Science Fair Report Golf Ball Essay, Research Paper

Introduction

This year I have decided to test a question that has been an interest of mine for quite awhile. I am going to try to find the perfect set of materials for a golfball to give the ball the most carry. I have chosen this specific topic because of its personal interest to me. I have and always will be an avid golfer. But like most weekend duffers, I would like to gain an extra edge on my opponents an since I m too lazy to actually go take lessons or go out and practice four times a week, I have chosen to use my science expo project as a way to improve my golf game. So first off I d like to give you some background information so you will be able to understand my project better.

Background Research

-Introduction

The question I am trying to answer is “Do the materials of which a golfball is made of have an effect on how far the golfball travels.” In order to answer this question I had to conduct research to further my knowledge and understanding of golfballs. Here I have compiled the information I have thought most useful and set them in a format so that people reading this could better understand my ideas through my research.

-Golfball Covers

There are a myriad of items which golfball covers are now made of. Materials such as Balata, Surlyn, Zylin, and Elastomer are some of the materials which are used to create the outside shell for golfballs. Balata, being the smallest of these materials, is made out of a natural rubber. Surlyn, the most durable cover, is the most used cover of them all. It revolutionized the way golfballs were produced when it was introduced twenty years ago. Most companies which manufacture golfballs either use Surlyn or some material which is similar. The Balata cover provides more spin than most of the other covers. This provides more control over the ball the a player who likes to have maximum feel and control. Many of today s regular golfers have turned to more durable covered balls because an occasional mis-hit will not damage the cover of the ball as easily. This information helps me to understand how the cover of a golfball may effect my test results. If I use three kinds of balls that have Surlyn covers and then use a Balata covered ball, it will in fact destroy my analysis because I will have based my conclusion on falsified data, deeming my project inconclusive.

(http://www.savingsolutions.com/ballinfo6.html, 2001)

-Golfball Pieces

One piece golfballs are perfect for a beginner and are most commonly used at diving ranges. This type of ball is usually made from a solid piece of Surlyn with dimples forged into it and is rarely if ever used as a playing ball. This type of ball is inexpensive, quite durable and has a softer feel when it makes contact with the club, however, this type of ball gives you less distance because of its low compression. A two piece ball is frequently used by the typical weekend duffer because it combines durability with distance. This kind of ball is generally made up of a single solid core enclosed by the balls cover. The two piece is almost indestructible and has a great roll distance. It is by far the most popular golfball among everyday golfers. The three piece ball which have either a rubber or liquid center covered by many yards of elastic windings over which is molded a cover. Three piece balls, also known as “Wound” balls, are softer and therefore allow more spin than either the two piece or one piece. These balls are typically more easy to control for higher skilled players. The proceeding information helps me considerably. It shows the how the materials of which a golfball may effect how the golfball handles. Therefore, when I am finished with my project, I will be able to refer back to here and see if my data supports my research here. This research gives me a good idea of what to expect during my project.

(http://www.savingsolutions.com/ballinfo8.html, 1998)

-Golfball Aerodynamics

This article shows the development of the golfball over time, from the Featherie to the Hammered Guttie to the Three piece Titleist DT Spin. It shows how the modern dimple pattern of today is used to decrease the amount of drag that the ball has to overcome while flying through the air. The dimples have quite a great task in helping the golfball reaching its maximum distance. They make sure that there is the least possible amount of air sticking to the ball so that the ball may fly its maximum span of distance. This helps me to further understand how the design of a golfball helps the golfball to fly. It aids me in understanding my project more so that when I conduct my actual experimenting, I know what might effect my results and how to control these things.

(http://www.savingsolutions.com/ballinfo4.html, 1997)

(http://www.titleist.com/htm/tech/aero2.asp, 1998)

-Possible Explanation

I found this article in Golf Digest. It is actually more of an advertisement for the new Nike Tour Accuracy ball. It shows how Nike s new ball, which is composed of a “high density polybutadiene solid core surrounded by a conductive ionomer transition layer sheathed in a soft yet durable polyurethane cover,” is just plain better than the three piece wound ball. It gives data and statistics to prove there point and gives quotations from interviews to prove its point. This article may not be useful in really understanding a how a golfball works or how I should conduct my experimentation, etc.; this advertisement tells me straight forward that the materials in a golfball do greatly effect the golfball. This is the answer to my question. It is all backed up by data and shows how a ball that has some sort of wound elastic or rubber bands does not meet the standards which the new Nike Tour Accuracy ball has set. My only question now is; how greatly do the materials of a golfball effect the distance and/or spin of the ball.

(”If you re a wound ball, Sorry.” March 2001: 1-2, 2001)

-Golf Range Activity

This activity helped me to better understand the concept of drag. In this activity you were able to choose the force with which you hit the golfball and the angle at which you hit it. There was a hole set a certain distance away and you were to try to get the ball in the hole (just like on an actual course). However, you had the option of playing with a ball that had the dimples in it which would be more aerodynamic and fly further, or you could play with a ball which had fewer or no dimples in it and therefore had more drag. This is useful to me because it helps me to understand further how a golfball works and why its shaped the way it is. The format this learning tool was put in was also very helpful because instead of sitting here and reading some article on the Internet for fifteen minutes, I was able interact with the forces which make a golfball fly and therefore show my understanding of the concept of drag.

(http://www.explorescience.com/activities/Activity\_page.cfm?ActivityID=19, 2000)

–Golfball Compression

At first compression was used to determine golfball quality. It was actually used to reference the tightness of the windings around the center of the core of a three piece ball. This created an illusion that compression effects the distance and performance of the ball. Since the technology of the three piece ball has grown steadily, golfball compression has merely become a condition of feel.

Also with the new availability of a good consistent two piece ball, compression has become an archaic way of measuring the quality of a golfball. “Today the word compression relates to a certain value placed between the number 0 and the number 200. Each ball is given such a number which tells how much the golfball s shape changes under constant weight.” As each three piece and some two piece balls are produced they are exposed a regulation weight. “(http://www.savingsolutions.com/ballinfo7.html, 1997) A ball which does not compress under this weight is given the number 200; a ball that compresses 2/10ths of an inch or more is rated zero. Between these two extremes, for every 1/1000ths of an inch that the ball compresses, it drops one point from 200 and the compression rate is then established. Most balls have compression rates around 80, 90, or 100. Not every ball that says 80, 90, or 100 actually has a compression rate of 80, 90, or 100. Balls can fall within three to five points of these ratings. These balls are then usually sold to driving ranges or marked as x-outs.” (http://www.savingsolutions.com/ballinfo7.html, 1997) It has been said that compression relates more to the feel of the golfball and your own superstitions than to the actual performance of the ball on the course. Studies have shown that if you take balls, rated at different compression values, which have the same cover, construction, cover material, etc., and use an automatic golf swing machine, the yardage between each ball is not enough to be significant. In fact the differences between each golfball was less than two yards. Thus this information consoles my ideas on compression. I thought ball compression might play huge factor, during my testing, as a variable. I was unaware that balls had different compression rates until I started researching and talking to people about my project. I am glad to find out that previous testing shows that differences are negligible between golfballs with different compression rates. I found this information also quite intriguing. I had always wondered why some golfballs were x d-out, and where driving ranges got there balls. However, I now wonder why companies, such as Titleist, x-out such balls if studies show that compression makes almost no difference in the distance the average person can get out of the ball.

(http://www.savingsolutions.com/ballinfo7.html, 1997)

-Summary

I hope you have found my research most interesting and enlightening. I m regret to say that I would have been able to conduct more research and maybe be able to do a better job had the fateful event of the underwater cable snapping, which cut off all Internet services, had not occurred. However, I m sure that this information will do quite well for now. I would just like the fact of the Internet being down taken into consideration when the grading of this research summary is done.

–The Role of Variables

-Variables which will need to be controlled

A) Wind Speeds may effect testing. The wind speeds will effect the distance a golfball travels my having the ball ride in its gusts to a further distance it would normally travel or by screeching it to a halt, short of where it might ve landed. This may alter the data I collect and because I am unable to control Mother Nature this might render my testing unreliable because I am unable to test indoors with the facilities I have available to me.

B) The force with which each golfball is hit with will most definitely effect my test results. I may barely tap one golfball and have it travel two inches whereas, I could take a full swing at another and have it travel one hundred yards. If this happens my test is totally questionable. However, I have taken steps to control this variable. I will hook a golf club up to a swing set. Then I will pull the swing set back to a certain point and then let it go. By doing this it keeps the force steady.

C) The type of golf club that each ball is hit with will certainly effect the data which is produced during testing. If I hit five balls with a driver and the rest with a nine-iron, then the results I wont know whether its the club that s hitting the ball further or the materials inside the ball, or both. So I plan to use a pitching wedge for half of the trials and then a three iron for the other half. I will separate the data I get for each club into different data tables and compare whether the balls performed pretty much the same under each condition.

D) The conditions which each ball is subjected to might have some sort of effect on my test results. I plan to keep all the golfballs under the same surroundings (temperature, moisture level) 24/7 except when testing.

E) The color of the ball. I think this may not potentially effect the data which I collect but I have still taken some precautions. I am using all balls of the same color just to make sure my test results are valid.

F) The conditions which each of the balls was subjected to during production and distribution may have been different. There is no way I was or will be able to control this variable. I don t think this variable should potentially effect my test results either because each ball is machine processed in the virtually the same way as far as I can tell from my research. I just hope there was no difference in shipping and manufacturing between golfballs.

G) The materials of which each golfball I am testing could effect test results. Now this is my experimental variable so I suspect this to effect results but I am testing three balls of each kind. I don t know if accidentally, during production, that if I have three balls of same kind, they were filled with different materials. Let s say I bought ten Titleist balls that were all supposedly filled with a hard rubber core but instead three of them are filled with titanium. I would never know and the distances each ball traveled would vary because of the materials and the average would be different then if all the golfballs were filled with a hard rubber core.

H) Time is a big factor here. If I test on different days, the conditions from day to day may change making my test inconsistent and possibly unreliable. I will have to conduct all tests on one day.

-Experimental Variable

The variable which I am changing in this experiment is the materials inside the golfball. I have bought different types of golfballs which have different cores and inner-layers. I will be testing the distances each of these golfballs travels and recording my results.

-Control Group

There really is no set group to use as a control group for my experiment. I am going to use the standard designed golfball. A golfball that has been held as a reference point in golf technology for the past couple of years.

Hypothesis

I hypothesize that there will be quite a minuscule difference between golfballs. The materials, which the golfballs are made of, differ so little that the difference in distance should vary remarkably little.

Materials

1] A golf club with a straight shaft

2] 3 Titleist DT Spin golfballs

3] 3 Titleist HP Distance golfballs

4] 3 Top-Flite XL2000 Super Titanium golfballs

5] 3 Ultra Metalmatrix golfballs

6] 3 Pinnacle Gold Distance golfballs

7] A swingset or other device which will keep the golf club swinging at the same velocity for each trial.

8] Tees to hold the golfball up

9] An open area for the golfballs to fly through without breaking any windows or hitting any people.

10] Pen/pencil and paper to record data with

Procedure

1] First I will use duct tape to adhere the golf club to a swing so that the club swings at the same velocity every time.

2] Then I will set the golfball up on a tee in the line of fire of the club

3] Then I shall bring the club/swing back to a certain marked off point and let it go.

4] The club should then make contact with the ball sending it soaring across the field.

5] I will then measure the distance the ball travels in feet and inches.

6] I will repeat each step with each ball and record the data which these trials produce

7] I tested each ball five times . I tested three balls of each type and I have six different types of balls. This will make a total of 90 trials. 90 trials is a lot of trials for such a short period of time that we have and it should yield the best or at least very good results.

Data/Results:

General Observations

-There were almost as many mistrials as trials which were used as reliable data.

-When the golfballs were used in the trials conducted with a three iron seem to have traveled further than the when hit with a pitching wedge.

-All balls seemed to fly slightly to the left of the tee.

-It seemed as though all the golfballs went about the same distance.

-Sometimes the ball was hit twice by the pitching wedge during one trial. These were then counted as mistrials.

-The wind speed was inconsistent.

-There were less mistrials with the three iron.

Data Tables/Graphs/Calculations

-To find the averages, for each brand of golfball, and make the graphs for each I had to convert all the data into inches. To do this I multiplied the number of feet by twelve and then added the remaining inches. Then to find the average I had to divide by the number of trials (ten).

-Graphs and tables of data are shown on the following pages.

Analysis

Sources of Error

-As I said before, the wind speed was not constant. This could ve effected the distance each golfball traveled by either creating friction against the ball and stopping it short of the distance it might ve traveled or it could ve carried the ball further than it would ve gone had there been no wind therefore, making my results somewhat unreliable.

-I measured the distance that each ball flew plus the distance it rolled. Each ball did not roll over the same patch of grass as the others. The grass where I tested can have a different texture depending on where you look. One ball may have rolled over a part of earth where there is no grass and it would ve been able to roll further than usual because of less friction whereas, one ball may have rolled through a patch of towering weeds which would cause more friction between the ball and the grass and it would slow the ball down quite a bit, stopping the ball short of where it might have gone had there been no weeds.

-I tested on two different days. It may have been more humid on one day than the other which could have effected my test results. On a more humid day the moisture in the air may have gotten into the tiny holes in the golfball and made the ball swell a little. This would eventually create a bigger and less aerodynamic ball. Being less aerodynamic would definitely slow the ball down and stop it short of the distance it may have originally gone.

-I used duct tape to adhere each club to the swing set. Now I used quite a bit of duct tape to make sure the club was steady but there is a possibility that the club may have shifted during testing and that may have resulted in some balls going further than others.

Reliability

Even though I did list quite a few possible sources of error I still think that my data is reliable. However, I do not think I conducted enough trials to find a significant difference in distance between balls. I think that many, many trials must be conducted to show much of a difference and I think the difference these tests would show would still be quite minute. Plus conducted many, many trials would be very time consuming. It would take quite a few weeks to conduct enough trials to see any kind of difference and I just did not have the time to do this. I believe that my measurements were accurate enough. I used a tape measure to measure from where the ball was hit from to the middle of ball.

Significance

My data is not significant at all. I would need to conduct a number of more trials to find a significant difference. An inch or two in golf is nothing special. To say that one brand of golfballs has a longer carry than another takes proof of the ball out shooting its counterparts by at least ten to twenty yards. Now that s a significant difference. Two or three inches is a difference but not enough to make me go out and a box of Top-Flite balls because they traveled that extra inch.

Conclusion

My data shows that my hypothesis is heavily supported. There was no significant difference in the distances each ball went. I then conclude that because of the dwarfish difference between the materials used in each of the golfballs there is virtually no difference in the distances each went. My data shows that the Top-Flite brand carried a little further than the others but to really find a significant difference I would conduct a myriad of more trials. However my hypothesis was still somewhat supported. I hypothesized that there would be a minuscule difference between balls. It is possible that because the materials in each ball do not vary all that much that even with more testing there would be a microscopic difference. My data shows that my hypothesis is heavily supported. There was no significant difference in the distances each ball went. I then conclude that because of the dwarfish difference between the materials used in each of the golfballs there is virtually no difference in the distances each went. Then again, I am almost positive that the answer to my question (do the materials of a golfball effect how far the golfball travels) could possibly be yes. I mean, if I shaped a piece of wood into the shape of a golfball and then covered it in surlyn, the distance it traveled would not be as far as if I did the same with a sheet of aluminum. For further study I would look into golfball compression. I did not take into account this factor when testing. From my research, I learned that golfballs are designed to be hit at high speeds for them to be compressed and function normally. I hit each golfball at a relatively slow speed. I would estimate about 5mph if even that. Golfballs should be hit at about 60-120mph. So the golfballs I tested may not have been compressing like it ought to which could definitely effect my results. Apparently, through my research (refer to background research section), I was able find out that the compression of a golfball may have a certain effect on how far the golfball travels. If golfball does not compress well than it will be less aerodynamic and fall to the ground earlier than a ball that might compress better. I was unable to find out the compression of each ball I tested. So basically, I am completely in the dark on whether this might have effected my results and caused my data to come out the way it did. Compression may be the reason for some balls, such as the Top-Flite, posting farther numbers than say the Wilson Ultra ball. This may be the key to my results and the answer to why some of the balls behaved differently. Although I still stick by my reasoning, that because the materials that were used in each golfball are so similar and have basically the same purpose, that it would be natural for each golfball to perform the same way. I would still look into this as another possible answer and I would definitely conduct testing on this area to find out more. Also each type of ball did not necessarily perform the same way, compared to the other balls, when a different club head was used. When looking at my data table you can see that the Titleist HP went the furthest out of all the balls (15ft 3in, note the DT also traveled this average distance when hit with a pitching wedge) but then when I used a three iron to hit each ball; the HP succeeded in performing second worst out of all the different types of golfballs that I tested. As I have discussed before, my results may have been unreliable too. I discussed the possible sources of error. Now these possible errors which could ve effected my testing were controlled to a certain point by the number of trials I conducted but they also may have had a part in altering my results. I think this to be very unlikely, but it is still a possibility that I can not leave out.

Now here I would like to reflect on what I learned here and the value of this project. I always disliked science fair because of all the effort, work and time that is needed to put into this project to be able to pull out a decent grade. However, I think that is a good thing, seeing how this project is counted as almost half of your grade, you have to work hard and actually do some learning about the topic your testing and then in order to do everything right, you must go through and learn the scientific process and then apply to your situation. This project basically shows how much you ve learned and how well you can apply it. It forces you to work hard. But it also takes quite a bit out of the yearly curriculum. There needs to be some classtime dedicated to working on this project. Nevertheless, when your already behind in the year s curriculum then its hard to get back on track and learn everything that s is supposed to be learned throughout the course of year after the science fair. Even though this project Is of great value as a learning tool, it is also necessary to learn the science curriculum that s supposed to be taught every year. I learned quite a bit about what scientists have to go through whenever looking into any kind of question and I learned a lot about golfballs too. I never would have found out about half the stuff I now know about golfballs without the science fair. I also would not know have the things I know about the scientific process and how to conduct scientific testing without science fair. Overall I think science fair is a must. It should be kept as a yearly activity throughout middle school so that young adolescents like myself can spend time reviewing the basics of science and learning new concepts. To close I believe that I have learned a lot through my past three science fairs and I regret that this type of investigation is not carried on into high school. It presents a new way to view ideas. I hope you thoroughly enjoyed looking over my testing here. It has been a pleasure doing this project.