**Personal Power**

**Aim:** To calculate and compare the power generated by different students running up the stairs.

**Background Information:**

In this experiment, personal power is equated by dividing the energy transferred by the time taken to perform an action. In this example, the energy conversion is from chemical energy (from the food a person consumes) into kinetic energy, or the movement up and down the stairs. On the other hand, the time taken in this experiment would be the duration of travelling up a flight of stairs.

To find the energy transferred, the weight (state how weight is calculated) of the student is needed, which is calculated by the formula:

**WEIGHT =** mass x gravitational acceleration

where the mass is how much matter is in an object (measured in grams) and the gravitational acceleration is the rate at which objects accelerate towards the Earth. (University of Winnipeg, 1999)

Along with the weight the distance travelled up the stairs( what distance are we referring to?) is needed as well:

**ENERGY TRANSFERRED =** Force x Distance moved in the direction of the force

Combine the result of the equation above and the average time a student takes to run up the stairs, the power generated by the action is found:

**POWER =**

The power each student generates is calculated by dividing the energy transferred by the time taken to complete the action.

*(Mr. Sam, I’m still pretty confused on what else to put here.)*

**Hypothesis:**

I predict that Jung would be the most powerful person in our group. This is because he appears to have the greatest weight in our group and, knowing from experience, has the fastest speed among all of us. Combining those two factors together would make him the most powerful person.

**Risk assessment:**

There is one main danger involved with performing this experiment, namely the possibility of falling down the stairs and sustaining injury. Taking precautions such as not running down the stairs, ensuring the stairs are not covered with water or other substances, and not skipping steps whilst ascending prevented this type of accident.

**Materials:**

6 students | Flight of stairs | Measuring tape | Stop watch

**Method:**

1. Weights of group members were collected by multiplying each member’s mass by 10 (the gravitational acceleration of the Earth rounded up to the nearest whole number) (University of Winnipeg, 1999).
2. Height of staircase was measured by extending measuring tape from bottom to top of stairs and recording reading.
3. Each student ran up entire staircase in his or her fastest speed possible whilst being timed.
4. Times for each student were recorded using what????.
5. Steps 3 and 4 were repeated an extra time for each member.
6. Times were averaged for each student across his or her two trials.
7. Average power was calculated.

**Diagram:**

Test subject (group member)

Staircase (3.5m)

*Figure 1: Diagram of a Student running up a staircase. good*

**Results:**

**Average Power of Group Members**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Group Members** | **Weight (Mass x Gravity)** | **Stair Height** | **Time Taken (seconds)** | | | **Average Power** |
| **(N)** | **(M)** | **T1** | **T2** | **Average** | **(W)** |
| Kota | 500 | 3.5 | 5.41 | 5.93 | 5.67 | 308.64 |
| Emily | 450 | 3.5 | 5.36 | 5.97 | 5.665 | 278.02 |
| Nadhira | 400 | 3.5 | 5 | 5.82 | 5.41 | 258.78 |
| Ashweetha | 380 | 3.5 | 6.31 | 6.5 | 6.405 | 207.65 |
| Jung | 720 | 3.5 | 4.68 | 5.93 | 5.305 | 475.02 |
| Carlos | 700 | 3.5 | 6.65 | 5.69 | 6.17 | 397.08 |

**good**

**Analysis:**

**good**

In order to find out the average power of each group member, the three formulas aforementioned in the background information have to be used. First, the weight of each member must be found, alongside with the average for both trials. With the weight of the member and the height of the staircase calculated, the average energy can be found. Lastly, the average power is found through dividing the average energy transferred by the average time. A sample of these calculations is included below.

These are the calculations for Carlos, and these formulas were used for each member.

Weight calculation: Mass x 10

= 70 kg x 10

= 700 newtons

Average time calculation:

=

= 6.17 seconds

Average energy calculation: Force x distance moved

= 700 N x 3.5 m

= 2450 joules

Average power calculation:

=

= 397.08 watts excellent

**Discussion:**

Based on the recorded data, it is apparent that as weight increases, the power increases as well. For example, Ashweetha, who had the lowest weight of all members, also had the smallest generation of power. On the other hand, Jung, who possessed the highest weight, produced the greatest power amongst all members. The relationship of time in the results varied from person to person, possibly due to each person’s athletic ability in regards to their weight. This result proves my hypothesis as Jung did generate the greatest power out of everyone in our group. Good

A problem that may have compromised our results is that there may have been inaccurate trial times due to late or early or late stopwatch starts. A solution to this problem would be to remove the human element to starting and stopping the stopwatch and possibly having each student step on pressure pads at the start and finish to start and stop the stopwatch, respectively.Another problem that may have plagued the integrity of our results may be that students did not weigh themselves properly by finding out their real mass, instead of a guess based on a previous weigh-in. A solution to this problem would be to have the subjects find their mass using an accurate measuring devices, such as a bathroom scale.

**Conclusion:**

I can therefore conclude that Jung creates the greatest amount of power in our group due to his high weight and power. This correlates with my hypothesis that Jung would be the member who generates the greatest power. This also fulfills our aim of calculating and comparing the power generated by different students running up the stairs.

Points to consider…

* In text referencing
* Look at assessment rubric and be self critical, score yourself before submission and make relevant canges if necessary
* A good start, well done.

**References:**

Evergreen, M.J., Lofts, G. 2007. *Science Quest 3*, 3rd edition. John Wiley and Sons Australia, Milton, Queensland.

University of Winnipeg, 1999. *Gravitational Acceleration* [online]

Available at: < <http://theory.uwinnipeg.ca/mod_tech/node55.html>> [Accessed 11 February 2012]