injury is classified as a trauma sustained to a tissue (Peterson & Renstrom 2001). Therefore if an injury is sustained the likely hood of the participant being able to take full part within their sport is very low. A medical examination will need to be carried out to identify the injury. Once this examination had been completed and the injury has been diagnosed a sufficient rehabilitation program can be produced or other interventions can be implemented.

3.3 Testing Guidelines

Once consent had been obtained from all participants base line data was collected. All participants completed the Y Balance Test (YBT) on their

dominant leg. The test was carried out three times and the average score was taken. All results were saved on to a private computer, which required a password to gain access.

Once all the participants had completed the test a time frame of two-weeks was given prior to re testing. This period of time was chosen to reduce the chances of muscle memory and maximise reliability (to make the results as reliable as possible.

3.4 Taping Considerations

Participants were randomly assigned in to three different groups. Group one were tested with kinesiology tape, group two were tested with dynamic tape and then the third group was the control group. Before any taping could be done participants had to ensure that there was no hair, skin irritation or moisture in the area where the tape was going to be applied. This was to ensure that the tape could be applied effectively and its objectives would not be affected. The tape was then applied to the participants laterally from their greater trochanter to the under side of the metatarsal (Appendix C). They were then retested performing YBT.

The tests were carried out in the participants training environment, at the Talbot Athletic Ground, Port Talbot, South Wales. This ensured the participants were comfortable in the environment and the team's coaches and medical staff were able to witness the testing. A risk assessment of the facilities was completed prior to any tests being carried out.

3.5 Procedure

The YBT was used to obtain baseline data and then also used for the re-testing. Before any testing was carried out the participants witnessed a video of the YBT. This ensured that they were familiar with the test and the procedure of the test. Each participant was asked to wear sports clothing which had to include shorts to ensure that movement was not restricted.

Before conducting the test each participant will have one practice go at the test, just to familiarise themselves with the procedure.

The YBT is completed in the following way; stand with their dominant leg on centre platform, then with non dominant leg reach in an anterior, posteromedial and posterolateral direction. On each of the three ranges the participant must move the designated markers as far as they can along the dowel pole. If at any stage the participant is unable to maintain balance on centre platform, failing to sustain contact with the markers in each movement plane, using each marker as a support to increase test scores or touching the floor with leg when returning back to centre platform, will all result in the test being cancelled.

3.6 Validity

To increase the validity of the test sufficient recovery time between each range test to ensure that any fatigue element was limited. Therefore the participant will complete the test in the three ranges, rested for two minutes and then repeat the test again. This protocol was be used throughout the three attempts. The test was be conducted bare footed to ensure there was in no additional stabilisation from other factors, e.g. trainers or socks.

Participants were be randomly split in to three groups, Group one was be the control group, group two the Kinesiology tape group and group three was be the dynamic tape group. The tape was be applied laterally from the greater trochanter to the underside of the fifth metatarsal. Both dynamic and kinesiology tape was applied when the limb was on stretch with the participants in a side lying position with their dominant leg raised on to a higher surface (box) (Capobianco & Van Den Dries 2009).

3.7 Statistical Analysis

Once all data had been gathered, a composite score was produced. This provided each participant with a score for each test, allowing for more manageable data (Move2Perform, 2010).

Once the data has been gathered and composite score produced a Statistical analysis was carried out using SPSS Statistics 17.0 (SPSS Inc, Chicago, IL, U.S.A). This identified significant difference between the two data sets that were gathered. Analysis between the two types of tape and the control group were carried out and also analysis between the baseline data and retest data. An 2-Way Mixed Model ANOVA was be used to identify if there were any changes in results which could be attributed to the application of tape.

CHAPTER IV

RESULTS

4.0 Results

There was one participant that was unable to continue with the experiment once it has commenced due to a hamstring injury. All other 16 players fully participated in the testing procedure.

The mean results were calculated for test one where base line data was collected and test two where two groups had the intervention of tape, as illustrated in Table 1.

Table 1 – Mean YBT results in each group for Test One and Test Two with percentage changes.

Group	Test 1 Mean	Test 1 Std.Deviation	Test 2 Mean	Test 2 Std. Deviation	Mean Percentage increase
Control Group	102.9	±9.49263	104.3	±6.54698	1.4%
Kinesiology Tape	98.2	±6.8477	105.3	±7.41766	7.2%
Dynamic Tape	96.7	±2.8178	101.0	±8.92861	4.4%

A 2-Way Mixed model ANOVA was then used to compare results (See appendix D). Form looking at Table 1, it is evident to see that there were improvements in mean scores from test one to test two in all three groups. The ANOVA provided evidence that showed that there was no significant ($p>0.05$) difference between any of the groups.
The ANOVA also identified that there was no significant difference in the interaction between groups ($p>0.05$) ($p=0.423$). Therefore the improvements in the mean results between test one and test two were not attributed to the application of tape (Figure 1).
Despite this, looking at the estimated marginal means (Figure 2), it can be seen that there is a trend towards a greater improvement in the kinesiology

tape group. Therefore it could be suggested that Kinesiology tape may have a positive effect on Balance. There is also a trend that identifies an improvement in the dynamic tape group, however this is not as great as the Kinesiology tape group. The control group also highlighted an improvement in its trend however the magnitude of this was not as great as that of the other two groups. Figure 1 identifies the percentage change for each group from test one to test two. This backs up the trends by identifying the greatest percentage increase between test one and test two, was in the Kinesiology tape group with an increase of 7.2%. The dynamic tape group had an improvement of 4.4%, and the control group had the smallest increase of 1.4%.

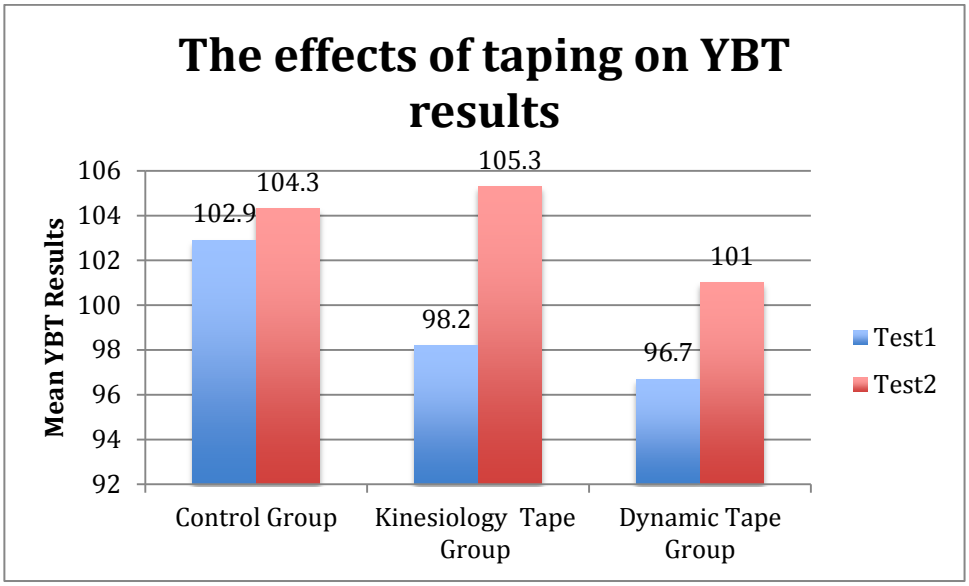

Figure 1 – Mean YBT scores between test one and test

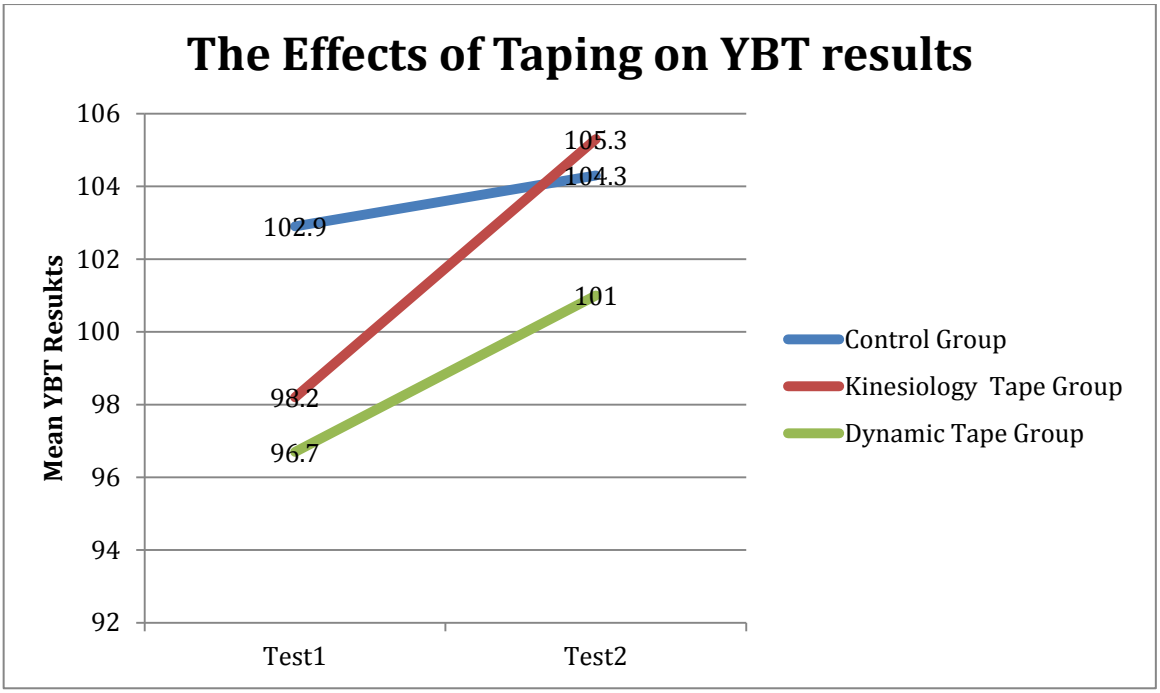

Figure 2 – Estimated marginal means.

CHAPTER V

DISCUSSION

5.0 Discussion

5.1 Introduction

The purpose of this study was to determine the effects of kinesiology tape and dynamic tape on YBT results in rugby players. Semi professional rugby players were used to carry out the study from Aberavon RFC. The aim was to identify if the lateral application of kinesiology or dynamic tape to the leg helped improve balance in semi professional rugby players. The participants were told to carry out their normal training methods prior to and between each test. There are many factors that could have affected the results gathered, these will be identified and discussed in this section.

5.2 Results

The findings from this study evidently showed all groups improved their YBT results between test one and test two. This was shown in the mean scores between test one and test two in all three groups increasing. The control group test one (mean=102.9) and in test two (mean=104.3). The kinesiology groups means changed form test one (mean=98.2) to test two (mean=105.3). The dynamic tape improved from test one (mean=96.2) to test two (mean=101). The 2-way mixed model ANOVA, identified that there was no significant differences between the groups from test one to test two ($p>0.05$). It was also identified that there was no significant difference in the group interaction therefore it can be said that the groups are similar ($p>0.05$). The 2-way mixed model ANOVA was used as it provides statistical analysis within and also between the different groups within the study.

When interpreting the estimated marginal means that were produced in the statistical test, trends within the data can be identified. From these trends one may assume that kinesiology tape did in fact have an affect on the YBT results with an increase of 7.2%. The trends also identified improvements with in the dynamic tape group (4.4%) however this improvement was not as great

as that of the kinesiology tape group. The control group also saw an increase however this was much less than the other two groups (1.4%).
Therefore this study is suggesting that kinesiology tape did in fact have an affect on balance.

5.3 Pervious research

This study supported pervious research, in respect to the application of kinesiology tape, improved balance results, however the application of dynamic tape did not support previous research as there weren't significant improvements. The kinesiology tape supported the findings by Cortesi et al (2011) as they also identified that lateral taping helped improve balance in the medial /lateral plane. It also supported the evidence provided by Capobianco and van den Dries (2009). Capobianco and van den Dries (2009) identified that taping the lateral chain would improve balance, however they taped the chain up to the splenius capitus and SCM where as this study only taped to the greater trochanter. Therefore this study has contributed to knowledge as it is now evident the application on kinesiology tape in the lateral chain from the greater trochanter to the 5^{th} metatarsal (Capobianco and van den Dries, 2009), has some positive effects on balance. However this study also identified the use of dynamic tape does not support the findings by Cortesi et al (2011) or Capobianco and van den Dries (2009). This was due the improvements not being statistically significant, and just put down to general improvements as seen in the control group.

5.4 Sample number

The reliability of the investigation was greatly affected by the small sample size (n=17), therefore relating these findings to the general population is difficult (Fields and Hole, 2008) (Berg and Latin, 2008). Seventeen participants agreed to take part in the study, however one had to withdraw as they sustained a hamstring injury pre testing (n=16). In future research larger sample size needs to be used, this will give the study more reliability. A study by Berg and Latin (2008) identified that sample error is reduced when there is

a greater sample tested, as a result of this better conclusions can be produced.

Furthermore the participants could be tested bilaterally to identify any symmetrical differences between the right and left side of the body. The reliability of the study could have been improved if the participants were professional athletes, as they would all be doing the same training and no additional physical stresses of their main occupation. The study could also look at different sporting groups to identify if the tape has effects on different sporting populations.

5.5 Tape

This study used two different types of tape, kinesiology and dynamic. Kinesiology tape proved that it does significantly improve balance, as identified in YBT results. Further research could use this tape to provide more evidence of this studies finding. The alternative Dynamic tape did not have any statistical significance on YBT results. As this is a newly developed tape, further research is required to provide theoretical underpinning for its uses. The application of the tape required there to be hair, or moisture on the skin as this affects the effectiveness of the tape. Some participants were not completely hair free when the tape was applied therefore this is a limitation of the study. It was evident during the application of dynamic tape that its adhesive properties were not as good as that of the kinesiology tape. The application of an adhesive spray in future research could have helped with this problem and may have helped with the reliability of the results. Future research could also look at the use of other tapes and braces, in relation to improvements of balance. Other tapes that could have been used are Power Tape, Tiger Tape, Rock Tape, and zinc oxide. These tapes can be used to support a movement or to add stability to a chosen joint (knee, ankle).

5.6 Anthropometric Data

Only the limb length was measured during this study, therefore in future research stature and body mass could be looked at to identify if they have any

affects on balance. A participant's body mass can effect their centre of gravity and therefore could have an affect balance. This then could have a positive or a negative effect on the YBT results (Hoffman and Payne, 1995). McGinnis (2005) identified that body mass and feet size may have an effect on balance and stability. It has been suggested that a participant who has a small body mass and a small base of support will be less stable than that of a participant with a large muscle mass and a large mass of support (McGinnis, 2005). Therefore basic anthropometric data should be gathered to identify if any of these characteristics have an affect of the YBT results post application of tape. .

5.7 Sample type

The current study used semi professional rugby players from Aberavon RFC to take part in the testing. This was due the accessibility to the participants. As a result this limits the conclusions to male rugby players. The study could have looked at participants from a range of different sports and genders to formulate a conclusion that could be related to the general population. Future research could look at a wider spectrum of participants, from males and females to different sports that have balance elements within their sport.

5.8 Other contributing factors

The study shows that there was an improvement in YBT results in all three groups however the there were only significant improvements in one group. There is a 5% chance that this significant improvement was due to chance and not attributed to the application of tape. Therefore a number of other factors that could affect the results obtained.

The YBT was used in this study as a screening method to identify lower dynamic balance. The reason dynamic balance was assessed is due transferability in to game specific movements within rugby union. Static balance could have been used however there are very few occasions in rugby where static balance is going to be used, due to the nature of the sport. The

YBT can also be used to identify symmetrical relationships or differences between right and left side of the body. This can be used if future research to see if there are any differences in application of tape to both right and left legs. Plisky et al (2009) identified that the YBT had excellent efficiency and reliability of results. The learning affect on participants could have had a detrimental affect on the results obtained. Participants should practice the YBT prior to data being recorded this will ensure that the learning effect is significantly reduced. In future research the participants could practice the YBT, for a couple of weeks prior to testing, as this will significantly reduce the learning effect and improve reliability of results (Hertel et al., (2000).

The current study looked at the application of two different types of tape laterally down the leg, and their effects on balance. However there could have been other types of fitness factors that could have affected the results obtained during the testing. For example, during the time in-between tests, subjects could have, done additional weights, or agility training which could have strengthened the leg muscles, improving strength, stability and balance.

The teams training may have been different between the tests. If the team had played a match on the weekend prior to testing or lacked attacking intent, then agility work could have been worked on in training. They could have worked on proprioceptive training, which has an effect on participants balance (Freeman *et al*., 1965; Tropp *et al*., 1985). This then could have improved the participants YBT results in one or the two tests. As well as the affects of previous matches on training, the testing could be affected by the nature of the game and the opposition during the match the weekend prior. The time frames on the pitch could be different, one week the participant could play a full game (80 minutes) and the next week the participant could have been on a substitute (playing anything from 79 minutes to not playing at all). This then could have and a positive or negative affect on the YBT results due to the bodies ability to recover from fatigue.

In addition to the rugby specific implications that could affect the results there are additional external factors that could have had an effect. The participants

that were used were from a semi professional team therefore many of them have day jobs. The stresses on the days of test in work could have had a detrimental effect on the results obtained. For example the participants may have been off on one testing day so they were less fatigued, and on the other they have been working, increasing fatigue resulting in the result being affected.

5.9 Further research

In order to further knowledge in this area, there are a number of different things that could be looked at. The role of tape could be compared to a proprioceptive training programme. This study has identified that kinesiology tape has a significant affect on YBT results and research by Brukner and Khan, (2012) has identified that proprioception is linked to balance. Therefore future study could see the difference between the applications of tape to improve balance compared to a proprioceptive training program. Future research needs to use a greater sample size to improve the reliability of results allowing the conclusions to be related to general populations.
The YBT should be considered in future research as a clinical measurement for dynamic balance. It can also be used to identify if there are any symmetrical differences, between right and left side of the body. In this study the YBT was used to look at balance in the lower limbs, however the test can also be used in the upper body. This could mean that dynamic balance can be collected from both upper and lower extremities. This data could then be used to identify if there are any areas of weakness within the body.

Tape was used as an intervention strategy within this study to see if its application improved balance results. Future research could compare other interventions with taping to identify if there are any significant improvements in balance results. For example the tape could be compared to balance training programs to identify any improvements in balance. Heitkamp *et al.,* (2001) stated that balance training significantly improved one-legged balance ($p<0.01$), in addition to this the balance training also produced muscular strength gains in the lower limbs. This muscular strength gain could improve

an athlete’s performance and also reduce the chances of an injury being sustained.

To conclude, there is very little literature available that looks at the effects of taping on balance performance. Therefore further research needs to be carried out provide taping with more substantial evidence, to its effects on balance. This study suggested that kinesiology tape does improve YBT results, however dynamic tape has no effect on YBT results. The use of the YBT in this study provided reliable results, so accurate conclusions could be made.

CHAPTER VI

CONCLUSION

6.0 Conclusion

The aim of the current study was to identify if kinesiology tape, or dynamic tape has any effect on Y balance test results in rugby players. The outcome of this study can provide sports athletes and therapists, with a better understanding of the roles of kinesiology tape and dynamic tape on balance. The results of this study can also reinforce results and findings that have been identified in previous research. Research by Cortesi et al (2011) and Capobianco and van den Dries (2009) both have identified that side lateral taping of the lower limb improves balance in the medial /lateral chain.

It was identified that balance plays a big role in rugby as it underpins a number of different skills within the game (Drewett and Biscombe 2010, Johnson 2009). Balance can be both static or moving (dynamic), it is the ability to maintain centre of mass over the base of support (Wesson et al 2005). The current study used the YBT to measure dynamic balance, as it was identified that it is an accurate and reliable method of obtaining data (Kinzey & Armstrong 1998).

There were two different types of tape used within the study, kinesiology tape and Dynamic tape. Kinesiology tape is said to apply a longitudinal stretch to the skin that results in the epidermis to be lifted. This lifting allows more space under the tissue for improved lymphatic and venous movement (Moore, 2012). Dynamic tape is said to mimic the movements of muscles, as well as absorbing energy from the movement. This energy is stored as potential energy and transferred back to the biomechanical chain as kinetic energy. This then is said to support the muscle and offload the workload to improve biomechanical support.

In the current study identified that there were no significant different between the groups between test one and test two ($p>0.05$). it also identified that there was no significant difference in the interaction of the groups ($p>0.05$) therefore the groups are similar. It was identified that the taping had no affect between the groups, between test one and test two. All three groups improved their

results from test one to test two. The trends that were produced from the estimated marginal means, identified that kinesiology tape group had the greatest improvement (7.2%) compared to that of the dynamic tape (4.4%) and the control group (1.4%). From this one may assume that in fact kinesiology tape did have an affect on the YBT results.

When relating the results back to the initial research question, of “The effects kinesiology tape, or dynamic tape on Y balance test results in rugby players”. The current study suggests that Kinesiology tape does have an affect on YBT results, compared to dynamic tape. These results therefore are similar to previous research by Cortesi et al (2011) and Capobianco and van den Dries (2009) but further research needs to be carried out.

A major limiting factor on the current study was the lack of research looking at Dynamic tape. As this is a new tape, a vast amount of further research needs to be carried out to provide this product with more theoretical underpinning.

There is very little previous research available to identify if taping effects balance. Therefore this is an area where future research could be focused. In addition to this the size of the sample needs to be increased to ensure that any findings can be related to a greater population. The current study looked at the used of Kinesiology tape and dynamic tape. There are numerous other types of tape that could also be looked at to identify if they have any benefits to improve balance. These tapes include, power tape, rock tape, and zinc oxide.

In summary, the application of kinesiology tape is suggested to have a positive effect on YBT results within rugby players, compared to dynamic tape. Therefore the application of Kinesiology tape, may help improve balance. There were a number of limitations that could effect the current study therefore these should be taken in to consideration in future research. This will therefore strengthen any further research.

CHAPTER VII

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CHAPTER VIII

APPENDICES

APPENDIX A

APPENDIX A – PARTICIPANT INFORMATION SHEET

Title of Project:

The effects of kinesiology tape and dynamic tape on the Y balance test results in rugby players.

Information Sheet

Background

A number of articles have been researched which identify a number of different factors relating to rehabilitation. As balance is a key component of fitness for rugby players the above proposal will identify if kinesiology tape or dynamic tape aids in improving their balance. Taping is an option used by athletes to aid stability around a certain joint, which in turn could improve the efficiency of certain movements. If an athlete is able to improve their stability around a particular joint this could aid their balance through movements. There has been very little research conducted with the use of kinesiology tape and its effects on stability within the lower extremities of the body. Research has proven that kinesiology tape can aid in pain relief (Kaltenborn 2007), and it has also been thought to increase flexibility in the upper body. There have been fewer studies conducted looking at Dynamic tape as it is a new product. Therefore the research proposal that has been produced will further knowledge as there have been very few studies that have looked at the effects of kinesiology tape and dynamic on the lower extremities and how that then effects stability.

What the participants have to do (methodology)

The procedure that will be carried out to obtain the results for the research proposal is as follows:-

This project will look at the affects that kinesiology tape has on balance and agility in rugby players using the following procedure.
The participants will initially conduct the Y balance test without any tape and the results will then be recorded. The athletes will then be re-tested using the

same test; this time the participants will be randomly split in to three groups, and two will be assigned a tape and the third will be the control group. The test will be conducted on the dominant leg of the participants and the results analysed using SPSS. This will enable a detailed analysis to be under taken of the two data sets and a conclusion can be produced.

The Y balance test

The participants will remove any shoes that they are wearing to improve reliability of results. They will then stand on the foot platform at the centre of the Y. From here, the participants must move their free limb in an anterior, posteromedial and posterolaterl direction. The distance the limb moves the marker is then measured and recorded. Each directional movement will be carried out 3 times and an average will be taken. Figure 2 shows the Y balance test.

Figure 2 the Y balance test

(www.sportsrehabexpert.com (9-5-11)

The data that has been gathered from the test can then be used to identify if the kinesiology tape and dynamic tape has had an effect on balance of the rugby players.

Your participation in the research project

Why have you been asked?

You have been asked to partake in this study because balance plays a big role in rugby. The study is looking to identify if the balance in rugby players, is effected when kinesiology tape and dynamic is applied laterally from hip to foot on your dominant leg.

What would happen if you agree to take part?

If you agree to take part in the study:

1. You'll be visited in training, where the tests will be discussed and any further questions will be answered.
2. The tests will then be carried out in your training environment. On the second visit the tests will be carried out without the use of tape. This will provide base line data.
3. Then you will be revisited around 4 weeks later when the same tests will be conducted this time the tape will be applied to the knees and ankles. .
4. Once the results have been formulated they will be sent to each participant, to show findings.

Are there any risks?

We do not think there are any significant risks to you in taking part in the study. If you have sustained an lower limb injuries prior to the test, you will not be able to take part (no injuries 6 months previous to study).

Your rights

During the participation of the study you have the right to pull at any time (right to refuse).

What happens to the results of the evaluation?

The measurements that are taken prior to the testing and the test results will be stored securely in locked filing cabinets at Cardiff Met. There will also be a computerised copy of results that will be stored on a pass coded memory stick that will be kept in the looked filing cabinets. All of the data that is gathered will be coded to your identity will remain anonymous.

The final results will then be sent to each of the participants to show findings.

What happens next?

With this letter you'll find a consent form. This form will just identify if you are willing to take part in the study and that you understand what is going to happen. If you are willing please fill out the form and hand it back to myself when I visit in the first training session.

How we protect your privacy:

To ensure that you identity remain anonymous each participant will be given a specific code. The only people who will know these codes will be myself. All information will also be stored in a locked filing cabinet. And any computerised information will be stored on a security coded memory stick, which will be stored in the filing cabinet along with the hard copy documents. The forms that were signed will be retained for ten years as required by Cardiff Met.

Further information

If you have any questions about the research or how we intend to conduct the study, please contact myself

Matthew Murray
Telephone – 079********
Email – st09002425@outlook.uwic.ac.uk

APPENDIX B

APPENDIX B – CONCENT FORM

UWIC CONSENT FORM

UREC Reference No:

Title :-

The effects of kinesiology tape and dynamic tape on the Y balance test results in rugby players.

Name of Researcher: Matthew Murray

Participant to complete this section: Please initial each box.

1. I confirm that I have read and understand the information sheet related to the above project (methods of the study and the reasons why the Study is being carried out). ☐

2. I understand that as the participant I have the right to pull out of the study at anytime that I wish ☐

3. I understand that information from the study may be used for Publishing, but that my name will not be used and I will remain anonymous ☐

4. I agree to take part in this study:-

   "The effects of kinesiology tape and dynamic tape on the Y balance test results in rugby players." ☐

Name of participant_____

Signature of Participant_____

Date_____

APPENDIX C

APPENDIX C – HOW THE TAPE WAS APPLIED

C3

C4

APPENDIX D

APPENDIX D – 2-WAY MIXED MODEL ANOVA RESULTS

Descriptive Statistics

	Group	Mean	Std. Deviation	N
Test1	1.00	102.9000	9.49263	5
	2.00	98.1500	6.84770	6
	3.00	96.7000	2.81780	5
	Total	99.1813	6.99030	16
Test2	1.00	104.2600	6.54698	5
	2.00	105.2833	7.41766	6
	3.00	101.0000	8.92861	5
	Total	103.6250	7.38652	16

Multivariate Tests[a]

Effect		Value	F	Hypothesis df	Error df	Sig.
Testing	Pillai's Trace	.310	5.836[b]	1.000	13.000	.031
	Wilks' Lambda	.690	5.836[b]	1.000	13.000	.031
	Hotelling's Trace	.449	5.836[b]	1.000	13.000	.031
	Roy's Largest Root	.449	5.836[b]	1.000	13.000	.031
Testing * Group	Pillai's Trace	.124	.920[b]	2.000	13.000	.423
	Wilks' Lambda	.876	.920[b]	2.000	13.000	.423
	Hotelling's Trace	.142	.920[b]	2.000	13.000	.423
	Roy's Largest Root	.142	.920[b]	2.000	13.000	.423

a. Design: Intercept + Group
Within Subjects Design: Testing

b. Exact statistic

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Testing	Sphericity Assumed	144.414	1	144.414	5.836	.031
	Greenhouse-Geisser	144.414	1.000	144.414	5.836	.031
	Huynh-Feldt	144.414	1.000	144.414	5.836	.031
	Lower-bound	144.414	1.000	144.414	5.836	.031
Testing * Group	Sphericity Assumed	45.527	2	22.764	.920	.423
	Greenhouse-Geisser	45.527	2.000	22.764	.920	.423
	Huynh-Feldt	45.527	2.000	22.764	.920	.423
	Lower-bound	45.527	2.000	22.764	.920	.423
Error(Testing)	Sphericity Assumed	321.673	13	24.744		
	Greenhouse-Geisser	321.673	13.000	24.744		
	Huynh-Feldt	321.673	13.000	24.744		
	Lower-bound	321.673	13.000	24.744		

1. Group * Testing

Measure: MEASURE_1

Group	Testing	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1.00	1	102.900	3.105	96.192	109.608
	2	104.260	3.432	96.846	111.674
2.00	1	98.150	2.834	92.027	104.273
	2	105.283	3.133	98.516	112.051
3.00	1	96.700	3.105	89.992	103.408
	2	101.000	3.432	93.586	108.414

Pairwise Comparisons

Measure: MEASURE_1

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.[a]	95% Confidence Interval for Difference[a]	
					Lower Bound	Upper Bound
1.00	2.00	1.863	3.885	1.000	-8.806	12.532
	3.00	4.730	4.058	.794	-6.413	15.873
2.00	1.00	-1.863	3.885	1.000	-12.532	8.806
	3.00	2.867	3.885	1.000	-7.802	13.536
3.00	1.00	-4.730	4.058	.794	-15.873	6.413
	2.00	-2.867	3.885	1.000	-13.536	7.802

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.