

The reaction time essay sample



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The focus of this study was to investigate how the participation of different sports activities affects the reaction time. Two hypotheses were established based on my research question: " People who carry out sports should have a faster reaction time than those who do not" and " The sport where a fast reaction time is most important, thus where training sessions focus on improving it the most, should have a participants with faster reaction time than the sport where a fast reaction time is less important".

The sports chosen were boxing, badminton, stationary bicycle, judo and swimming. A control group was included. In every group there were 20 participants where 10 subjects were women, 10 subjects were men, 10 subjects in the age group 10-17 and 10 subjects in the age group 18-40. The test was carried out using a reaction timer software installed on a laptop.

The results showed that people who carry out sports do have a faster reaction time than people who do not. The average reaction time for people not carrying out sports was 0. 305 seconds compared with 0. 266 seconds that was the average reaction time for the slowest group of people carrying out sports, namely the people carrying out stationary bicycle. The investigation also revealed that the sport where a fast reaction time is most significant for winning a competition has participants with the fastest reaction times and the sport where a short reaction time was not as significant for dominating a competition had participants with longest reaction times. Boxing, where reaction time is of more essence than in stationary bicycle, had participants with average reaction time of 0. 203 seconds. The concrete results were that the mean reaction times of the

participants, in decreasing order, were the following: Boxing, Badminton, Swimming, Judo, Stationary Bicycle and Control Group.

Word Count: 300 words

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1. Introduction

To be able to participate in certain sports activities one needs to, to some extent, be fit. Strength, endurance, flexibility, balance and agility are some of the factors which might decide who wins a game of some sport.

Another factor that contributes to having an advantage in sports is a fast reaction time.

Reaction time is the time between a stimulus and the beginning of the reaction to given stimulus. 1 The time to respond to the stimuli, which is the time it takes to carry out an action or the movement speed to carry out the reaction, is not included in the reaction time.

To have a fast reaction time might not be as important when dancing as when being out in the ring boxing with a guy twice your size. So it is not always as important to have a fast reaction time.

Reaction time itself is an inherent ability- every individual has got a built-in limited time range to react. But the reaction time is also dependent on a variety of factors, such as practice, experience, anticipation, strength and coordination. So within the range of the individual's reaction time there is plenty of room for improvement. 2

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Reaction time drills are exercises focusing on making a person get used to react in a shorter time than they would actually have to in a real competition. ³ This kind of training seems to be a way to shorten the reaction time more than just being generally physical fit. Hitting a ball that moves 150 km/h in a real competition will be easier if you have gotten used to practicing with balls travelling at 200 km/h. This kind of training would in this case give better results than just running a few miles; otherwise this kind of over-speed training would not have existed.

There are a lot of previous investigations that have been done in order to find out if one can or cannot improve reaction time and even find out if the methods to do so have different efficiency.

One of these studies tested how fast female football players, depending on their football playing experience, were able to answer questions⁴. The result of this investigation was that the longer and more experienced the football player was, the faster did she answer a question. In other words, she was able to come to a conclusion in her mind or decide an appropriate answer faster if she was an experienced football player. However, whether the answers were correct or not was not considered in this investigation.

Another research² that has been done is that Japanese researchers tested 22 baseball players, 22 tennis players and 38 non-athletes. The results showed that baseball players scored better at a test which involved pressing a button or not pressing a button as a result of a stimulus. The reaction time of more skilled baseball players was significantly shorter than that of less skilled players. Professional baseball players had the shortest reaction time

of all groups. The research team concluded that practice can improve reaction time.

A third example is that the authors of an article in *Perceptual Motor Skills*, based on a review of reaction time research, concluded that “reaction time must be considered a skill dependent upon experience and learning.”²

All these researches clearly indicate that one can improve one’s reaction time and that carrying out sports is one method to do so. But it is also interesting to know if participating in different sports result in different improving of one’s reaction time. All sports do not carry out the same exercises and therefore do not give same results. In order to have a further understanding about this investigation we need to know more about the sports that were chosen to be investigated.

Stationary Bicycle is a cardio workout that gets your heart pumping and keeps it there for prolonged periods of time.⁵ Stationary bicycle is a way to train your lower body as well as your heart meaning you become physically fit. It seems to be quite a good way to become physically fit, but not excellent, and no reaction time drills are carried out.

Swimming does exercise almost the entire body.⁶ Swimming seems to be very similar to stationary bicycle, except for that you train your whole body. Still, no reaction time drills are carried out.

From personal experience I can tell that Judo improves one’s physical fitness (not as much as previous two) and reaction time drills are also carried out.

Badminton improves and keeps your body composition optimal for your height and weight. 7 This indicates that playing badminton gives almost the same results as swimming, meaning a good overall physical fitness and from personal experience I can tell that reaction time drills are carried out.

Boxing includes repetitive motion of the arms by sparring and jogging while punching helps arms and legs gain strength and power. 8 Boxing seems to include exercises giving a very good physical fitness results. From personal experience I can tell that boxing is very demanding and that reaction time drills, such as sparring matches where you practice dodging hits that come at very high speed etc. are constantly carried out.

Looking at these brief introductions to the different sports we can try to group them into different categories. The most relevant grouping seems to be: Sports Including Reaction Time Drills (SIRTD), Sports Not Including Reaction Time Drills (SNIRTD) and the control group will be a group of its own. The sports in SIRTD are Boxing, Judo and Badminton. The sports in SNIRTD are Stationary Bicycle and Swimming.

This study aims to investigate whether people that carry out sports have or does not have a significant faster reaction time than those who do not. I would also like to see if practicing different sports result in different reaction times. The results gained from this investigation might be useful for those that depend on a fast reaction time in their profession. With the help of my results special training programs could be set up for those people including the kind of sport that proved to be most efficient in improving reaction time.

I believe these questions can be answered by answering my research question: How does the participation of different sports activities affect the reaction time.

2. Hypothesis

In order to make a valid hypothesis regarding this research question it will have to be divided into two hypotheses.

The first part is comparing the reaction time of people performing sports in general with the control group, which will consist of people not carrying out any sports frequently. The hypothesis will then be: “ People who carry out sports should have a faster reaction time than those who do not”. This is based on the previously named investigations that have been made concluding the same result as this hypothesis.

The second part is trying to figure out which sport gives shortest reaction time. The hypothesis will then be: “ The sport where a fast reaction time is most important, thus training sessions focus on improving it the most, should have a participants with faster reaction time than the sport where a fast reaction time is less important”. Since both carrying out physical exercise and doing reaction time drills decreases one’s reaction time we can predict that the sport that includes the most demanding and exhausting physical exercise and where a good reaction time is most important will have the people with the fastest reaction times. For this hypothesis we can use the previously made groups, SIRTD and SNIRTD. Then my hypothesis will be that SIRTD got participants with higher reaction times than SNIRTD, and the Control Group will have the slowest reaction times.

3. Controlling the Investigation

- The age of the participants was controlled because it is known to affect reaction time. 9 Half of the participants were in the age group 10-17, and the other half were between 18-40 years old. They were asked how old they were and if within the age groups they were invited to do the test.

- Time that the experiment was carried out relative to when the participants trained last. They therefore did the test after approximately half their training session so that they got a relatively high pulse. I was trying to make sure they were at the aerobic stage where the pulse should lie in the interval of 70%-80% of max pulse (about 140 for all ages) since here one is using most energy and is most alert. 10 The max pulse is known to be 220 subtracted with the age of the individual¹¹ but due the percentage intervals for the aerobic stage individuals between the age group 10-40 fall between 140 $\frac{1}{2}$ 10 in their aerobic stage.

- What they have consumed before. Things like coffee and energy drinks are known to affect reaction time. 9 This was controlled by letting the trainers warn the participants in advance.

- Sleep. It is important that the individuals had received at least 6 hours of sleep. This will be controlled by asking them and letting them know in advance. 12

- Gender. It is known that males and females do not have the same reaction time. 9 This was controlled by having an equal amount of female and male participants.

- Type of stimuli. Reaction to audio stimuli seems to be faster than that of visual stimuli. 9 This was controlled by using the same test on each individual.

- Distractions are known to affect reaction time and an attempt to let participants do the test in their usual training environment was therefore made.

Control Group: People that do not carry out sports.

4. Method

1. I started with deciding what sports clubs I would visit in order to carry out my experiment. The decision was depending on the availability of local sports clubs. I was at the time participating in boxing and lifting weights in the local gym so I decided to chose the boxing club and stationary bicycle that people carried out in the local gyms. I had been participating in swimming, badminton and judo in the past so I knew that these were available as well. These were the sports that were chosen for my experiments. I also knew, from experience, that there would not be sufficient with people at one time in a club for me to be able to carry out this type of experiment, since it is suggested that 3009 individuals should be used so I decided to use only 20 subjects from each sports club. The 20 individuals from each sports club should be of different age and gender since previous studies show that gender and age affects reaction time.

So the age and gender had to vary in all clubs so that the results would not be biased on the fact that there might be 20 young men doing the test from

boxing while all swimmers were old ladies. I decided that out of these 20 individuals from each sports club, there should be 10 females and 10 males where 5 of each are in the age group 10-17 while the remaining half would be in the age group 18-40. The lower limit of first group was chosen because research shows that coordinative maturity comes before sexual maturity, at an age of about 11 years. 13 The upper limit was chosen because of that one is considered an adult at the age of 18. The upper limit of the second group was just estimation because research shows that people seem most physically active at the age of 27 but after 30 it decreases. 14 The ages were all just qualified estimations. I called and booked time with the sports clubs and asked if they could inform the participants to not consume anything for two hours before their training session the date I was supposed to attend. This had to be done because many nutrients affect the reaction time significantly- such as monosaccharides and caffeine. 9 They had also to be informed of that if possible, they should try to get at least 6 hours sleep since lack of sleep is another factor affecting reaction time. 9&12

2. Now I had to find a method to test the individual's reaction times. Since I was to test the reaction time I wanted to have an experiment where only the time between given stimulus and the beginning of reaction time would be measured- the movement speed and response time should be as insignificant as possible. A software called ReactionTimes¹⁵ was found. The software works in such a way that on an orange screen, a square of approximately 5cm*5cm size with the color cyan appears. The size and color of the square had to be consistent to all trials done since that are a factor affecting reaction time. 16 The bigger and more contrast the popping square

has, the faster reaction time. As soon as it appears the subject must click the mouse button with their dominant hand. The dominant hand had to be used since this has shown in previous studies to affect the results. 9 The square would then disappear and at a random occasion between the intervals of 1 to 6 seconds it would re-appear. This happened 10 times and the data was automatically recorded for all trials and stored in the computer. Only one run were done per participant due respect to the training session.

3. At the set times and dates I visited the different sports clubs. I told the trainer for the day to go on with their usual planning in order to take as little of their time as possible, even though a controlled experiment where their pulses would reach the pulse of 140, as previously discussed, would have been better since at this pulse their bodies use most energy and is most active. An estimation was made that at approximately half their training session where they should be properly warmed up and a quite high pulse rate should have been reached I asked the trainer to pick them out one by one to come and do the test.

4. Now that the data for the reaction time of all sports were recorded by the software I had to carry out the same experiment on the control group. Subjects for this group were not hard to find since I used friends, parents of friends and relatives.

5. The data was converted into an Excel sheet since I could not handle the software's calculating functions with mean values, standard deviations and T-test. The mean values and the standard deviations were calculated using

Excels calculating function while the T-test was calculated using a T-test calculator web page.

5. Data Presentation

Graph. 1: The mean reaction times for the different sports with their standard deviations presented in a decreasing order of magnitude.

As it can be seen, almost all SIRTd seems to have shorter than SNIRTd and the participants from the control group got the longest reaction times.

In order to find out whether there was a significant difference between the control group and the different sports, T-test was used.

Table. 1: T- comparing the different sports with the control group.

Sport

P-value using T-test

Significant Difference?

Stationary Bicycle

0. 0140

Yes

Swimming

<0. 0001

Yes

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Judo

<0.0001

Yes

Badminton

<0.0001

Yes

Boxing

<0.0001

Yes

There is a significant difference, meaning the null hypothesis can be neglected, if the P-value is “small” (<0.05). In the first case when comparing the participants of stationary bicycle and the control group, the P-value was small enough for neglecting the null hypothesis. In the other cases the results were extremely significantly different than the control group.

6. Conclusion & Evaluation

The boxers had the best reaction time with a mean of 0.203 seconds (SD: ± 0.018) while the badminton players came in second with an average reaction time of 0.218 seconds (SD: ± 0.021). The swimmers had an average reaction time of 0.227 seconds (SD: ± 0.027) which made their time the third best and were tightly followed by the subjects carrying out

judo that had an average reaction time of 0.233 seconds (SD: ± 0.030).

The subjects carrying out stationary bicycle came in fifth place with the reaction time of 0.266 seconds (SD: ± 0.046) as an average and last place was the control group with an average reaction time of 0.311 seconds (SD: ± 0.048).

Since the standard deviations were relatively small compared to the actual values it means that there were not a large variation in the data indicating that the results were reliable.

The research question of this investigation was: How does the participation of different sports activities affect the reaction time. The result of this investigation was that participants of a sport have better reaction time than people not carrying out sports. It is also so that participants of different sports have different reaction times, in this case proven that SIRD have shorter reaction times than SNIRD.

These results cohere quite well with my hypothesis. I had predicted almost the same results, except for the fact that the subjects carrying out judo had a worse average reaction time than those carrying out swimming, which broke the trend of all SIRD having shorter reaction time than all SNIRD.

This can be because swimmers work a lot more on their physical fitness than the ones in judo and even if the judo participants do to some extent carry out reaction time drills it is not enough to cover up for the great difference in the physical fitness. As I, personally, have once upon a time had the physics fit for someone in the control group, then later practiced badminton, swimming, boxing, judo and stationary bicycle, I can confirm that practicing

judo will not have nearly as good effects on one's physical fitness as when swimming. I did not find any other studies treating the specific sports in this manner so any direct comparing cannot be done with literature values, but I think it is safe to state that the results of this investigation were accurate comparing to what should be expected.

Boxing on the other hand takes physical training to new levels. It is a very exhausting sport where having a good reaction time is one of the greatest factors deciding who wins a match. It was clearly stated in the hypothesis that it should be the sport that got participants with the fastest average reaction times and that coheres very well with the results.

Badminton requires a lot of flexibility and in order to be able to shoot back the shuttlecock as well as using any feints at all one needs to have a very good reaction time. Since carrying out this sport leads to one day after day having to use their reaction time to its limit it will improve with time.

Looking at the results from the T-test it is very clear that it is significantly differing from the other values where people carry out sports. This also coheres with the literary facts that previously have been presented that implies that people not carrying out sports should have a slower reaction time than those carrying out sports, no matter which one, since “ even a single bout of exercise helps” 19. One might wonder how long one has to participate in a sport in order to experience significantly shorter reaction time.

These results are of high importance and the use of this knowledge can be very wide. People that need a short reaction time in their profession can

carry out; in this case boxing or the reaction time drills of boxing, in order to have the optimal reaction time that can be required as a police officer. Other professions include stewardess, firefighter and truck driver. The knowledge of that sports do shorten reaction time and that it differs from sport to sport can encourage people to start carrying out what in this case is boxing. Since a good reaction time is required in everyday life and is of vital importance when just driving from home to work it can save many people if they are encouraged to start boxing. 20

7. Weaknesses & Errors

- The numbers of subjects used were very few compared to the approximately 300 ones that have been suggested for this type of experiment. 9 This is a very significant and major weakness in this experiment since 20 subjects did 10 reaction tests each for each sport and the mean reaction time was measured. The reaction time would have been affected if some of the subjects were newcomers to the sport, were sick, had attention problems, had consumed coffee etc. If the subjects had been greatly more in numbers than they were, then the outliers would not have affected the mean as much as they would and probably did right now, but this was impossible to achieve due time limits.

- Some of the participants stood in line in order to be able to do the test while others jumped out in the middle of their exercise in order to do it. This lead to that some were breathing more heavily and their heart-rate was higher than the ones who were standing in line. This is not very significant

unless the participants were so breathless that it would distract them from carrying out the experiment properly.

- Distractions also seemed to be a problem. Even though a good attempt to give them all, even between the different sports, a fairly constant environment it would still differ a little. They were given their own habitat and the same amount of noise as they were used to as when exercising by taking them out one and one while the rest were still practicing, but a good example of an occasion where a significant distraction occurred was in the judo when they were exercising using balls for some kind of game and one of the balls hit the subject while she was doing the test. Of course I let her re-do the test but other similar distraction that I did not notice may have occurred. Since, as previously discussed, distraction is a factor affecting the reaction time this was fairly significant but still not very much so since it was probably just occasional and rare distractions and only individuals would be affected.

8. Improvements

- Instead of finding 300 subjects to do the experiment, which would have been very hard, I could have spread out the experiment during a long period of time and instead taken repetitive test samples of the people they got in the various sports clubs that were included in the investigation. The people could have done far more tests instead, and that would have made the result a lot more precise and accurate.

- If I had made sure that all the participants would have had approximately one minutes of rest before doing the test there would at least not have been a risk for them to be distracted by their breathlessness.
- If the subjects had been removed from the practice area to a room nearby with windows and doors the major distractions could have been avoided at least.
- Further control of the nutrient intake and sufficiency of sleep by making them sign a paper approximately one week before their reaction time test where they guarantee that they will have slept the minimum amount of time and not consumed anything in the given number of hours before the test.

9. Further Experiments

- A relevant further experiment would be if one had done test on newcomers to a sport repetitively over a year to check if there would be any improvements. If there had been newcomers to all sports including a control group, the improvements could have been measured. This way we would in a clearer manner be able to see which sport really does improve one's reaction time the most.
- Instead of using visual stimuli we could have used audio or sensational stimuli in order to get a reaction from the subjects.

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