Altruism

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Introduction

Why did the person next to you help you in that hard math problem? Why did that mother sacrifice herself to save her child? Why do we help others? What drives us?

It all began when we were brainstorming ideas and Melissa was curious to why drivers slowed down to look at roadside accidents. David then suggested it was possibly (though very unlikely) due to altruism. We then wondered why individuals would help one another in times of need. And that's when we began our research for this project. The factors we decided to focus on were race, gender, and beneficial gain. We felt that these possible factors could affect an individual's decision in expressing altruism to another individual.

First off, what exactly is altruism? By definition, altruism is an act of selfless concern for another individual's well-being at the expense of themselves. (1) In other words, an individual is expressing a selfless act towards another individual with a cost and no beneficial gain. For example, David tutors Gavin in his math homework. In this case David (donor) is the one expressing altruism by tutoring Gavin. Gavin (recipient) is benefitting from David's tutoring at the expense of David's time (cost). Note that an act of selflessness is not always altruism, especially if there's a beneficial gain for the donor. (3) If the donor expresses an altruistic act, but receives a beneficial gain from doing so it's not necessarily altruism and wouldn't be considered selfless. For example, if Hannah helps Aly in Calculus homework and Aly helps Hannah with her physics homework, it's not necessarily considered altruism. In both of their cases, the action isn't selfless, since they are both benefitting from each other.

However, there's always the possibility of an individual expressing altruism for an egoistic reason, in which it'll benefit the donor. For example, a mother is carrying her child on the escalator when the escalator floor panel suddenly gives way and she throws her toddler out of harm's way while she is crushed and dies. (9) This is altruism illustrated at its most extreme and yet it benefitted her in a way that her toddler carries ½ of her genes and will continue to pass it on for many generations. It is needless to say that there is a large relation between the mother and her child, therefore as shown in Hamilton's Rule (explained later) the beneficial gain is large for the mother, hence her genes were worth more than the cost she had to pay (at a really high price). This suggests that in extreme altruistic cases like these it is rare for an altruistic act to have no beneficial gain towards the donor. In many cases where altruism is considered to be taking place there's always the possibility of a self-benefit, such as feeling accomplished (egoistic). The idea of 'true altruism' then becomes questionable.

Hamilton's Rule, which is later known as Kin Selection, shows that the genetic relation to another individual will overrule their own cost to express altruism as shown in the formula. The formula is: $b > \frac{c}{r}$ or $b \times r > c$. The 'b' represents the benefit the recipient will receive, 'c' represents the cost the donor will have to pay, and 'r' represents the relation between the donor and the recipient. This formula shows how the cost, the relation to the individual, and the benefits in a situation can make an individual more prone to express altruism to another individual to a certain degree in which the recipient shall benefit. Therefore, this formula shows that the closer the related to the donor, the more likely the donor is to express altruism as the benefit increases.

When an individual is not expressing altruism, the individual is typically expressing egoism. By definition, egoism is based on the actions taken by an individual, for the sole purpose of that individual's self-benefit. In other words, it's considered as the opposite of altruism. For instance, Krystal – an individual at the front of a line – will pick the best apple within a basket, mixed with ripe and unripe apples (there will be more unripe apples than ripe apples in the basket). In the act of Krystal picking the best apple, she was negligent of the other individuals within the group, that did not necessarily have the advantage of having the first pick of the best apple from the bunch, thus showing how Krystal expressed an act of egoism. This suggests that she ensured that she will get a ripe apple and others will not. If there was a limited food supply and there were only apples to eat, she would be ensuring the survival of herself rather than others, therefore this decreases the group's chance to survive and reproduce. To further illustrate, this causes the members within the group to dwindle down until there is, the only one egocentric individual left, with no one to to reproduce with, this represents how egoism affects the individual, which also exemplifies how egoism can affect a group as a whole over time. (3)

Theory: How did Altruism come to exist today?

There are two theories of how altruism exists to this day despite the contradicting ideas of natural selection and egoism. Natural selection refers to the fittest individual in its environment to then survive and reproduce. The idea of altruism seemed to contradict Charles Darwin's idea of natural selection because it seemed irrational for organisms to express altruism amongst each other if they're trying to survive and reproduce themselves (individually). (3)

Darwin then proposed Multilevel (Group) Selection, this suggests that altruism can benefit the group of altruistic organisms rather than individual organisms. For example, in a group of monkeys there would be one or a few monkeys who are on the lookout for any approaching predators. When there are predators in sight, the "lookout" monkeys will yell to warn its group that there are predators nearby. This behavior enables the whole group to more likely escape and survive, however this makes the "lookout" monkey a target for the predator's next meal. In this case the individual (the monkey) does not benefit from its altruistic action, but the group benefits. (2) While in another group of monkeys where they don't have this altruistic characteristic of "looking out" for predators, this group is less likely to survive as a whole if a predator were to anticipate the monkeys. Therefore a group of monkeys who aren't altruistic and are 'selfish' (egocentric) will express that each individual has this idea of "benefiting for themselves", which will ensure their own individual survival, but the likelihood survival of the whole group is lessened. So in Group Selection, the group with altruistic monkeys is more likely to survive and pass on their genes, thus the trait of altruism will be passed on to the next generation.(3)

Another theory is Kin Selection. This is basically altruism expressed between individuals of relation (eg. daughter, brother, etc.), to ensure that their genes are passed on to the next generation. (2) The closer the relation to the individual or recipient the more likely altruism is expressed to the other individual. Hamilton's rule (which was later known as kin selection) gives a formula to show the relation of cost, genetic relation, and benefits to show that the closer related one individual is to another individual, the more likely altruism will be expressed. Also the more related both individuals are the more closely related genes/traits both individuals have.

Therefore, it is more likely for individual A to express altruism to individual B who has some relation to individual A. However it is less likely for Individual A to express altruism to an individual who would have no relation at all to individual A. Overall, it is more likely for altruism to be expressed between related individuals (due to similar gene/traits) than non-related ones, therefore this also allows for the altruistic trait to be passed on.

According to professor Abigail Marsh – a professor of Psychology in Georgetown University – it was found that altruists have a significantly larger amygdalae (we have two) than non-altruists. The amygdala is an almond-shaped nerve that is located in the mid-lower part of the brain, and is responsible for processing emotion. (4) The size of the amygdala plays a vital role in an individual's decision in expressing an altruistic action towards another individual. Based on the individual's amygdala size, it alters their values in the benefits and costs (as seen in Hamilton's rule) equation of a possible recipient, therefore altering an individual's decision of expressing an altruistic action. (2) Dr. Marsh had also conducted another study on altruism with psychopaths. She conducted the study by showing the psychopaths pictures of people expressing different emotions while running them under a MRI (Magnetic Resonance Imaging) machine or brain scanner. Such as being happy, sad, and excited. Dr. Marsh had ascertained that these psychopaths were "blunted" or numb to the images shown to them while under the MRI machine. Meaning they had shown that they had little to no activity in the amygdala when the psychopaths were shown the pictures of the people. She then took measurements of the size of each amygdalae and compared it with the others known for their altruistic actions. She found that

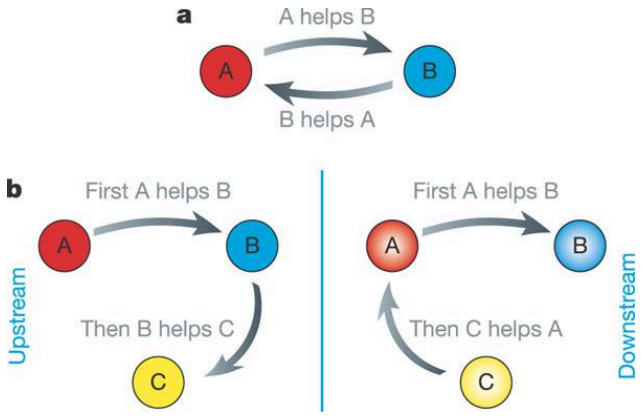
the amygdala were bigger in those known for their altruistic tendencies and smaller in those of the psychopaths.(8)

Types of Altruism

There are different types of altruism: Direct Reciprocity (or reciprocal altruism), indirect reciprocity (upward and downward), and network reciprocity. Direct reciprocity is when an individual expresses altruism towards another individual, but hopes for the favor to be returned in the future. For example, Melissa loans her Geometry notes to Jane (for SAT) , while Melissa expects Jane to help her on her Calculus homework later on. If Jane does help Melissa with her Calculus homework because Melissa loaned her geometry notes then Melissa was not altruistic. Typically, an individual has to meet the other individual more than once to ensure the favor will be returned in the future. But, if the favor is indeed returned then we wouldn't call it altruism. (7)

Indirect reciprocity is when an individual expresses altruism to another individual who in turn expresses altruism to another individual and so on, similar to a chain reaction. There are two types of indirect reciprocity: Upward and Downward Reciprocity. Upward reciprocity is when Individual A expresses altruism to Individual B and in turn expresses altruism to Individual C and so on. Upward reciprocity can be thought of as a chain reaction, so when altruism is expressed to an individual it's likely that the individual will express altruism to other individuals and so forth. Downward Reciprocity is when Individual A expresses altruism to Individual B, who in turn expresses altruism to Individual C and expresses altruism back to Individual A. This

is when an individual expresses altruism to other individuals who at some point receives altruism from other individuals.(7)



Network Reciprocity is altruism being selectively expressed to other individuals or within one's network (or connections). For example, Individual A is more likely to express altruism to Individual B who is of close relation versus Individual C who is a complete stranger (out of Individual A's network). So if Jesus has a box lunch and notices his friend Cedrick (with no food) and a distant classmate Justin (with no food), he's more likely to share his food with Cedrick because he's of close relation. Or in other words, Jesus chose to share his food with his friend because he knows him and they are within the same ring of friends. The closer relation of individuals the more likely for the traits to be similar therefore those of close relation are more likely to express altruism amongst each other. (7)

Lastly, another type of altruism is Empathetic altruism. Empathetic altruism is motivated by the feeling of sympathy, pity for the individual, etc. which acts as factor for individuals to express altruism. For example Krystal notices Jennifer has dropped her ice cream cone and is sad. Krystal notices this and decides to buy Jennifer another ice cream cone due to sympathy for Jennifer. (12)

Objective

In our hands-on we are looking for increased amounts of altruism within groups of opposite gender and groups of same Ethnicity to prove our hypothesis correct. We reasoned that there would be an increased amount of altruistic acts expressed due to sexual attraction. Meaning that there would be an increased amount of altruistic acts to increase an individual's progeny. For the same ethnic groups we had reflected back on Darwin's theory of evolution, we then presumed that individuals within the same ethnic group would express more altruism amongst each other because this would (biologically speaking) ensure the group's survival, especially in extreme cases of altruism.

In the first part of our hands-on, being the Spaghetti Towers followed by volunteers taking an online-test, we grouped volunteers based on their race and gender where either factor is the independent variable within multiple sessions of 12 volunteers. In the second part of our hands on, dropping textbooks, we were again looking for increased amounts of altruism between individuals of the same/opposite ethnicity and same/opposite gender. We took note of the distance a donor of altruism would go out of their way to express altruism to the recipient.

Hypothesis

We think that individuals are more likely to express more altruism towards the opposite gender due to sexual attraction. It would be very beneficial to the 'helper' to possibly pass on their genes (progeny; descendants). We think that individuals will express more altruism towards another individual within the same race because they're within the same group. We also think that altruism will be expressed more when there is a beneficial gain to the "helper." Altruism is

when an individual expresses selflessness for the wellbeing of others at the expense of oneself. In the past, when people expressed altruism, they ensured the survival of their group and also the trait of altruism. For example, the sharing of food amongst their group ensured the trait of altruism within a group to be passed on (Group Selection; altruism within a group). While those who didn't have that trait were more susceptible to die out, therefore altruism is still expressed to this day.

Materials and Methods

Spaghetti Towers

The materials needed for this part of the hands on were: 2 boxes of spaghetti sticks, 1 roll of masking tape, 1 cardboard box, 1 bag of family size barbeque Lays chips, 4 boxes containing variety of chips, 3 cameras (phones can work too), and empty room to initiate activity

Preparation: Place the bag of chips (family size) onto a table that would be in the view of all the volunteers, then we place the cardboard box over it and draw a question mark. We must also place the 3 cameras (to record) in good positions apart from each other in which it can view the volunteers from different angles.

1. We will divide the volunteers into 6 groups (all male , all female, both gender, Asian, Hispanic, and Both Asian, Hispanic and other races).
2. For each session we will have 12 volunteers do the activity. Each of us shall overlook at least 4 volunteers and note whether or not altruism is expressed based on the following groups of focus: gender or race. We will also note whether an altruistic action was expressed for a beneficial gain.
3. We will assign students seats; where at each table there are 4 volunteers (with gender/race based on the group of focus).
4. Hand out 5 spaghetti sticks and 3 ½ in. of masking tape to each person.
5. We will announce to the volunteers that they will participate in a contest to create the tallest tower out of the materials given. They will be competing against all the other volunteers from other sessions to win the mystery prize (which is already placed in their view). Then the volunteers will be told that they will have 30 minutes and to start.
6. While the volunteers are doing the activity all three of us will be sitting at different corners of the room (pretending to do paperwork) while looking up from time to time listening and taking note of altruism or altruistic actions being expressed. We will keep

track of altruism expressed between the volunteers and note the three factors we are trying to find using tally marks (shown below).

Name of Volunteer	Factor of Observation (Same/Opposite Gender, Same/Different Race)
1.	
2.	
3.	
4.	

Online Test:

The materials needed for this part of the hands on were: an empty room with access to computers to initiate online test, surveys, and access to printer to print out surveys.

1. After the spaghetti towers, we will have the students take an online test.
2. The volunteers will get a laptop or go on the computer and go on http://psychologytoday.tests.psychtests.com/take_test.php?idRegTest=1607
3. They will complete the test and we will record the test results from all the volunteers.
4. We will then compare their online test results to the results from the spaghetti tower experiment.
5. After the volunteers have completed taking the online test we will also hand out surveys asking if they helped anyone during the Spaghetti Towers and why. If they didn't help anyone then why not?

Dropping Textbooks:

The materials used in this hands on are: binders, papers, and textbooks.

Preparation: We must first get permission from the teacher to initiate our project in their classrooms and to know which period is preferable

1. One of us will be carrying a couple of textbooks, binders, and papers into a classroom (where we have permission from the teacher) and pretend to struggle holding the textbooks and papers.
2. The person will then drop the textbooks (load) after struggling for a bit. (to clearly express that they are in need of help)

3. The other two members of the group will be in the classroom looking from afar and at a distance unnoticed by the students.

4. We will record the reactions of the students in the classroom and see if they express altruism or not.We will take note of how many students came to help within a close distance (approx. 5 feet) as well as their ethnicity and gender.

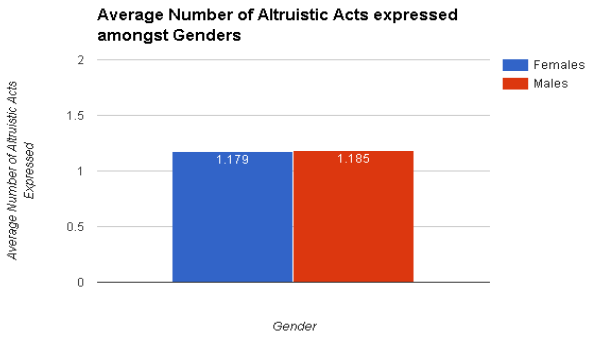
5. We will repeat this process with multiple 5 classes with 2 different periods of the same class.

Teacher: Period: Class:

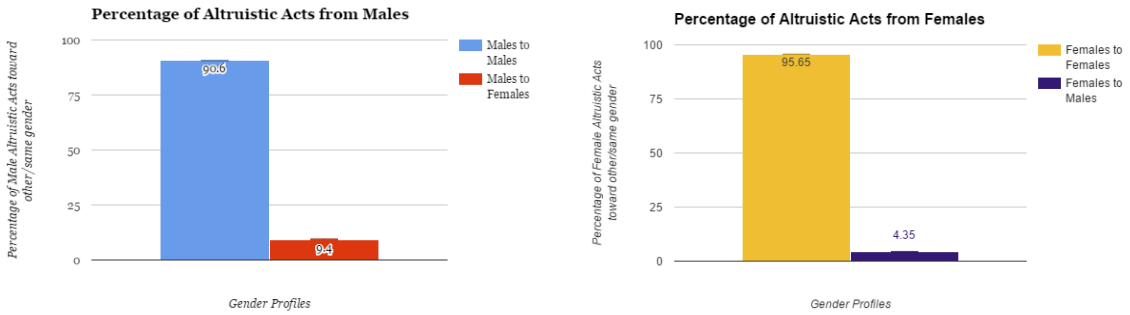
Name of Student:	Gender (M/F):	Ethnicity:	Distance from Person (m)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			

10.			

Analysis

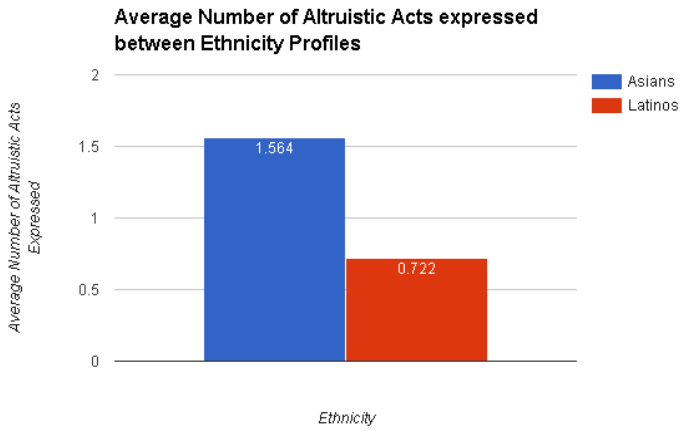


Based on our data table (shown above), the altruistic acts expressed by both male and female are approximately the same. Therefore we can conclude that Female and Males are equally altruistic.

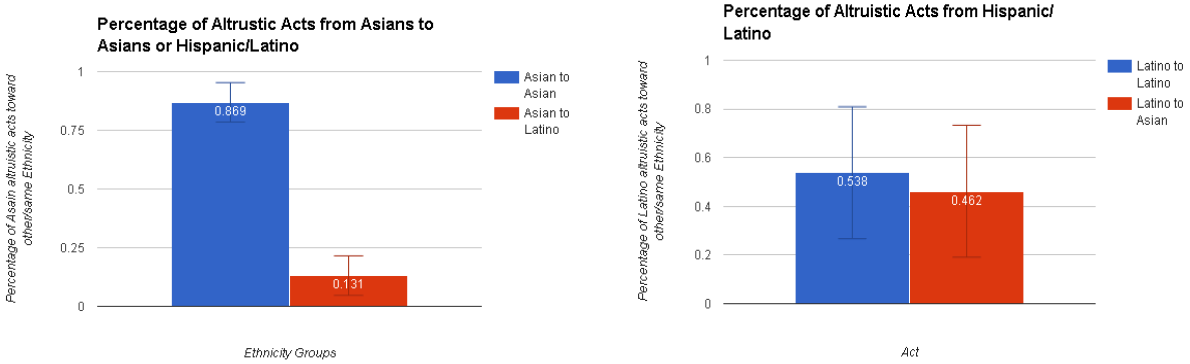


Based on our data table (shown above), more altruistic acts are expressed by individuals of the same genders. Therefore, we can conclude that both genders are more altruistic towards their own gender than the opposite gender. We think this is due to empathetic altruism, which is

basically a feeling of sympathy, concern, etc.(as mentioned in the theory). Typically in our own perspective, females tend to sympathize with other females due to similarity in issues encountered and similar in thought processes. This is the same for males.



Based on our data table shown above, Asians have a higher average number of altruistic acts expressed between the two ethnicity profiles. Therefore we can conclude that Asians express more altruistic acts than Latinos.



Based on our data table shown above, both ethnic groups have a higher percentage of expressing altruistic acts towards their own ethnicity than towards the other ethnic group. Therefore we can conclude that Asian are more altruistic towards their own ethnic group. Although, we didn't

obtain a sufficient amount of data to conclude that Latinos/Hispanics express altruism more towards their own ethnicity. Therefore the data for the Hispanic/Latino group is statistically insignificant. As shown by the error bars. Overall the data for the Asian group supports our hypothesis of altruism being expressed within the same ethnic group however in the Hispanic/Latino group it still remains inconclusive. Based on our research we can derive that the Altruistic acts of the Asian ethnicity to a multi-level altruistic type.

Conclusion

We can conclude that our hypothesis was proved incorrect (referring to gender). Individuals within the same gender expressed more altruism amongst each other than if they were towards the opposite gender. We can explicitly see this in the graphs, in which it shows that both the females and the males were more altruistic toward the same gender, than to opposite gender. We predict that males and females may help their own gender more because they can relate to each other.

We are also inconclusive towards our hypothesis on ethnicity due to insufficient amount of Hispanic/Latino volunteers. However based on our data, Asians expressed more altruism amongst each other, because they are within the same group. This exemplifies network reciprocity, which helps the group instead of the individual. In spite of the fact of having little data significance with latinos, there was a past experiment that would prove altruistic tendencies increase within the same ethnicity, than if it were to be expressed towards another race (Andy Lum & partner's experiment in 2013).

What we would've changed…

Summoning volunteers throughout our hands-on proved to be more difficult than we had first expected; we had to run to individual classes to pull out volunteers (who are sometimes absent) and it consumed time we could use to initiate our hands-on. Another issue we had was the limited amount of time to commence the hands on therefore we could've saved more time by calling students to take the online test portion after school. At some point we ran out of masking tape and didn't have enough Hispanic/Latino volunteers. If we were to repeat the project all over again, we would assign students time to come in advance, had students come after school for online-test, get extra masking tape, and recruited more Hispanic/Latino volunteers.

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