



COMPARISON OF UPPER LIMB REACTION SPEED BETWEEN YOUNG TABLE TENNIS AND BADMINTON ATHLETES USING THE LYMMIC ELECTRONIC SYSTEM

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Abstract:

The aim of the present study was to compare the upper limb reaction time between young athletes (boys) of table tennis and badminton. Two groups of 14 table tennis and badminton athletes (a total of 28 athletes) with a mean age of 14 ± 1.65 and mean involvement in these sports of 5 ± 1.32 were the sample of the study. The visual stimulus tests used to record reaction times were as follows: a) left hand simple reaction time test, b) right hand simple reaction time test, c) left hand choice reaction time test, d) right hand choice reaction time test. The tools used for the measurements were a special light sensor and other technological means. ANOVA and Duncan's multiple range test ($p < 0.05$) were applied for statistical data processing. The analysis of the results showed no statistically significant differences in any of the 4 tests of the athletes. The findings and the way of measuring reaction speed could be used by the athletes' coaches to enrich and improve the training process.

Keywords: table tennis, badminton, reaction time, hands

1. Introduction

Racket sports are characterised by continuous fast strokes in which the athlete must be constantly hyper stimulated and engaged in repetitive motor activity of high intensity and speed (Lees, 2003). During competitions, athletes must make decisions that must be executed in tenths of a second, increasing their levels of concentration and decision-making ability (Tiwari, Rai & Srinet, 2011).

The performance of a team and individual sports athlete is influenced by many factors such as strength, flexibility, agility, and balance which are used continuously and sequentially (Tamer, 2000). One of the most important performance factors is sports

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reaction time (Koc, Kaya, Saritas & Coksevim, 2006). More specifically, performance in racquet sports is closely related to both physical and psychomotor skills. Although psychomotor skill is only one aspect of performance, it is the key to good performance. Reaction time is one of the variables assessed in psychomotor skills and the main predictor of psychomotor performance evaluation (Ando et al., 2005). Reaction time describes the time interval between a stimulus and the response to it (Batra, Vyas, Gupta, Gupta & Hada, 2014) and can be divided into three categories: Simple Reaction Time (SRT), Recognition Reaction Time (RRT), and Choice Reaction Time (CRT) (Luce, 2008). Simple reaction time refers to reacting to a single stimulus and is usually very fast (Badau, Baydil, & Badau, 2018). Reaction time is quite complex as it depends on visual ability, movement, time, decision time, and generally on the muscular functions of the body (Singer, Murphy & Tennant, 1993). Reaction time is influenced by very many factors both physical and pharmacological (Malathi, Parulkar, Dhavale & Pinto, 1990) such as age, gender, left or right handedness, exercise, fatigue, fasting, distraction, personality type, anxiety, intelligence, and alcohol (Bamne, Fadia & Jadhav, 2011) (Deshmukh, et al., 2015).

Several studies show that athletes have shorter reaction times than non-athletes (Nakamoto & Mori, 2008), (Kuan et al., 2018). In addition, badminton players have higher visuomotor skills than individuals who do not play racquet sports (Xin et al; 2012) and table tennis athletes have also shown that visual reaction time is shorter compared to healthy individuals who do not play sports (Bhador et al., 2013).

Therefore, the aim of the present study was to compare through visual stimulation the simple reaction time and choice reaction time of the hands among young table tennis and badminton athletes.

2. Material and Methods

2.1 Participants

A total of 28 healthy Greek athletes (14 table tennis and 14 badminton athletes) were measured for the purpose of the study. All 28 athletes were boys, right-handed, aged between 12 and 16 years (12 ± 1.65) with training age between 4 and 7 years (5 ± 1.32). Both groups of athletes trained 4 times a week for 2 hours. All athletes had participated in national championships and were in the official rankings of their respective sports.

2.2 Measurement Instruments

The reliable electronic system Lummic Reaction Lights, an iPhone 14 mobile phone with the Lummic App installed, and an HP2000 computer were used to measure the reflexes.

2.3 Procedure

The research involved recording and comparing both hands between young table tennis and badminton athletes. All athletes were tested on 2 tests on both hands (2 tests on each hand). One test was for simple reaction time while the second test was for choice reaction time. In the first test, each athlete was in position and had a Lummic light sensor in front

of them at a distance of 35cm which was placed on a table. The athletes' hand rested on the table and as soon as the light of the sensor turned on, the athlete had to turn it off with a touch (Figure 1). In the second test, the athlete had four sensors with lights in front of them having equal distance from the athlete's measuring hand. Each time, all four lights were turned on simultaneously and the athlete had to touch a specific color (Figure 2). In each test, the color the athlete had to touch was the same but on a different sensor unknown to the athlete. Each athlete performed 3 times for each hand and each test, for a total of 12 attempts. The score (time) noted by each athlete is derived from the average of the three attempts performed individually for each test (Table 1). Thus, each athlete noted a score which then produced the average of each group for each particular test which was the final score.



Figure 1: Simple reaction time test



Figure 2: Choice reaction time

Table 1: Example of total score

Athlete	1 st attempt	2 nd attempt	3 rd attempt	Score
Right hand (1 ^o test)	x	x	x	$(x+x+x)/3$
Left hand (1 ^o test)	x	x	x	$(x+x+x)/3$
Right hand (2 ^o test)	x	x	x	$(x+x+x)/3$
Left hand (2 ^o test)	x	x	x	$(x+x+x)/3$

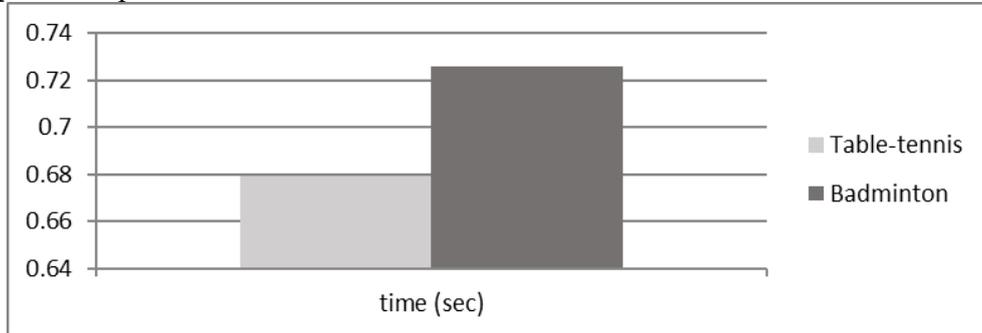
2.4 Statistical Analysis

The experiments were conducted in triplicate and statistical significance was determined at a significance level of $p < ANOVA$ and Duncan's multiple range test was employed to analyze the results for statistical significance and to identify significant differences among outcomes. The computations for coefficients, ANOVA tables, and significance ($p < 0.05$) were carried out using Statistica version 10.0 (StatSoft Inc., Tulsa, OK, USA).

3. Results and Discussion

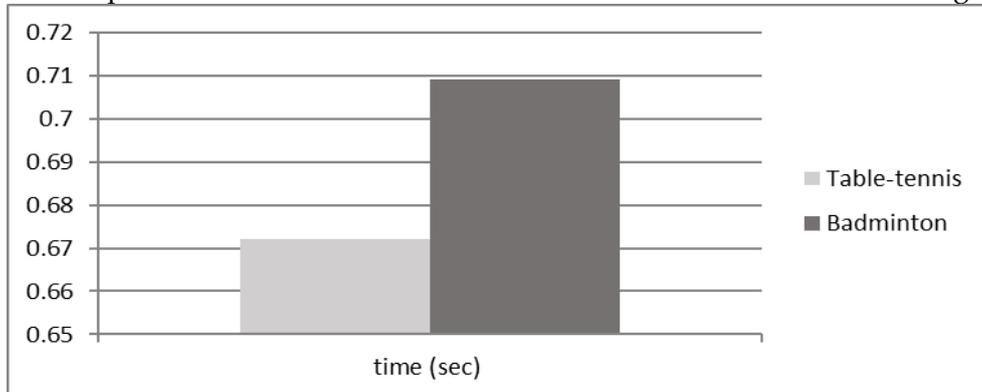
No statistically significant difference was observed in any comparison group as in all comparison groups $p > 0.05$ was noted. Follows a detailed presentation of the graphs below.

Graph 1: Simple reaction time of table tennis and badminton athletes for the left hand



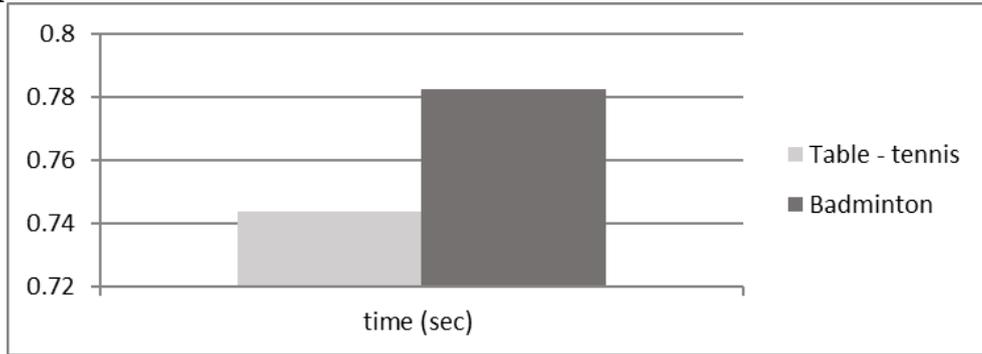
* $p > 0.05$

Graph 2: Simple reaction time of table tennis and badminton athletes for the right hand

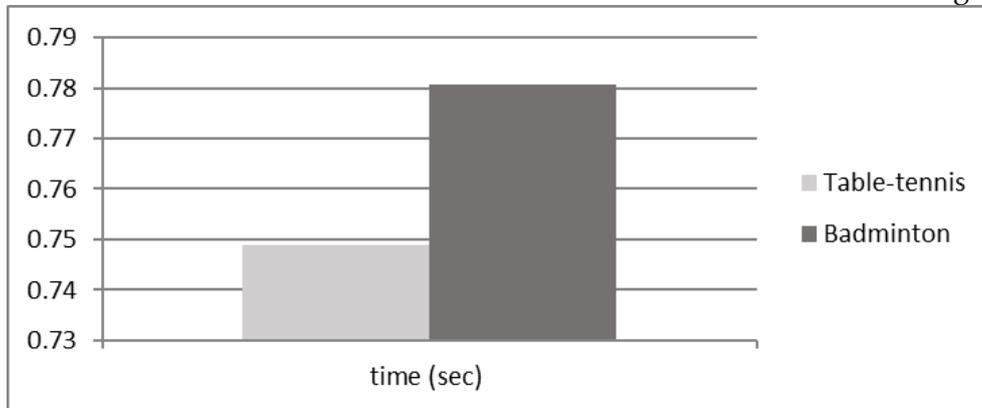


* $p > 0.05$

Graph 3: Choice reaction time of table tennis and badminton athletes for the left hand



Graph 4: Choice reaction time of table tennis and badminton athletes for the right hand



5. Discussion and Conclusions

In the present study comparing upper limb reaction speed through visual stimulation between young table tennis and badminton athletes, it was found that there were no statistically significant differences in any of the four tests. The first test involved left hand reaction to a visual stimulus while the second one tested equally the right hand. The third test involved choosing a particular colour among other colours and concerned the left hand, while the fourth test was the same as the third one but aimed at measuring the right hand.

In other studies, it has been found that badminton athletes have a shorter reaction time compared to people who do not play sports (Bańkosz Nawara & Ociepa, 2013). There are also studies that have shown that athletes who participate in team sports and sports that require fast eye movement, such as tennis, have a shorter reaction time than athletes who participate in other sports (Ozmerdiveli, 2005; Dogan, 2009). In a study involving racquet sports, specifically table-tennis and tennis, Ak and Kocak (2010), who measured reaction time and anticipation time, showed that tennis athletes had better anticipation times than table-tennis athletes, while table-tennis athletes' reaction times were better than tennis athletes.

The present study agrees with the research of Kiplim, Yildirim, Akcan, Ozdal, Abakay & Bagceci (2019) who found no statistically significant differences in the reaction time of tennis, badminton, and table-tennis athletes through visual stimulus. In a similar study on reaction time through visual stimulus conducted by Can, Kilit, Arslan & Suveren (2014) among tennis, table-tennis, and non-athletes, it was observed that there were no statistically significant differences regarding the left hand, while statistically significant differences were found only regarding the right hand with table-tennis athletes showing better times than the other two groups, results that are partially consistent with the present study. Undoubtedly, reaction time is also very important in sports performance and in fact, several studies show that it can be improved with sport practice (Davranche & Audiffren, 2004; Mouelhi-Guizani et al., 2006).

In conclusion, the results of the research show that there are no statistically significant differences between young male table-tennis and badminton athletes in any of the following tests:

- Simple left hand reaction time,
- Simple right hand reaction time,
- Choice reaction time of the left hand,
- Choice reaction time of the right hand.

6. Recommendations

This research could be conducted with different age groups (older and younger) and with different genders (boys and girls). It could also be carried out on elite-level athletes as well as more novice athletes to see if the level of the athletes plays a role. It would also be interesting to measure the reaction time after a hard training session or before a race. Finally, the measurement between the two hands in racket sports athletes would be a good topic for further research.

Conflict of Interest Statement

The authors declare no conflicts of interest.

About the Author(s)

Andreas Nikolakakis is an MSc graduate of the Democritus University of Thrace, Greece, a tennis and table tennis coach, and a sports researcher.

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