

Examining the Relationship between Simple and Choice Reaction Time on Team-Sport and Individual-Sport Athletes

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ABSTRACT

Reaction time is an important aspect in athletic performance. Simple reaction time (SRT), a response to a single stimulus, may be important to nearly all types of athletes; however choice reaction time (CRT), a reaction to multiple stimuli, is uniquely required in team sports such as football or basketball. Literature has shown that generally athletes have faster SRT than non-athletes, but there is limited research examining the effect of sport type of either SRT or CRT. The purpose of this experiment is to determine if team sport athletes have faster SRT and CRT compared to individual-sport athletes and non-athletes. Both SRT and CRT were assessed using the Deary-Liewald reaction time test; a computerized simulation in which subjects were to respond to the images on the screen by pressing the appropriate key or keys. Three groups were measured ($n = 14/\text{group}$): team sport athletes (basketball, football, and baseball players), individual sport athletes (track and cross country runners) and non-athletes (no participation in collegiate athletics). Each subject completed both the CRT and SRT assessments in a single laboratory visit, which took approximately 30 minutes. The order in which they completed the tests was randomized. Comparisons between the three groups were made using a one-way ANOVA for SRT and for CRT. For the SRT there was a significant group main effect ($p = 0.007$). The team sport group ($p = 0.016$) and the individual sport group ($p = 0.018$) had significantly faster SRT as compared to the control group. However, there was no significant difference between individual sport athletes and team sport athletes for SRT. There was no main effect for CRT ($p > 0.05$). Overall, athletes had faster SRT as compared to non-athletes, but there was no effect of sport type. Unexpectedly, this effect did not exist for CRT, as there were no significant differences among the three groups.

INTRODUCTION

Reaction time is an important aspect in athletic performance. Simple reaction time (SRT), a response to a single stimulus, is a widely used component of many types of sports. For example, SRT is required when a track runner accelerates in response to the starting gun, or when a driver accelerates in response to a green light. However, choice reaction time (CRT), a reaction to multiple stimuli, is uniquely critical to many team sports such as football or basketball. For example, CRT is required when a quarterback throws a ball to an open receiver. While it has been established that generally athletes have faster SRT than non-athletes, there is limited research examining the effect of sport type of either SRT or CRT. We hypothesized that team sport athletes would have faster CRT and SRT, as their daily practices require these skills. Both SRT and CRT were assessed using the Deary-Liewald reaction time test; a computerized simulation in which subjects were to respond to the images on the screen by pressing the appropriate key or keys (Deary & Liewald, 2011). This simple and free test is similar to those used to measure CRT in athletes, but we are the first to show its use in team sport and individual sport athletes.

PURPOSE

The purpose of the study was to determine the relationship between sport type and reaction time in college athletes.

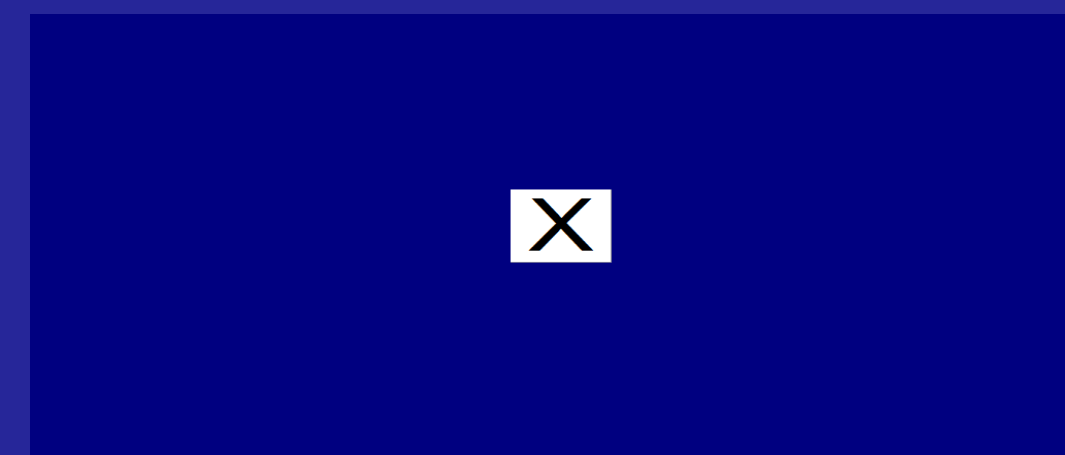
METHODS

IRB Approval: The study was approved by the Institutional Review Board (Human Subjects) at Texas A&M University-Kingsville.

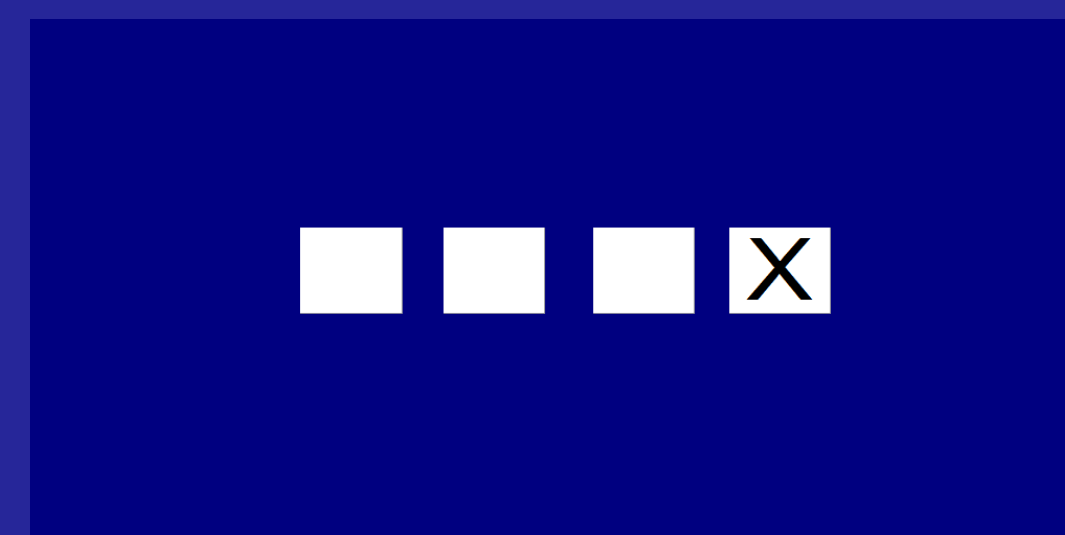
Subjects: Forty two male subjects were recruited from Texas A&M University-Kingsville. The study was composed of three groups ($n=14/\text{group}$): Team-Sport, Individual-Sport, and Non-Athlete. The Team Sport group consisted of basketball, football, and baseball players who were currently a member of the university varsity team. The Individual-Sport group consisted of track and field and cross country varsity athletes, and the Non-Athlete group was composed of students who had never participated in college athletics. The athletes were recruited through word of mouth and by their coaches through email and by phone. All participants were ages 18-26, and completed the informed consent process upon arrival.

METHODS, cont.

Simple Reaction Time (SRT): The participants took the SRT test in a closed room with no distractions. The test was conducted on a desk top computer with a keyboard. After a brief description of the simple reaction time test, the participants had 8 practice sessions and 20 experiment trials. The test began with an empty box in the middle of the screen, and shortly after an X appeared in the box. As soon as the participant saw the X, he then pressed the desired key on the keyboard. The response time measured from 150-1500 ms and the inter stimulus interval was between 1000-3000 ms.



Choice Reaction Time (CRT): The participants took the CRT test in a closed room with no distractions. A brief description about the choice reaction test was given. There were 8 practice trials followed by 40 experimental trials. The response range measured 200-1500 ms, and the inter stimulus interval measured 1000-3000 ms. There were four boxes in a parallel line to choose from on the computer screen. An X appeared in one of the boxes and the subject pressed the corresponding key on the keyboard. Once the corresponding key is pressed the X disappeared and then reappeared for the next trial. The corresponding keys were z, x, comma, and period.



Experimental Design: The orders of the two tests were randomized by the test administrator. The combined time for the test and the description of the test totaled approximately 20 minutes. The data are presented as the mean \pm standard error. Comparisons between the three groups were made using one-way ANOVA for SRT and for CRT. Post hoc analysis was completed using the Tukey test.

RESULTS

For SRT, there was a significant difference among the three groups ($p = .007$). Post hoc tests showed that both the Team-Sport (259.9 ± 4.8 ms) and Individual-Sport (260.2 ± 4.8 ms) groups were significantly faster than the Non-Athletes (281.7 ± 7.6 ms, $p = .016$ and $.018$, respectively). For CRT, no significant group difference was detected ($p > .05$). Team-Sport athletes (403.0 ± 15.8 ms), Individual-Sport athletes (389.7 ± 7.6 ms) and Non-Athletes (407.4 ± 7.8 ms) were not significantly different.

Simple Reaction Time

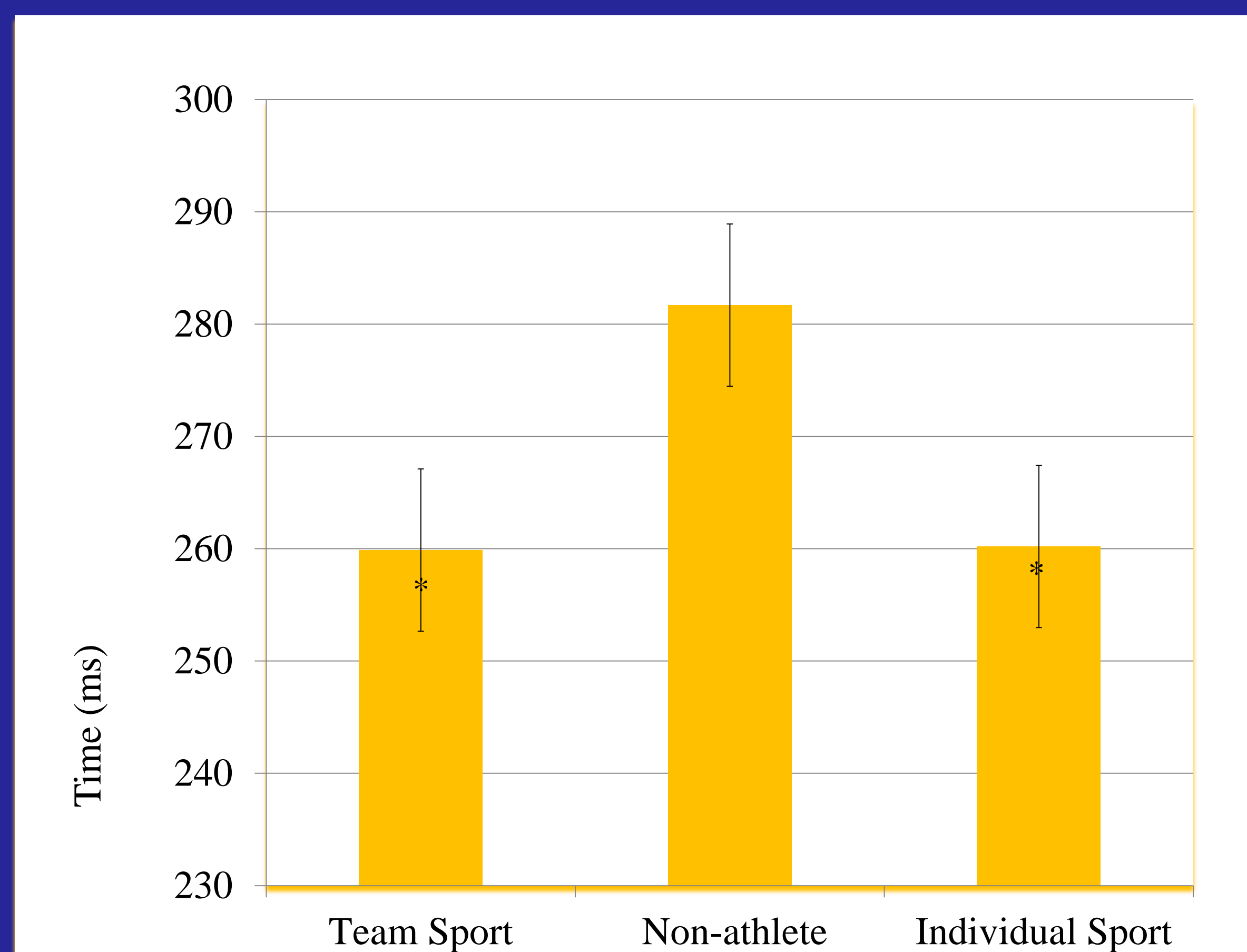


Figure 1. Simple Reaction Time for Team-Sport, Individual-Sport and Non-athletes. * Individual-Sport and Team-Sport significantly faster than Non-Athletes, $p < .05$

RESULTS, cont.

Choice Reaction Time

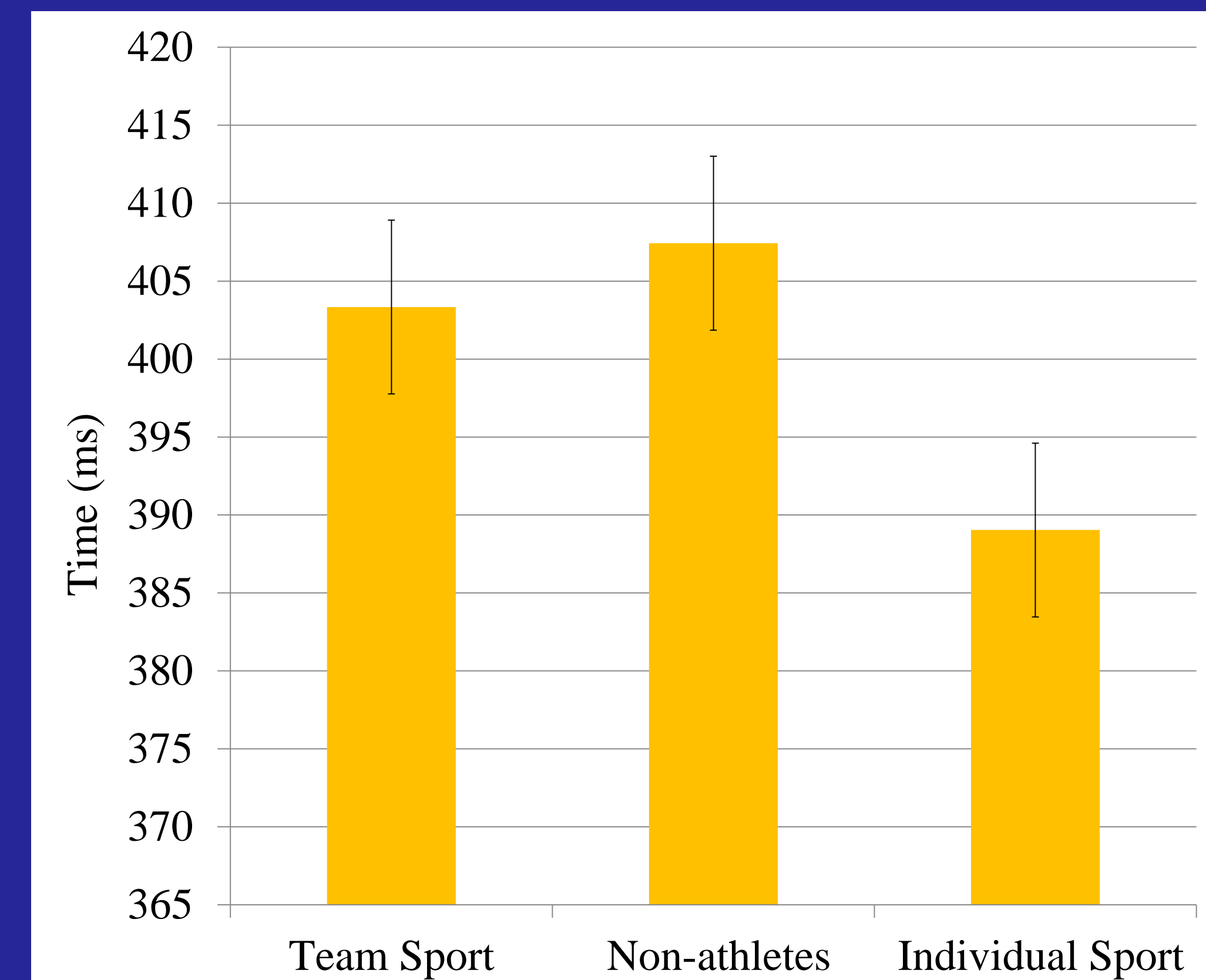


Figure 2. Choice Reaction Time for Team Sport, Individual-Sport and Non-athletes. No significant difference between sport type, $p > .05$.

CONCLUSIONS

Overall, athletes had faster SRT than non-athletes, which is consistent with the literature (Akarsu, Caliskan & Dane, 2009); however, there was no differentiation between sport type. We did not find any difference between sport type for SRT, but we did hypothesize that team sport athletes would have a significantly faster CRT. Team sport athletes, such as football or basketball players spend more time practicing activities that require CRT, whereas individual sport athletes, especially distance runners, spend very little of their practice time improving CRT.

Surprisingly, no differences in CRT were found between athletes and non-athletes. The results did not support our hypothesis. This may be due to the sample population; in other studies, professional or elite athletes were compared to sedentary controls (Heirani, 2012), whereas the athletic abilities of the subjects in this study were not as drastically different from the Non-athlete group. A more complex reaction time test such as a test of discrimination may be needed to detect if more subtle differences exist in this population. Additionally, reaction time is variable as evidenced by the standard error, and it is possible that a significant relationship between different types of athletes may be detected with a larger sample size.

REFERENCES

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