

Introduction

- metabolic rate govern structure of living things (Alborn 2006), when looking into the increase in metabolic rate of humans it is proportionate the amount of weight of the load that is carried (Kram 1996).
- The rhinoceros beetles (Scarabaeidae) showed that the metabolic requirements are not proportional, and that it is cheaper for them to carry heavier loads, compared to humans (Kram 1996).
- When examined it was determined that Rhinoceros beetles could carry loads 10 times their body mass, while their metabolic cost only doubled (Kram 1996).
- This study will compare the ability of both humans and rhinoceros beetles and their capacity to weightlift.
- It is hypothesized that the rhinoceros beetle on average will be able to lift more times its own weight compared to humans.
- while professional weightlifter are hypothesized to be able to lift more times their own weight compared to non-professionals.

Objectives/Goals

- Average the deadlift ability of professional weightlifters and members of the Northern Sports Center.
- Compare the weightlifting capacity versus the body mass of professional weight lifters, members of the Northern Sports Center, and of rhinoceros beetles.
- Determine how many time more a Rhinoceros beetle is able to lift, compared to professional and non-professional human weightlifters

Materials and Methods

- Since beetles move on six legs and carry weight on their back, humans have to be measured in a different way.
- In the experimental aspect of this project male humans will be asked to deadlift the maximum weight they are able to lift for 4 repetitions.
- For the professional weightlifter data component of this experiment was found (ExRx.net 2013).
- The rhinoceros beetle data was collected for an experiment (Karam 1996).
- Weight and maximum deadlift on professional weightlifters and members of the Northern Sports Center (NSC) was obtained.
- Results were analyzed used a paired two tailed t-test with equal variance and an alpha value of 0.05.

Results

Table1. Calculated P-values for the average weight and average maximum deadlift for male members of the NSC and male professional weightlifters.

	Weight of NSC to professionals	Significance	Maximum deadlift of NSC to professionals	Significance
p-value	0.576		4.26E-07	*

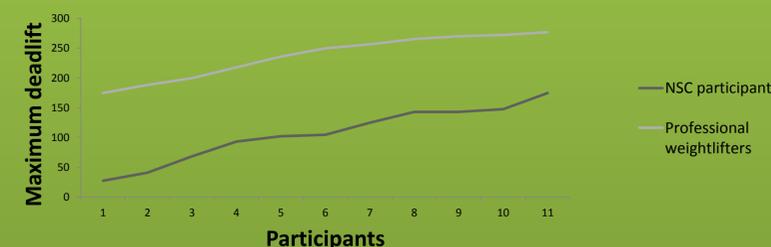


Figure1. Arrangement from least to greatest amount of maximum deadlift for NSC participants and professional weightlifters in kilograms.

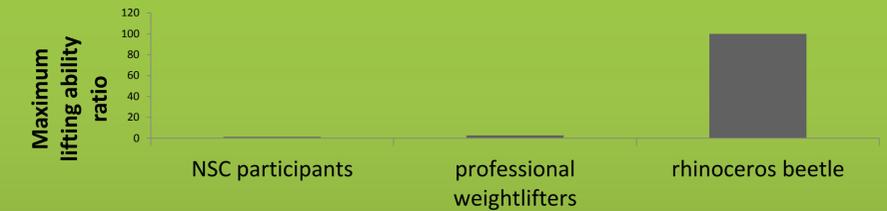


Figure2. Graph showing the ratio of body mass to maximum recorded lifting ability of NSC participants, professional weightlifters, and rhinoceros beetles.

Table2. Comparison of NSC and professional lifters ratios to Rhinoceros beetle ratio.

	NSC participants	Professional lifters
How much more strength Rhinoceros Beetle has	81.30	36.76

Discussion

- Professional lifters were able to lift more than to NSC participants even though their weights were similar (Table1. and Figure2.)
- Only the beetles could lift 100 times their own weight (Table 1.). Which could be due to the low metabolic rate (Kram 1996).
- NSC would need to lift 81.3 times their own weight and professional weightlifter would need to lift 36.76 to compare to the beetles (Table2.).

Conclusions

- As hypothesized professional weightlifters performed better than non-professionals
- Rhinoceros beetle had the highest capacity to lift more times its own body mass than humans.
- Humans would have to lift many times their own weight to compare to beetles.

Acknowledgements

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References

Kram R.1996.Inexpensive Load carrying by Rhinoceros Beetles. The Journal of Experimental Biology[Internet].[March 1, 2014];(199):609-612. Available from: <http://jeb.biologists.org/content/199/3/609.full.pdf>

ExRx.net[Internet].c2013.[March 5, 2014]. Available from: <http://www.exrx.net/Testing/WeightLifting/DeadliftStandards.html>

Ahlborn BK.2006.Zoological Physics: Quantitative Models of Body Design, Action, and Physical Limitations of Animals. New York(NY):Springer. 10-12p.