Hit or Miss:
How bat compositions changes the game

Testable question

How will changing the material of a baseball bat affect the speed of the ball?

Hypothesis

Using a metal bat will increase the speed and how far the ball travels and using a plastic bat will decrease the speed and how far the ball travels.

Introduction

We decided to test a variety of different types of bats and their effect on the speed of a baseball. Each bat had three trials or three hits. We took the average time and distance from the three trials to determine the average speed and the distance traveled by the ball for each bat. We had a lot of students in our class that play baseball or softball, so this testable question had a lot of votes from our class. Knowing the type of bat that hits balls the farthest and fastest will help our school's athletes be more competitive.

Research for bat weight, length, and composition

We brought in our personal bats and researched the weight, length, and composition

- **Hype Fire:** Length- 31 in/ Weight- 21 oz./ Material- composite
- **Easton maximum ultra:** Length- 12 - 30 inch. Weight- 18 oz./ Material- composite made of seamless carbon construction.
- **Sluggers paradise:** Length- 30 in/ Weight -23 oz/ Material- maple wood
- **Blitzball:** Length- 35 in/ Weight- 8 oz/ Material- High quality plastic
- **Easton Crush:** Length- 28in/ Weight- 18 oz/ Material- aluminum Alloy
- **Worth toxic T-BALL:** Length- 24 in/ Weight- 10 oz/ Material- lithium alloy aluminum.
- **Avenge pro bat:** Length- 29 in/ Weight- 19 oz/ Material- charged carbon (handle); Armor enhanced alloy

Research Notes

- **The Average exit velocity for a 13 year old is 60-65 mph.**
- **The average velocity for a 13 year old pitching 60-75**
- **The average 13-year old baseball player hit is 225-275 feet**
- **Bats typical weight is 31 to 35 ounces**
- **The peak length of the bats is 31 inches.**
- **When a player practices hitting with a heavier bat there normal bat tends to feel lighter to them which can lead to higher exit velocity and can lead to easier control.**
- **Composite bats hit further than a wood bat due to there superior trampoline affect.**
- **Heavier bats tend to work best only as training tools.**
- **Composite bats are said to be the best type of bats for youth**
- **Faster bat speed affects the exit velocity of a ball.**
- **Softball bats are lighter so they will swing faster. But heavier bat can lead to farther hit power.**

Materials

Blitzball bat (plastic)
Wood bat
Composite metal(HYpe fire,Easton maxum)
Metal bats

Baseballs
Baseball field
Measuring tape

Variables

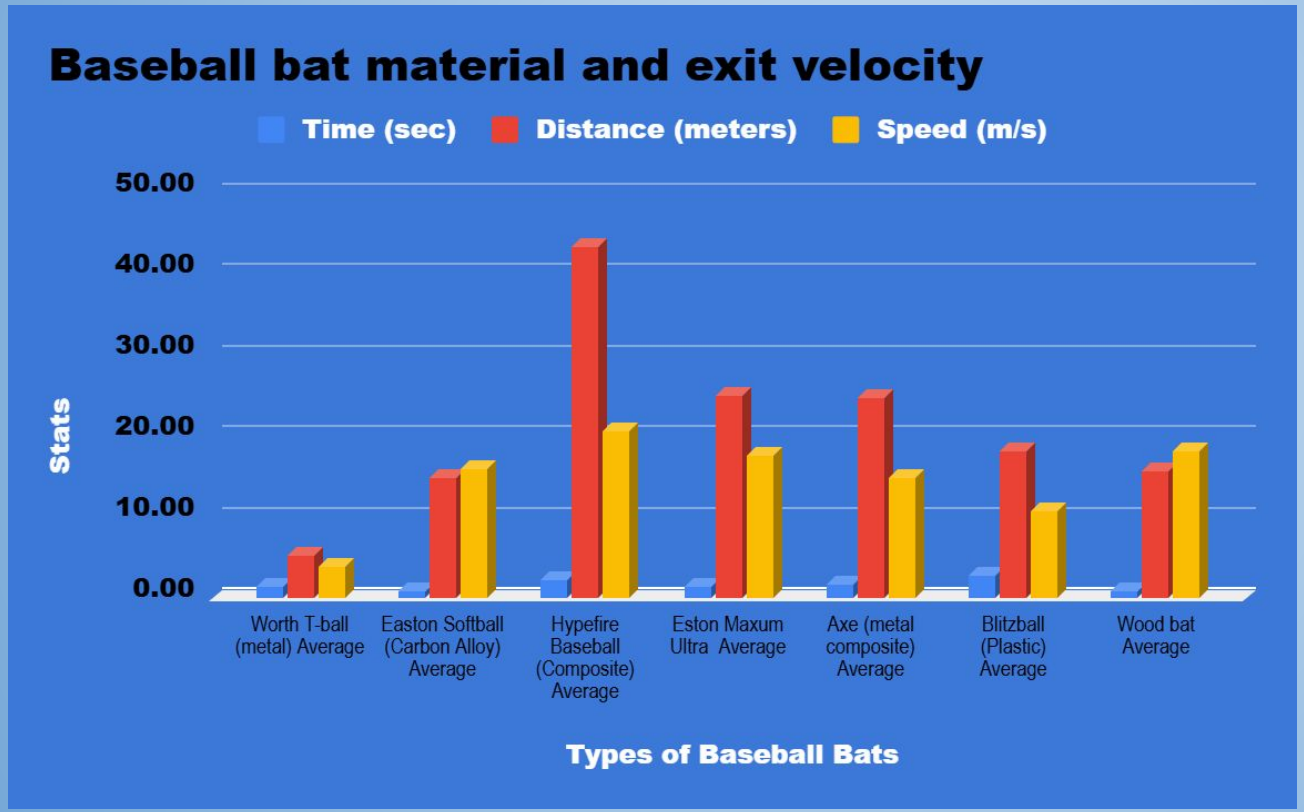
The independent variable is the different bats that we used. Our dependant variable is that the speed and distance as we switch each bat.

Our controls were the pitcher and pitches.

Procedure

- Assign students with various jobs (timers, recorders, rock placers) and have them take their places
- Pitcher pitches the ball
- Batter hits the ball
- Start the stopwatch as soon as the bat connects with the ball
- Stop the stopwatch when the ball hits the ground (three people with stopwatches to get average repeat three times.)
- Place a rock where the ball originally landed
- Measure the distance from home plate to where the ball landed
- Repeat with different bats made with different materials
- Observe and record the results
- Figure out the averages for the distance and time for each trial then calculate the speed

Graph



- Each baseball bat was tested three times. The averages are graphed here.
- The speed was calculated by dividing the average distance traveled by the ball by the time the ball was in the air.

Table

# Bats	# Time (sec)	# Distance (meters)	# Speed (m/s)
Worth T-ball (metal) Average	1.31	5.26	3.89
Easton Softball (Carbon Alloy) Average	0.90	14.73	15.95
Hypefire Baseball (Composite) Average	2.16	43.34	20.53
Eston Maxum Ultra Average	1.36	24.78	17.59
Axe (metal composite) Average	1.71	24.63	14.84
Blitzball (Plastic) Average	2.59	17.97	10.64
Wood bat Average	0.85	15.71	18.02

Trends and Observations

- **The hypefire bat was the bat that hit the farthest distance and had the highest of each stat.**
- **The T ball bat was the bat that hit the shortest distance.**
- **The metal bats had around the same air time.**
- **The Easton and the wood bat both had higher speed than distance.**
- **The wood bat had the shortest air time.**
- **The T-ball bat had the slowest speed.**

Discussion and Interpretation

Our experiment was designed to see if the material of a baseball bat would affect a ball's speed when hit. Our data shows that in fact the material of a baseball bat makes a noticeable difference. We tested different materials in many bats. Our data supports our hypothesis that different materials make a difference in a ball's speed. To be more specific the bats we saw with the highest speed averages were bats made of composite materials, especially the ones made from metal composites. The bats that had the lowest speed were the plastic bats. We also ended up noticing that the distance the ball traveled and how long it was in the air were affected as well. The Hype fire metal bat traveled the farthest, but the ball hit by the Blitzball plastic bat spent the longest time in the air. There were a few factors we didn't think to test, like if the temperature of the testing environment makes a difference in our results. So, maybe if we had factored in a few more variables we would have had more similar results between the bats.

How we could improve if we worked more on this and why it is important to the real world ?

This project was almost perfect besides a few things that could have gone better like the lack of time. So maybe next time someone does this the science fair time could be longer. We also decided to switch the pitcher and batter to give more kids a chance to play, but this might have affected some of the results if one set of batter and pitchers was better than the other. (They seemed pretty equal though).

The project is important to the real world because it helps the future students know which bats are better for distance and speed. This can also give people better performance and greater force when batting. The project can also introduce baseball to new people and science when they do the experiment.

References

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Pictures