THE EFFECT OF THREE DIFFERENT RESISTANCE LEVELS OF RUBBER BAND DURING A WARM UP PROTOCOL ON VERTICAL JUMP PERFORMANCE

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THE EFFECT OF THREE DIFFERENT RESISTANCE LEVEL OF RUBBER BAND DURING A WARM UP PROTOCOL ON VERTICAL JUMP PERFORMANCE

ABSTRACT

The purpose of this study was to investigate the effect of three different resistance levels of using rubber bands during a warm up protocol on vertical jump performance. Quasi experimental design was used in this study. Seventeen recreationally active males aged between 20 to 25 years old were randomly selected. The participants underwent four sessions consisted of (a) familiarization warm up, (b) warm up with orange color rubber band (high level of resistance), (c) warm up with blue color rubber band (medium level of resistance) and (d) warm up with green color rubber band (lower level of resistance). At the end of every session, the participants performed the squat jump on the force plate. The data on force, power and height of jump were collected and analyzed. Repeated Measure One-way ANOVA was utilized for data analysis. The force result indicated that the mean force (N) obtained for blue rubber band (M = 1532; ±SD = 251) was higher than green (M = 1507; ±SD = 268) and orange rubber band (M = 1511; ±SD = 264). In term of power (W), the mean power achieved for orange rubber band (M = 3384; ±SD = 459) was higher than green (M = 3296; ±SD = 444) and blue rubber band (M = 3256; ±SD = 455). Next, height of jump (cm), the mean height of jump for blue (M = 37.86; ±SD = 4.87) was higher than green (M = 36.34; ±SD=5.59) and orange rubber band (M = 36.59; ±SD = 5.49). However, ANOVA result indicated no significant difference between the different colors (difficulty levels) of rubber bands used on force *[F(2,14) = 0.544; p>0.05]*. There were also no significant differences found between the levels of resistance on the power *[F(2,14) = 3.656; p>0.05]* and height of jump *[F(2,14) = 0.988; p>0.05]*. In conclusion, the data revealed that the highest power was recorded when the highest resistance was applied in warm up. But in term of force and jump height, moderate resistance will produce the optimal force and height jump. In implication, the moderate and high resistant rubber bands could be used to improve vertical jump performance.

ABSTRAK

Tujuan kajian ini adalah untuk mengkaji kesan tiga tahap rintangan yang berbeza menggunakan gelang getah semasa protokol pemanasan terhadap prestasi lompatan menegak. Reka bentuk kuasi experimen telah digunakan dalam kajian ini. Tujuh belas lelaki yang aktif secara rekreasi berusia antara 20 hingga 25 tahun dipilih secara rawak. Peserta-peserta menjalani empat sesi yang terdiri daripada (a) penyesuaian pemanasan, (b) pemanasan badan dengan jalur getah warna oren (tahap rintangan tinggi), (c) pemanasan badan dengan jalur getah warna biru (tahap rintangan sederhana) dan (d) pemanasan badan dengan jalur getah warna hijau (tahap rintangan rendah). Pada akhir setiap sesi, para peserta melakukan *squat jump* pada *force plate*. Data daya, kuasa dan ketinggian lompatan dikumpulkan dan dianalisis. Pengukuran berulang sehala ANOVA digunakan untuk analisis data. Hasil daya menunjukkan bahawa daya purata (N) yang diperoleh untuk jalur getah biru (M = 1532; ± SD = 251) lebih tinggi daripada hijau (M = 1507; ± SD = 268) dan jalur getah oren (M = 1511; ± SD = 264). Dari segi kuasa (W), kuasa purata yang dicapai untuk jalur getah oren (M = 3384; ± SD = 459) lebih tinggi daripada hijau (M = 3296; ± SD = 444) dan jalur getah biru (M = 3256; ± SD = 455). Seterusnya, ketinggian lompatan (cm), purata ketinggian lompatan untuk biru (M = 37.86; ± SD = 4.87) lebih tinggi daripada hijau (M = 36.34; ± SD = 5.59) dan jalur getah oren (M = 36.59; ± SD = 5.49). Namun, hasil ANOVA menunjukkan tidak ada perbezaan yang signifikan antara warna yang berbeza (tahap kesukaran) jalur getah yang digunakan terhadap daya *[F(2,14) = 0.544; p>0.05]*. Tidak juga terdapat perbezaan yang signifikan antara tahap rintangan terhadap kuasa *[F(2,14) = 3.656; p>0.05]* dan ketinggian lompatan *[F(2,14) = 0.988; p>0.05]*. Kesimpulan, data menunjukkan bahawa kuasa tertinggi dicatatkan ketika rintangan tertinggi digunakan semasa pemanasan badan. Tetapi dari segi daya dan ketinggian lompatan, rintangan sederhana akan menghasilkan daya dan lompatan ketinggian yang optimum. Implikasinya, jalur getah rintangan sederhana dan tinggi boleh digunakan untuk meningkatkan prestasi lompatan menegak.
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CMJ	Counter movement Jump
DS	Dynamic Stretching
EMS	Electromyostimulation
PAP	Post-Activation Potentiation
PARQ	Physical Activity Readiness Questionnaire
RPE	Rating of Perceived Exertion
SJ	Squat Jump
SS	Static Stretching
UPSI	Sultan Idris Education University

APPENDIX LIST

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Warm up is essential in preparing the sports activity. Warm up gives the benefits in temperature-related mechanisms, and also non-temperature-related mechanisms (Bishop, 2003). Traditionally, the warm up routines consist of submaximal of aerobic exercise, static stretching, and followed by sport-specific dynamics activity. Static stretching gives the benefits of increasing the range of motion in preparing physical activities or competition. However, the implementation of static stretching before the competition or physical activities impaired speed, power, and strength (Church, Wiggin, Moode & Crist, 2001; Behm, Bambury, Cahill & Power, 2004). Besides, the dynamic warm up which mimicking sports movements used in training or competition gives a positive effect on the performance. According to Cilli, Gelen, Yildiz, Saglam, & Camur (2014) dynamic warm-

up is included load resistance exercises, plyometric movements, or maximum voluntary contractions (MVC). Dynamic warm up enables activated the nerve-muscle function which resulted to increase the performance. This phenomenon called post-activation potentiation (PAP) which muscular performance is accurately enhanced when preceded by maximal or near-maximal neuromuscular activation (Zois, Bishop, Ball, & Aughey, 2011).

Hence, to assist the dynamic warm-up process, one of the current trends is to combine it with an additional piece of equipment that may assist elicitation of PAP and improves performance such as squat racks (Gourgoulis, Aggeloussis, Kasimatis, & Mavromatis, 2003) leg machines (Zois et al., 2011) and weighted vest (Cilli et al., 2014; Faigenbaum et al., 2006). Even though it has been proven the effectiveness, the factor of accessibility and portability of this equipment made is not practical to be used before any sporting events, especially when travel and availability of weight room are questionable. Due to these limitations, equipment like resistance band started to be introduced. The resistance band is a greatly portable, feasible, inexpensive, and undersized device (Page, Behm, & Aboodarda, 2015). This tool has a related percentage of hardness based on the colors. Basically, the resistance band is a tool that has been used in rehabilitation and helps in improving the strength and power performance while there are several studies about warm up area.

The effectiveness of using the resistance band as warm up tool is scarce in the literature review. Thus, it is the purpose of this to investigate the effect of the resistance band at a different level as a warm-up tool prior to strength and power-based activity. More precisely, this present study aims to investigate the immediate effect of using rubber band

from various levels of resistance as part of warm up on vertical jump kinetics performance, kinematics performance, and level of session's rate of perceived exertion (sRPE)

1.2 Statement of the Problem

The preparation to start any physical activity is an important part of any athletic event. Well prepared in warm up routine is essential due to activate muscle fiber and readiness the muscle performs the extensive activity. While warm-up has been generally accepted as essential for safety and optimum performance in sports and physical activities, methods and approaches to warm-up are still expanding. The dynamic warm-up has been known to be able to assist in power-based performance. The dynamic warm up with added tools or equipment also one of the varieties of warm up methods. However, its usage benefits are still questionable and in need of further investigations and evidence. Nevertheless, the use of the resistance band is quite popular due to the fact that it is more portable and accessible rather than the other equipment like squat racks, and leg machines.

The warm up with resistance band showed a positive effect on the acute jump power (Buttifant & Hrysomallis, 2015). But, its findings are not inclusive. This study has shown that warm up with resistance band enable to gives a positive effect on kinetic and kinematic performances. However, this study had used the highest resistance band in the warm up protocol. Thus, this study was not able to determine what different levels of the resistance band enable will do on performance. This is where this study fits in. The current study will provide more inclusive findings that cover several levels of resistance of the rubber band, as that is how rubber band was promoted and sell. Besides, there are still

inconsistencies in the finding of the warm up protocol that may affect the kinetic and kinematics performance. Hence, the purpose of this study is to look into the acute effect of the rubber band as part of warm up tool on kinetic, kinematic, and sRPE among the recreationally active males.

1.3 Significant of Study

Warm up is a routine before the start of any activity. The effectiveness of warm up protocol is dependable on its ability to increase the body temperature and readiness of the muscle fiber for the upcoming activities. Hence, the current study investigated the acute effect of using rubber band during warm up protocol on vertical jump kinetic performance, kinematics performance and rate perceive exertion. The resistance band has advantages in terms of accessibility and portability. Thus, the outcomes of this study would provide the needed information on the effectiveness of rubber band as part of warm-up protocol, and which of its resistance level the most suitable for explosive like performance as depicted by the jump.

1.4 Purpose of the Study

To investigate acute responses of using three different levels of resistance of rubber band during warm up on vertical jump kinetics, kinematics performance, and session's rate of perceived exertion (sRPE).

1.5 Objectives of the Study

Specifically, the objectives of the study are as below:

1.5.1 To determine kinetics output produced during a vertical jump performance after warm-up session's using three different levels of resistance of rubber band on young recreationally active male.

1.5.2 To determine kinematics output produced during a vertical jump performance after warm-up session's using three different levels of resistance of rubber band on young recreationally active male.

1.5.3 To determine the perception on the difficulty level of each rubber band used based on session's rate of perceived exertion (sRPE) among young recreationally active male participants.

1.5.4 To investigate the differences between each of the warm-up using the three different level of resistance of rubber band on kinetics and kinematics output of vertical jump performance.

1.5.5 To investigate the relationship between levels of sRPE rated by the participants with the level of kinetics output measured by the force plate during the vertical jump performance, after performing a rubber band based warm-up.

1.6 Research Questions

1.6.1 What is the kinetics output produced during a vertical jump performance after warm-up session's using three different levels of resistance of rubber band on the young recreationally active males?

1.6.2 What is the kinematics output produced during a vertical jump performance after warm-up session's using three different levels of resistance of rubber band on the young recreationally active male?

1.6.3 What is the perception on the difficulty level of each rubber band used based on session's rate of perceived exertion (sRPE) among young recreationally active male participants?

1.6.4 Is there any significant difference between the different levels of resistance band use as a tool in warm up session on kinetics and kinematics output of vertical jump performance?

1.6.5 Is there a significant relationship between the levels of sRPE rated by the participants with the level of kinetics output measured by the force plate during the vertical jump performance, after performing a rubber band based warm-up?

1.7 Limitation

The limitation of this study includes the possible withdrawal of the participants due to time constrain for participation. That was due to the timing of data collection which bound by the limitation of the duration of the study of the researcher. Environmental temperature also was the factor that may influence the outputs of the study but was not be able to control by the researcher for this study. However, the data collection process was done at the same time of the day for all participants to reduce the environmental-physiology effect. While the participants were advised on maintaining normal dietary intake, it was beyond the researcher's ability to control the actual food and beverage intake of participants, which might contribute towards faster recovery for certain participants.

1.8 Delimitation

The age group involved was delimited to 20-25 years old male-only, with participant's characteristics already as stated in the methodology section. The participants that recruited were from the sports science student of Faculty of Sports Science & Coaching, Sultan Idris Education University. The result that obtained might only be valid for a similar brand or made of the rubber band as what was used in this study. The use of rubber band was delimited for the color of the blue, green, and orange which represented it respectively hardness. The warm up protocol that added the resistance band is stated in the methodology section. The procedure of squat jump without arm swing has been used as the vertical jump testing on the force plate to measure kinetics and kinematics output.

1.9 Operational Terms

The operational definitions of this study which used as the keys terms in this study were:

1.9.1 Acute effect

The acute effect is the physiological immediate effect in human body after the physical performance (Buchner et al., 2017).

1.9.2 Kinetic performance

Kinetic is referring to the force in the study of motion (Magill, 2011). In this study, the kinetic measures were the force, and power as measured by using the force plate.

1.9.3 Kinematic performance

Kinematic referring the descriptor of motion without concern for the cause of that motion (Magill, 2011). In this study, the kinematic output was focused on the height of the jump (distance) during the vertical jump.

1.9.4 Rating of Perceived Exertion (RPE)

The sRPE is based on 10 points or scale originated from Borg Rating of Perceived Exertion (RPE) which used to measure the physical activity intensity level or simply state the perceived exertion of how hard the body feels when it is working by the participants (Day, Mcguigan, Brice, & Foster, 2004).

1.9.5 Resistance Level

The resistance level is the hardness level to stretch the rubber band which depended on the color of the rubber band. In this study, the selected colors of the rubber band were orange, blue, and green.

1.9.6 Rubber Band

The rubber band is the resistance band in which the resistance level of the band depends on the color of the rubber band. The color of the rubber band is orange, blue, and green color. The orange band is the high level of hardness with the 4kg of resistance whilst the blue band is the medium resistance with 3kg. Then, the green band is the low resistance with 2kg.

1.9.7 Vertical Jump

The vertical jump is the upright jumping performance. In this study, the squat jump was performed as a vertical jump performance.

1.9.8 Warm up

Warm up is the low-intensity activities or exercises performed by the individual at the beginning of the exercise protocol, aiming at increasing the body (physiologically) readiness to exercise. The effect that can be observed such as elevated in heart rate and body temperature.

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1.9.9 Recreational Active Males

The recreationally active males from sports science students of Faculty of Sports Science & Coaching whom ages from 20 to 25 participate in the study.