



IS THERE PINGING IN MY EARS?

Q-16

PURPOSE & HYPOTHESIS

The purpose of this experiment is to determine the amount of noise both kids and adults are exposed to during a typical baseball practice and whether these levels exceed OSHA workplace safety standards.

My hypothesis is that the sound levels will be sufficient to exceed the OSHA standards and be harmful to the hearing of both kids and adults. I predict that the noise levels of the aluminum bat will surpass all the other ones.

RESEARCH

OSHA regulation 1910.95 states that exposure to time averaged sound levels in excess of 90 dB over an 8 hour period can damage hearing. Employers are required to provide hearing protection to employees exposed to more than 80 dB over an 8 hour period.

Our adult test subject, being an ex major league baseball player, said that he took about 130 swings every day. Since other players can take up to 200 swings per day, we used that amount to do all of our final calculations.

The OSHA online sound exposure calculator was used to determine sound exposure levels for our experiment.

MATERIALS

The amount of materials materials for this experiment was surprisingly small. Here is a list of all of them.

- An aluminum bat (for both kid and adult).
- A composite bat (for both kid and adult).
- A wood bat (for both kid and adult).
- A hybrid bat (for both kid and adult).
- A net.
- A iPhone for measuring dB sound levels and for photos.
- A notebook.
- A pen/pencil.
- A regulation baseball (same ball used for all tests).

EXPERIMENT

Over the course of a day, a competitive baseball player will make contact with a baseball between 100 and 200 times. In this experiment a ball was placed on a tee to ensure consistent contact and struck 10 times each with bats made of wood, aluminum, composite, and aluminum/composite hybrid. Sound level measurements were made with the NIOSH sound meter iPhone app.

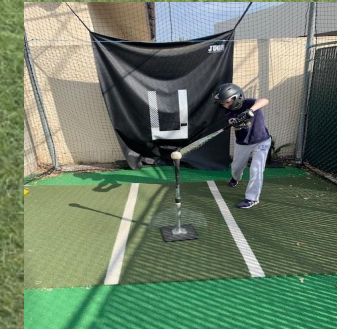
1. Kid subject - 10 swings each - wood, aluminum, composite, and hybrid bats measured from 30 inches.
2. Adult subject - 10 swings each - wood, aluminum, composite, and hybrid bats measured from 40 inches.
3. A single impact was analyzed for duration.

PHOTOS



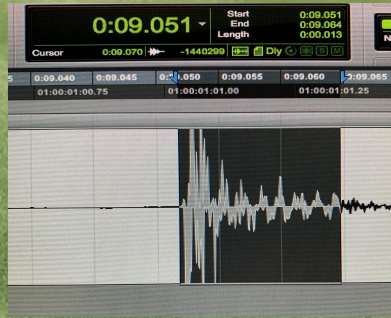
#2

We recorded the bat on ball hit and measured it for its duration.



#1

We did all the testing for the kid subject.



#3

We reviewed the waveform and calculated the duration.

#4

We did all the testing for the adult subject.



DATA

This table contains the data from all of our testing and averages it to make the calculations.

Material	Kid			
	Wood	Aluminium	Composite	Hybrid
	91.7	117.8	111.7	112.6
	112.9	115.1	111	111.4
	107.9	115.8	116.6	115.7
	109.2	114	121.7	114.3
	111	110	115.3	116.2
	113	116	117.5	114.8
	112.2	114	88.3	113.6
	115	109.8	116.3	113.6
	114.4	111.3	116.7	112.4
	86.6	117.5	119.2	110.4
Average	107.39	114.13	113.43	113.5
db Peak		Kid Avg		112.1125
		db Peak		

Material	Adult			
	Wood	Aluminium	Composite	Hybrid
	115	120.8	110	107.3
	113.5	122.5	119.5	113.8
	118.5	114.3	120	115.4
	122.3	116.8	120.1	116.8
	122.3	117.3	118.6	117
	112.9	115.3	113.4	112.2
	113.8	114.4	116	114.9
	114.7	113.7	113.3	120.2
	114.9	116.8	121.4	114.2
	103	118	111.3	116.8
	115.09	116.99	116.36	114.86
Average		Adult Avg		115.825
db Peak		db Peak		

ANALYSIS

A bat on ball impact was recorded digitally and analyzed for its duration. The visual waveform was measured to have a duration of 0.013 seconds. A player taking 200 swings per day will be exposed to 2.6 seconds of peak loudness.

For the adult average of 115.8 dB per swing, 2.6 seconds calculates to 0.3% of the OSHA daily sound exposure limit.

For the kid average of 112.1 dB per swing, 2.6 seconds calculates to 0.2% of the OSHA daily sound exposure limit.

Even a worst case scenario of 200 swings of 122 dB each accounts for only 0.8% of the OSHA daily sound exposure limit.

REAL WORLD CONNECTION

The real world connection for this experiment is that if someone were to play baseball enough, could they have permanent hearing damage? If so, then I should consider using bats that are either more quiet, or will just overall damage my ears less. Thus, I will be able to play this sport for a longer time, without it doing any harm.

CONCLUSION

The conclusion of this experiment is that these bats are not loud enough to do any kind of damage to your ears. After doing a variety of tests and calculations, we found out that someone would have to make contact over 6,000,000 times in a day to exceed the OSHA daily standards for sound exposure.

WORKS CITED

The things that we referenced to for this experiment are the websites
https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html#:~:text=Sound%20is%20measured%20in%20decibels,immediate%20harm%20to%20your%20 and
<https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.95> so
that we know the level of decibels it takes for sound do harm the human ear.