**Issues in Information Systems**
Volume 26, Issue 2, pp. 335-345, 2025

DOI: https://doi.org/10.48009/2_iis_126

# A study and analysis of the moral and ethical perception of cybernetic humans

**Daniel Joy**, *Carson-Newman University, drjoy@cn.edu*
**Seongyong Hong**, *Carson-Newman University, shong@cn.edu*
**Alden Starnes**, *Carson-Newman University, astarnes@cn.edu*

## Abstract

As technology advances, we are faced with new ethical and moral dilemmas, such as whether cyborgs should count as human beings. Literature generally finds that cybernetic technology is viewed as acceptable when restoring lost functions but not when it provides abilities past human capability. Previous research has not investigated public attitude towards perception of the cyborg's overall value of life. In our research and experiment, we are using surveys of students and faculty, most of whom are from Carson-Newman University in Tennessee, to measure how people view the value of a cyborg's life. We used a series of twelve questions where participants must choose whether a car should hit Pedestrian A or Pedestrian B with both hypothetical characters having varying amounts of external cybernetic enhancements. Respondents are provided with information on the purpose, extent, and invasiveness of each pedestrian's cybernetics. Pedestrians who enhanced their capabilities were more likely to be hit than those who used cybernetics for replacement of lost functions. Respondents also viewed cyborgs as more durable and more likely to survive collisions than fully human pedestrians. The findings of this research suggest that while cybernetic technology may restore or enhance abilities, public perception treats cyborgs as fundamentally different from natural humans, especially when visible enhancements are present.

**Keywords:** cyborgs, cybernetic technology, ethics and moral judgement

## Introduction

As technology continues to evolve, scientists have begun to turn to the human body as their next experimental playground. Saying the word "cyborg" brings up many diverse images for different people: some may imagine a man perfectly half-man, half-machine, while another may imagine a character who is far more human than machine but may have a metallic limb or small part of their body replaced with cybernetics. Not only do these wildly different definitions exist, but whether or not humanity should move towards cyborg-ness is also debated.

Some scientists argue that cybernetic enhancements are a requirement for humanity to survive in the future. Grinin & Grinin point to the fact of global warming, food shortages, population increase, and resource consumption as great challenges that humanity will increasingly face in the future, stating "food shortage is a global challenge for the humankind, taking into account that the population will continue to increase" (Grinin, L., & Grinin, A., 2020). They assert that cybernetic enhancements are the solution and believe that these implantable technologies will allow humans to adapt and live in environments that normal humans

cannot. Dartnell backs up this claim, defining cyborgs as "a human agent with some additional, machine-controlled, layers of automatic (homeostatic) functioning, allowing her to survive in alien or inhospitable environments" (Dartnall, 2004). Cromby agrees that cybernetics are the natural next step, arguing that cybernetics should not be considered the massive leap forward in technology by pointing out that "people with disabilities first encountered many of the issues posed by the cyborging of humanity… when the first spectacles, hearing aids and wooden legs were used" (Cromby, 1999). Scientists believe that cyborgs are not only the future, but increasingly, the present, and will only continue to grow in number as our world increasingly faces global problems.

Other authors do not see cybernetics as the solution to all of humanity's problems. Earle defines a cyborg as someone who "who needs an intimate connection to a technological artifact in order to go about normal, everyday, actions" (Earle, 2019), suggesting that cybernetics can actually be a hinderance to a person. He also shows how cyborgs can be seen as similar to those who have lost limbs or require extra care. With cybernetics being a technology that needs constant replacement to continue functioning correctly, it is clear how cyborgs have become negatively viewed in society. Roe's research findings were also cautiously anti-technology, finding that most participants had a "generally negative outlook on black box communication, even if the machines have been theoretically 'created for the betterment of humanity'" (Roe, 2022).

Currently there is not a consensus among the scientific community on the boundaries of humanity and value of life once organ parts begin to be replaced. Greguric warns that "There is a vast difference between the need to substitute a deficient organ or organ system function and upgrading the function of a hitherto normally functioning organism" (Greguric, 2014). Hong's review of how robots are viewed in society agreed that robots are viewed negatively and suggested to classify the issues into three categories: "safety & errors, law & ethics, and social impact" (Hong, 2019). Gillett's paper provides some additional evidence that cybernetics will be more accepted by society with certain precautions, with the phrase "we are less concerned when the cybernetic components of the person seem peripheral or somewhat incidental to their psychological identity or character" (Gillett, 2006) indicating that our viewpoint towards cybernetics humans is linked more to psychology rather than a physical capability standpoint.

This research examined how the addition of external cybernetic parts changes public perception of a human's life. In this research, a cyborg is defined as a human who has undergone the integration of technological components into their body or the replacement of existing body parts with technological replacements. This definition is accompanied by the provision of detailed information to participants regarding the specific nature of the cybernetic components in question.

## Related Research

The Moral Machine Experiment was conducted to determine if general public opinion on the actions a self-driving autonomous car should take agreed with policymakers. They devised an experiment called the "Serious Game" (Awad et al., 2018) that presented a simple question: should the autonomous car save its driver or the nearby pedestrian, and provided a variety of factors to help participants make the decision, such as age, gender, social status, and physical appearance of both characters.

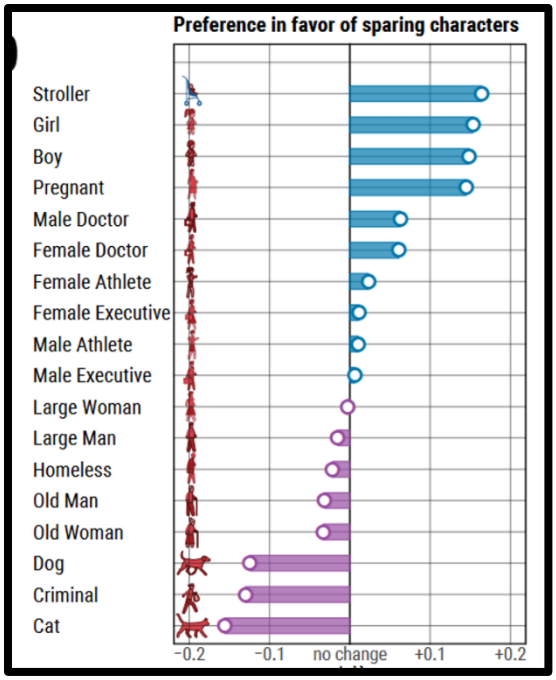


**Figure 1. Results from the Moral Machine Experiment**

The authors express that "The Moral Machine attracted worldwide attention and allowed us to collect 39.61 million decisions in 233 countries" (Awad et al., 2018) and thus they were able to examine large-scale trends that were largely unaffected by individual biases. The authors concluded, as shown above in Figure 1, that the general opinion agreed upon three rules: spare humans over animals, spare more lives over fewer lives, and spare younger people over older people; the last of which disagreed with policymakers. Our research does not involve autonomous cars, but we employ a similar style of survey. Murata, et al.'s research presents a survey focused only on cybernetic technology conducted in two Japanese universities. They surveyed college students on their perceptions of wearable ("electronic devices that are incorporated into clothes and accessories") vs implantable ("electronic devices implanted in a human body for non-medical purposes that interact with the user to increase his/her innate human capacities") technologies (Murata et al., 2017). The survey results showed that users overwhelmingly agreed that implantable technologies were viewed as less moral, riskier, and less desirable than wearable technologies, as seen in Figure 2.

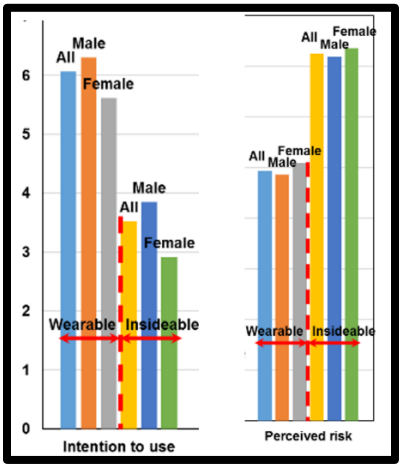


**Figure 2. Results from the Japanese survey**

The researchers also concluded that "Whereas respondents were prone to have impressions that wearables were neither good nor evil, they tended to question the morality of insideables" (Murata et al., 2017). The clear negative bias against insideables was linked to traditional Japanese culture, where changing one's body through tattoos or technology was shamed.

Other literature echoes a similar sentiment that cybernetic technology was less moral, especially when used to enhance one's abilities. The research of Zhang et al. concluded that "people often hold a 'natural-is-better bias'" and "associate unnatural actions or technologies with potential negative consequences", suggesting that implantable technologies will always be viewed negatively (Zhang et al., 2023). Fox's research backs up these ideas, stating, "for example, cyborgs with partially in-the-body technology could be viewed as being uncannily not quite human" (Fox, 2018). Evidently, it is the visual aspect of someone appearing to be less human than others that causes a negative social stigma. Sharp's work provides us with a useful framework that we employed in our survey. Sharp outlined several ways to measure cybernetic technology: the application and targeted outcome, the level of modality, the degree of integration, and the degree of body invasiveness (Sharp, 2003). We used the frameworks of degree of invasiveness and application of the implant in our survey.

Our literature review concluded that people generally view cybernetic technologies as less moral than wearable technology or no technology at all, due to cyborgs being perceived as people who have paid to have an advantage in life, people who don't adhere to traditional values, and those seeking to get additional abilities without effort. We now seek to uncover if there is a connection between viewing cyborgs as less moral to viewing cyborgs as having lower value of life. We also hope to quantify how quickly negative viewpoints of cybernetic humans correlate with the percentage of body parts replaced with cybernetic technology. Finally, we aim to see if we can provide more evidence for Zhang et al. and Fox's assertions that technology used to enhance physical capabilities will be viewed as worse than cybernetics used to replace normal body functions.

## Methodology

The main component of the project was creating a similar survey to the Moral Machine Experiment through an online survey. We gained IRB approval on February 26th, two weeks before data collection began. We chose to use Google Forms as our medium for the survey due to it being well-known, consistently available, and securely storing results. Knowledge of the site was spread through the author's social media platforms, a campus-wide announcement to our institute's student body, and direct interactions with faculty. The survey remained online for a month for maximum data collection. The data collection flowchart is shown through the flowchart below in Figure 3.

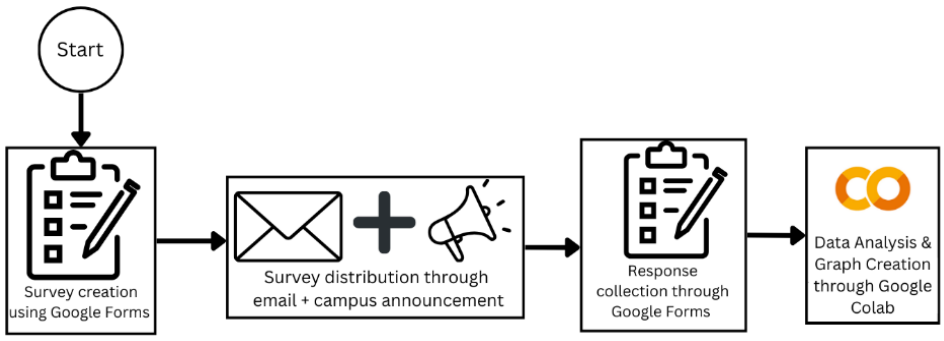


**Figure 3. Flowchart of data collection for the project.**

The survey comprised of twelve hypothetical scenarios where the user is driving a car. The respondents are told that they come across an obstacle and have three options to choose from: swerve left, hitting Pedestrian A; swerve right, hitting Pedestrian B; or mark that either option was equally acceptable to them. Information on both pedestrians was provided on the amount, application, and degree of invasiveness of their cybernetic implants using Sharp's framework, as seen in Figure 4, but nothing about the physical descriptions or any other identifiable information. We chose this method to confirm that decision making is based solely on the variable intended, rather than unintended variables such as age, gender, or appearance which will be affected by personal bias.

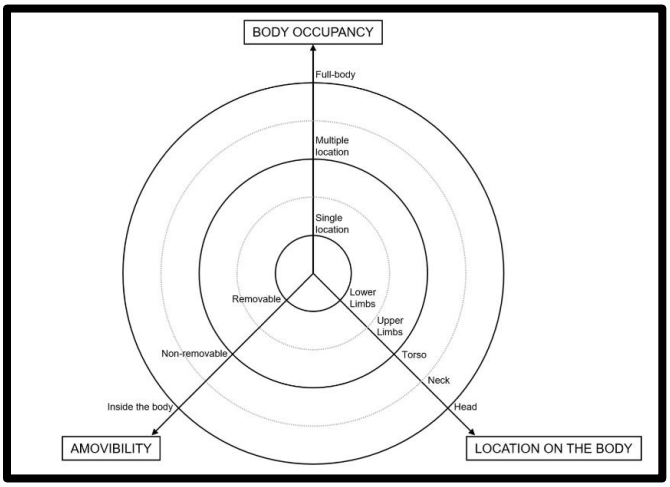


**Figure 4. Sharp's framework for defining cybernetics in detail**

The website briefly explains cybernetics and the measurements that will be provided for them in each scenario. The first question of the survey is reproduced below in Figure 5 as an example. This question presents the scenario to the user, introduces both pedestrians and their level of cybernetics, and provides two diagrams illustrating the specifics of the cybernetic enhancements. For Pedestrian A, being a regular human, their framework is left blank.

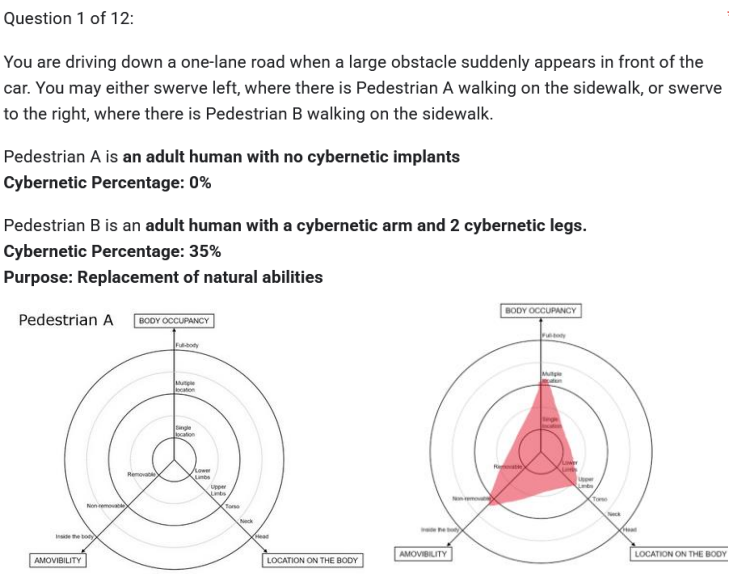


**Figure 5. Question 1 from the survey and cybernetic frameworks provided**

After the user has answered all the questions, they had the option of entering some demographic information. We collected respondents' ages and occupations in order to compare results from college-age students to our institute's faculty and other older respondents. Each question has a scenario that repeats with the same information, except for the descriptions noted in bold, which is changed between each question. The full table of questions is provided below in Table 1.

**Table 1. Questions from the Survey**

| Question Number | Pedestrian A Cybernetic percentage & purpose | Pedestrian B Cybernetic Percentage & purpose |
|---|---|---|
| 1 | 0% | 35% replacement |
| 2 | 75%, enhancement | 15% enhancement |
| 3 | 100% | 10% replacement |
| 4 | 90%, replacement | 90%, replacement |
| 5 | 0% | 90%, replacement |
| 6 | 50%, enhancement | 50%, replacement |
| 7 | 0% with robot | 5%, replacement |
| 8 | 5%, enhancement | 5%, enhancement |
| 9 | 75%, replacement | 30%, replacement |
| 10 | 10%, enhancement | 30%, replacement |
| 11 | 20%, replacement | 20%, replacement |
| 12 | 0% | 2%, replacement |

Questions 1, 5, 7, and 12 are designed to provide a clear visualization of how increasing the cybernetic percentage in Pedestrian B affected respondents' choices. We predicted that as the percentage of cybernetics rose from 2% to 90%, while Pedestrian A remained completely human, that the respondents would choose to hit Pedestrian B more and more often. Questions 6 and 10 were written to confirm Zhang et al. and Fox's research into whether the purpose of cybernetic implants affects the perception of the individual with them. Questions 4, 8, and 11 were phrased to see if respondents cared which body parts were being replaced with cybernetics. Finally, Questions 2, 3, and 9 were added to test whether the pedestrian with a greater percentage of cybernetics would always be hit more often than their counterparts.

**Table 2. Percentages of cybernetics based on body part replaced.**

| Replaced Body Part | Cybernetic Percentage Estimate |
|---|---|
| Neck | 5% |
| Leg | 10% |
| Arm | 15% |
| Heart | 20% |
| Head | 20% |
| Chest without Heart | 30% |

To create the metric of percentage of cyborg-ness, we construct the following table based on percentage of body mass that is being replaced and importance to body function. Table 2 contains the information used to calculate cybernetic percentage. This information was provided for each pedestrian to help the respondents get an idea of how much the pedestrian was metal versus flesh. We did not specify the materials used to create cybernetics. Results were exported to a CSV file and inputted to Google Colab for analysis and graph creation.

## Results

In total, the survey has 107 responses as broken down in Figure 6 below. Our campus-wide email reached a theoretical 3000 students, but only 53 students replied. A further 24 responses came from students from other colleges, 11 responses came from faculty members at our institute's. 7 responses came from faculty members of the University of Tennessee Martin and the remaining 12 responses came from a variety of sources.

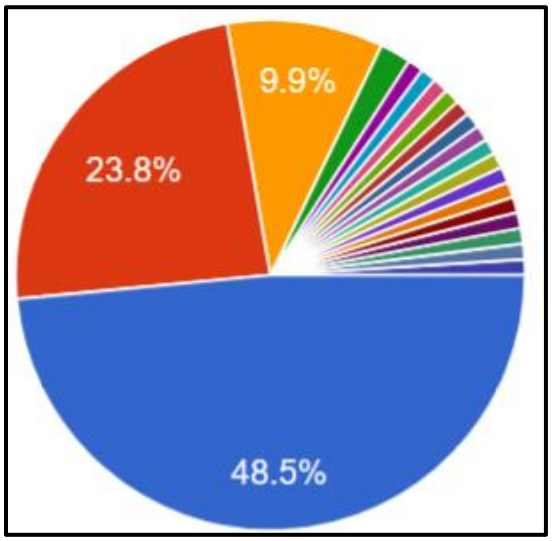


**Figure 6. Type of Respondent. Blue – C-N student, Red – other college students, Yellow – C-N Faculty, Green – UT Martin staff.**

We believe the low response rate likely stemmed from the survey not being tied to any sort of incentive, such as a raffle or extra credit for classes. We do not believe survey fatigue or length was a factor in the low response rate from C-N students. The results of all questions are below in Table 3.

**Table 3. All Survey Responses**

| Question Number | Number of Respondents choosing to hit Pedestrian A | Number of Respondents choosing to hit Pedestrian B | Number of Respondents choosing "Either" |
|---|---|---|---|
| 1 | 6 | 48 | 52 |
| 2 | 72 | 9 | 25 |
| 3 | 94 | 7 | 5 |
| 4 | 53 | 14 | 39 |
| 5 | 3 | 72 | 31 |
| 6 | 47 | 9 | 50 |
| 7 | 15 | 22 | 69 |
| 8 | 27 | 10 | 69 |
| 9 | 67 | 6 | 33 |
| 10 | 31 | 22 | 53 |
| 11 | 12 | 43 | 51 |
| 12 | 2 | 14 | 90 |

When examining the responses for questions 1, 5, 7, and 12, which all had Pedestrian A as a regular human and Pedestrian B as varying levels of cyborg, Pedestrian B was far more likely to be hit the more cybernetic

they were. As Pedestrian B's cybernetic percentage decreased, so did the likelihood of being it, and the percentage of times that respondents chose the "either" option vastly increased. This data is shown below in Figure 7.

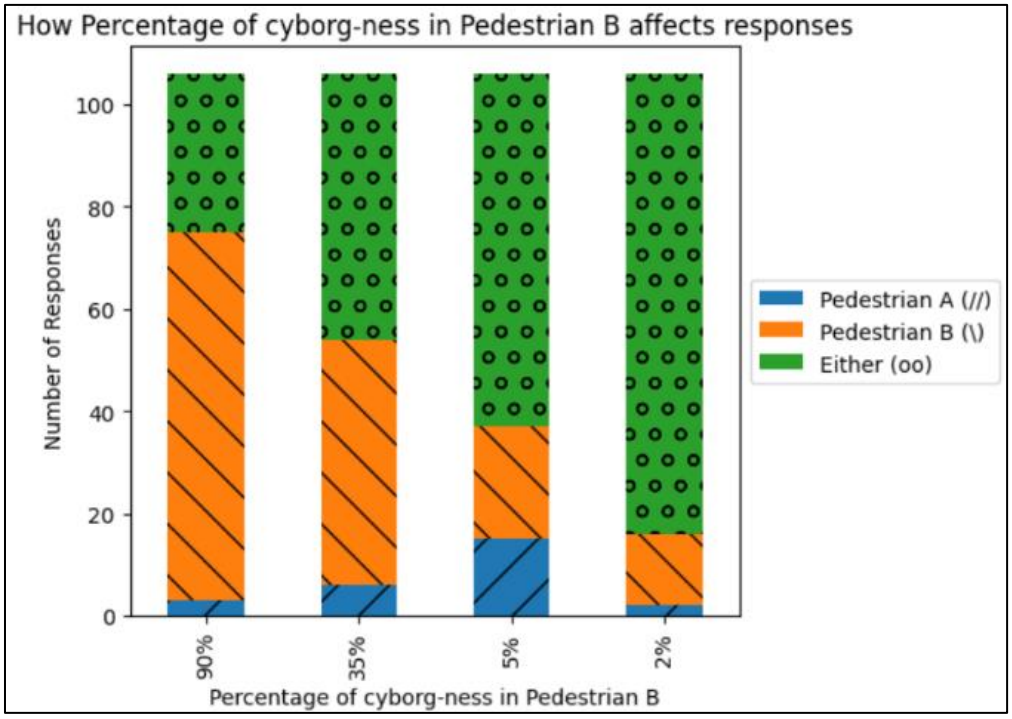


**Figure 7. Responses from Question 1, 5, 7, and 12.**

Figure 8 shows results from Questions 6 and 10, which focused on comparing pedestrians with cybernetics designed to enhance their physical capabilities versus pedestrians with cybernetics designed to replace lost natural abilities. In the case of Question 10, we wanted to examine whether respondents would trade hitting someone who is ~20% less metallic to hit the person who has gotten cybernetics for enhancement purposes.

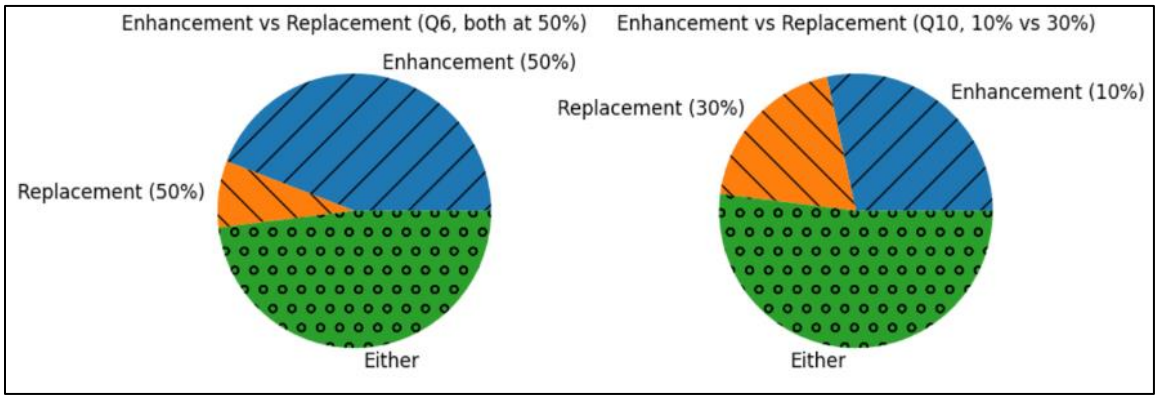


**Figure 8. Responses from Question 6 and 10.**

Figure 9 displays results from Questions 11, 8, and 4 regarding which body parts respondents viewed as more valuable or useful for surviving a car crash. In the figure, pedestrians are labelled by the body parts that were replaced with cybernetics. In these questions, all cybernetic parts were for replacement, rather

than enhancement purposes, and were approximately the same percentage of body composition to be a fair comparison.

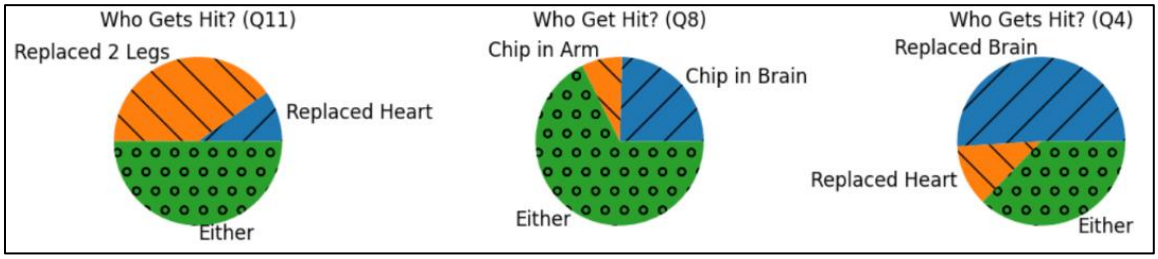


**Figure 9. Responses from Question 11, 8, and 4.**

## Discussion

Our results mostly matched up with our predictions and helped provide evidence for our hypothesis that the public has a strong negative perception of cybernetic humans. In looking at how differing cybernetic percentages affected a pedestrian's chance of being struck by the vehicle, such as in Figure 3, there was an overwhelming trend to indicate that increasing the number of cybernetic enhancements on an individual increases their chances of being picked for a collision. Alternatively, as the gap between regular human and cyborg decreased, such as in Question 12 where the two pedestrians were considered equal except for a single cybernetic finger, the percentage of times that the cyborg was hit significantly decreased and the number of times respondents chose the "either" option went up.

Furthermore, in almost every single question, the pedestrian with the greater amount of cybernetics in their body was chosen to be hit more than the pedestrian with the fewer amount of cybernetics. The only exception to this trend was Question 10, where Pedestrian A's 10% cybernetics for enhancement purposes received more votes than Pedestrian B's 30% cybernetics for replacement. Combined with the results from Question 6, clearly in both scenarios the pedestrian with cybernetics used for enhancement purposes was more likely to be hit than their counterpart. This agrees with what we had seen in the related research that public perception of cybernetics is extremely negative when said technology is used to enhance human capabilities. As expected, the pedestrian that received the single largest number of votes was Pedestrian A in Question 3, who was a 100% robotic creature with no human parts remaining; however, interestingly its counterpart, a cybernetic human who needed to replace 10% of their body, still received 7 votes.

When examining the differences in responses between the 18-25 age group and the other 3 age groups (26-40, 41-60, 61+), in eleven out of twelve questions, the older respondents were more likely to choose the "either" option, while the college-age respondents were more likely to choose one pedestrian over the other. This resulted in cases where the younger respondents overwhelmingly voted to hit Pedestrian A (such as 61% of times in Question 4), but the older respondents only hit Pedestrian A 35% of the time, resulting in Pedestrian A overall being picked 51% of the time. We believe that this phenomenon occurred either because older respondents did not care about the different levels of cybernetics, instead seeing anyone who was not completely human as the same level of cyborg and thus viewed them similarly, or because younger respondents were more open to hitting pedestrians in general while older respondents are hesitant to hit anyone, even in a survey's fictional scenario.

Additionally, when examining the reasonings that respondents gave, a definite trend emerged: phrases such as "perceived chance of survival", "more replaceable", "better chance of [sic] survival" and "most likely to survive". Evidently, respondents examined each pedestrian's chances of survival with the idea that

cybernetic parts were easier to replace in the hospital after a collision and that metallic body parts would survive a collision better than human flesh. As stated in Methodology, we did not specify what kind of materials were used for the pedestrians' cybernetics, and it appears that respondents assumed the cybernetics would be made of strong metals such as steel, aluminum, or titanium. This positive-cybernetic view did not come up at all in the literature review but seems extremely prevalent in the minds of our survey respondents. With the specific context of the survey leaning more towards a life-or-death scenario, rather than general feelings to cyborgs, we may have failed to capture people's viewpoint of cyborgs as hated objects, and instead captured people's viewpoint of cyborgs as resilient, repairable objects. This aligns with the results from (Dartnall, 2004).

## Conclusion

Though they have not flooded the streets yet, cybernetic humans are currently being created and deployed to more places around the globe. As a result, there is a clear need for standard agreed-upon ethics and code of morals. Our research aims to fill in a gap of knowledge on the current public perception of the value of altered humans' lives and provide guidance for future cybernetic technology creators to understand the public's concerns through a survey. We concluded that cybernetic humans will be hit far more than regular humans in pedestrian-automobile collisions, increasing by the amount of visual external cybernetics, however we found that some respondents viewed cyborgs as more replaceable than humans rather than simply having a lower value of life. Further research is needed to understand whether these views of replaceability or sheer moral negativity are more prominent when viewing cybernetic humans.

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