CORRELATION OF UPPER EXTREMITY MUSCLE STRENGTH AND REACTION TIME IN COMPETITIVE BADMINTON PLAYERS

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Abstract:

Introduction: Badminton is a racquet sport. At a higher level game, being a fast paced sport Badminton demands excellent fitness, aerobic stamina, strength, speed and precision. Playing Badminton also requires good agility, cardiovascular endurance, strength and reaction time. Reaction time is the amount of time taken to respond to a stimulus. It can be improved by practice as it affects the quality of game. Every player and healthcare professionals need to analyze the technique and requirement of the sport in order to modulate the coaching accordingly.

Aim: To find if there is a correlation between upper extremity muscles strength of dominant hand and reaction time in competitive badminton players.

Material and Method: Isometric muscle strength of pectoralis major, shoulder rotators, triceps, deltoid, wrist flexors and extensor were assessed using the hand-held dynamometer (FET3) and the reaction time was assessed by audio-visual reaction time machine for competitive badminton players. The average age was 18.77 (± 2.75) years. Both the parameters were correlated by the Pearson's correlation coefficient test using Microsoft Excel 2007.

Result: A negative moderate correlation was found between the upper extremity muscle strength and reaction time. This shows that when the strength of an individual is greater, then, the reaction time is lesser.

Conclusion: This study concludes that muscle strength, may affect the reaction time to some extent, i.e. strength and reaction time of the dominant upper extremity muscles are directly proportional.

Keywords: racquet sport; dominant hand; FET3 dynamometer; audio-visual reaction time machine.

INTRODUCTION

Badminton is a racquet sport, played by either two opposing players or two opposing pairs. At a higher level game, the sport demands excellent fitness, aerobic stamina, strength, speed and precision. As it is also a technical sport it requires good motor coordination[1]. Badminton is a fast-paced sport. Players need to get trained with resistance exercises for the muscles which are involved actively while playing badminton. Strength training is often acknowledged as a beneficial thing for optimal health in every player which helps in training the important muscles in badminton[2]. Strength improves power which is required to hit the shuttle coming from the opposite side.

Strength training helps in maintaining and increasing the flexibility, helps to manage and reduce pain, improves brain function and coordination, improves balance[2]. Badminton requires good agility, endurance, strength and reaction time. Reaction time is the amount of time taken to respond to a stimulus[3]. The average reaction time for humans is 0.26 seconds to a visual stimulus, 0.17 for an audio stimulus, and 0.15 seconds for a touch stimulus[1]. Reaction time is important in every sport as it affects the quality of the game[3]. Reaction time can be improved by practice. Every player and healthcare professionals need to analyze the technique and requirement of the sport in order to modulate the coaching accordingly.

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Need for Study

Playing badminton demands optimum strength of upper limb muscles. It also expects the player to react quickly to the shuttle cock heading towards the player which expects shorter reaction time. A Study performed by Salonikidis K, Zafeiridis A on 64 novice tennis players concluded that the plyometric training andlike squat jump, lateral jumps, power skipping, tuck jumps, alternate leg bounding, etc., training helped to improve the strength and reaction time in the players[4]. Hence this study aimed to find if there is a correlation between the two health related entities strength and reaction time of the dominant upper extremity.

METHOD & METHODOLOGY

Procedure

The study was performed on 37 competitive badminton players between the age group of 16 to 25 years of age selected randomly

from sports clubs and badminton courts in Pune city. Players with any recent injuries were excluded.

The strength and reaction time of competitive badminton players was assessed of which 7 were males and 30 females. The average age was 18.77 (± 2.75) years.

Approval from the ethical committee was taken before commencement of the research.

A correlation study was performed. Written consent was taken from the participants/parents before carrying out the study. Isometric muscle strength[5] of pectorals, rotators, triceps, deltoid, wrist flexors and wrist extensors was assessed using a handheld dynamometer (FET 3)[6] with the patient in sitting position for deltoid, triceps, rotators, wrist flexors and extensors and supine position for pectoral muscles; wherein the patient was asked to perform maximal isometric muscle contraction while the examiner placed the dynamometer on the forearm of the dominant hand. Best result out of three attempts was chosen for the study.

Reaction time was assessed by using the audio-visual reaction time machine[3]. The visual reaction times of the subject were assessed. The machine had two visual stimuli (red and green light). Each subject was exposed to these stimuli.

Best out of three readings were chosen for the study.

The correlation was calculated by using the Pearson's correlation coefficient test.

RESULTS

The correlation coefficient of strength and reaction time of dominant upper extremity in competitive badminton players were as follows:

MUSCLES	CORRELATION COEFFICIENT
Triceps	-0.6137
Pectoralis major	-0.5932
Internal rotators	-0.61349
External rotators	-0.55342
Deltoid(anterior fibers)	-0.56342
Deltoid(middle fibers)	-0.55555
Deltoid(posterior fibers)	-0.64232
Wrist Flexors	-0.60666
Wrist Extensors	-0.55873

DISCUSSION

The above study supports its hypothesis showing a negative correlation between the upper extremity muscles of dominant side and visual reaction time as it shows a significant decrease in the reaction time when the strength is greater. This correlation is a moderate correlation. If the muscle is stronger then the stimulus carried by the sensory receptors and sensory neurons to the central nervous system takes place faster due to which the relay neurons and the motor neurons carry the motor response/action more quickly. This means that change in the strength changes motor response[7,8]. Hence there is a negative correlation between the strength and reaction time of dominant upper extremity. This shows that when the strength of an individual is greater, then the reaction time is lesser.

This study was in agreement with a study done by Salonikidis K, et al, on effect of plyometriclike squat jump, lateral jumps, power skipping, tuck jumps, alternate leg bounding, etc., tennis-drills, and on reaction time, lateral and linear speed, power and strength in novice tennis players which showed that, there was a significant difference in the speed and reaction time in the players after plyometrics like squat jump, lateral jumps, power skipping, tuck jumps, alternate leg bounding, etc. and tennis-specific drill training of 9 weeks (3 times/week)[4]. Badminton players go through similar training and coaching and hence such changes can be expected in the badminton players. The above study is also supported by another study done by T McMorris, S Delves, J Sproule, et al, which had similar finding of negative correlation between muscle strength and reaction time in normal male population who were medically fit[9].

A study performed by Kelly L. Gao, et al, on stroke survivors also had a similar finding of negative correlation between strength of the muscles and reaction time[10]. Another study performed by FusakoYokochi, et al, on Parkinson's patients and the study concluded that the reaction time of the Parkinson's patients is affected to a certain extent due to loss of power in the muscles[11].

All these studies establish a connection between strength and reaction time in various populations with negative correlation suggesting some role of muscle strength on reaction time of the players, but the extent of it needs to be further analyzed.

CONCLUSION

This study concludes that there is a negative moderate correlation between the upper extremity muscles and visual reaction time in competitive badminton players, which means that muscle strength, can affect the reaction time to some extent, i.e. strength and reaction time of the dominant upper extremity muscles are directly proportional.

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CONFLICT OF INTEREST

Nil

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