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Article

Revisiting the Belmont Report: an analysis of the bioethical values of Generation Z

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SUMMARY

The 1970s world in which the Belmont Report was written no longer exists. In 2024, biotechnology and biomedicine are evolving at an unprecedented speed due to technologies like artificial intelligence and gene editing. The future leaders of our society, members of Generation Z (born from 1997–2012), face new frontiers of possibility and the great responsibility to uphold ethical standards and modify those that no longer suit the contemporary world. While previous generations have relied upon the Belmont Report, nearly half a century later, the time has come to reevaluate its relevance and reinterpret the report to fit modern needs. Pertaining specifically to Respect for Persons, we hypothesized participants would feel strongly believe autonomy is an inalienable human right and informed consent should always be used, absent extenuating circumstances. We hypothesized many participants would struggle to strongly agree or disagree with Beneficence-related topics due to Beneficence's multifarious nature. We hypothesized participants would be extremely engaged with topics of Justice, showing strong opinions, and gathering the least neutral responses of any category. Additionally, we hypothesized participants would exhibit openness toward new biotechnological advances because of their vast exposure to technology throughout their youth. Participants rated their agreement with statements pertaining to Respect for Persons, Beneficence, Justice, and new technological advances using the Likert scale. While numerous neutral responses illuminated that Generation Z's bioethical values are still forming, key findings include Generation Z's prioritization of equity over equality, diminished concern for genetic privacy, and unique interpretation of doing no harm.

INTRODUCTION

In a rapidly evolving world, ethics can provide a foundation to help humans navigate their every action. Resources like formal written guidance from academic sources or governance reports help guide ethical decisions. Bioethics, a sector of ethics, focuses on ethical, social, and legal issues that arise throughout the course of practicing medicine and conducting biological research (1). One of the first written bioethical doctrines was the Nuremberg Code, created in August 1947 to be a set of principles for ethical experimentation on human subjects (1). Decades later, in its sustained effort to improve ethical experimentation, the U.S. Congress established the National Research Act and in the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research in 1974 (2). From 1974 to 1978, this commission created the Belmont Report, a doctrine that provided a more complete picture of the bioethical values that the Nuremberg Code failed to explicate (3). The Belmont Report provides guidance on conducting ethical research and medical practices and has, since its creation, been held up as a gold standard, not just for scientists; politicians, journalists, doctors, and leaders of all kinds seek wisdom from the Belmont Report (4).

At the beginning of the Belmont Report, a summary is given that concludes with "the Department requests public comment on this recommendation," indicating that the report was never intended to be finite (5). The Belmont Report is a living piece of writing that is ever evolving; it is up to each generation to receive and interpret it. Each reader who possesses the text extracts meaning from its three central principles: Respect for Persons, Beneficence, and Justice. Respect for Persons prioritizes respect for autonomy and protecting the powerless (2). Respect for Persons comes into play when determining whether someone has the right to choose if they receive treatment. Beneficence prioritizes preventing or minimizing harm or risk to an individual (6). Beneficence can be extremely important when a procedure has mixed benefits and risks. Lastly, Justice prioritizes limiting bias and promoting equitable treatment (7). This pillar involves questions of how to make healthcare more accessible to various populations.

Despite its longstanding history, the Belmont Report has been criticized for its prioritization of protectionism. In the context of bioethics, protectionism is the value that certain communities should be excluded from studies to protect them, a line of thinking that is implied in the principle of Respect for Persons (2,8). Because protectionism can include marginalized communities, such as pregnant women, prisoners, and other vulnerable groups, some view protectionism as exclusionary rather than protective (2).

As made clear by its many critics, the Belmont Report is a popular topic of discourse in medical and scientific communities (7). Recently, scientists have rethought the Belmont Report in terms of its applicability and relevance (4). However, researchers have not yet looked into what the Belmont Report means to Generation Z.

Generation Z is the first generation to have grown up with portable digital technology at their fingertips. Generation Z has learned that technology is a crucial part of existence, with 91% of the generation having a phone before the age of 16 (9, 10). 86% of Generation Z, a larger percentage than other generations, feeling that technology is essential to their lives may shape Generation Z's perceptions of what is permissible in the realm of bioethics (11). This study aimed to explore the values of high schoolers on the cusp of adulthood to understand Generation Z's interpretation of and feelings about the principles embedded within the Belmont Report. Pertaining specifically to Respect for Persons, we hypothesized that participants would feel strongly that autonomy is an ageless human right and that informed consent should always be used in the absence of extenuating circumstances. We hypothesized that many participants would struggle to strongly agree or disagree with Beneficence-related topics due to Beneficence's multifarious nature. We hypothesized that participants would be extremely engaged with topics of Justice, showing strong opinions, and gathering the least neutral responses of any category. Additionally, we hypothesized that participants would exhibit openness toward new biotechnological advances because of their vast exposure to technology throughout their youth. From this study, we were able to conclude that Generation Z prioritizes equity over equality, has diminished concern for genetic privacy, and has a unique interpretation of doing no harm.

RESULTS

Respect for Persons is a crucial principle of the Belmont Report that emphasizes consent and autonomy (2). Participants were asked about nine scenarios related to this concept. One example scenario was whether a doctor should be able to admit a patient (age 21, 16, or 7 years old) with mental health issues to a hospital if the patient was deemed a danger to themselves (**Table 1**). For the eldest patient, a slight majority of 55.7% of participants believed that the patient should be forcefully admitted. However, when the age was lowered to sixteen, the age of many participants in the study, even more participants agreed to admit the patient, with 63.2% feeling this way. Lastly, when the youngest age was presented, a 7-year-old child, 58.5% of participants agreed to admit the child (**Figure 1**).

To understand participants' feelings about consent more broadly, participants were asked if an adult suffering from a painful, terminal disease should have the right to a medically assisted death. A majority of participants (87.7%) felt that an adult should have the autonomy to make this decision for themselves. This belief in autonomy extended to other scenarios as well. A majority of participants (53.8%) felt that an embryo could be genetically modified by an autonomous parent.

To create a more complete picture of high schoolers' thoughts surrounding Respect for Persons, the focus was transposed from the patient to the ethical responsibility of medical providers when obtaining consent. When participants were asked if a doctor who helped a patient should be punished if proper informed consent was not given, the ethical line was more blurred. The data followed a normal probability distribution: 33% of participants were neutral and neither side of the spectrum gained a majority of participants to illuminate significant preference. Building off other topics of consent, participants were asked if it was ethical for a doctor to withhold medical information from a patient if the doctor believes this will ultimately enable the patient to make a decision that is in the best interest of their physical health. 69.8% of participants agreed that a patient must always be fully informed to give ethical consent (**Table 1**). Main takeaways from questions around this principle included high percentages of agreement with the importance of transparency between doctors and patients, the right of patients to choose medically-assisted deaths in certain contexts, and the need to admit mentally ill patients of all ages when their conditions are threatening. These questions received a vast majority of participants favoring one side of the Likert Scale, supporting our hypothesis that participants would feel strongly about Respect for Persons.

Beneficence, in its broadest definition, is the value of minimizing harm to all (6). Participants were asked their thoughts about five statements focusing on the bioethical principle of Beneficence. Participants were provided with two separate scenarios and asked whether or not a patient's mental health should be prioritized over their physical health. In the first scenario, prioritizing the patient's mental health put their physical health at risk by allowing them to avoid undergoing a recommended medical procedure. In the second scenario, prioritizing the patient's mental health put their physical health at risk by allowing them to undergo an unnecessary but desired medical procedure. In response to both situations, a great number of participants did not agree with prioritizing the patient's mental health over the doctor's recommendations (66% and 47.1%, respectively). In both situations, many participants were unsure how the situation should be handled (with 21.7% and 40.6%, respectively, answering with a neutral response) (**Table 2**).

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
A doctor should be able to forcibly admit a 21-year-old with a long history of mental health issues to a hospital if the patient is deemed to be a danger to themselves.	7.5	13.2	23.6	36.8	18.9
A doctor should be able to forcibly admit a 16-year-old with a long history of mental health issues to a hospital if the patient is deemed to be a danger to themselves.	6.6	12.3	17.9	40.6	22.6
A doctor should be able to forcibly admit a 7-year-old with a long history of mental health issues to a hospital if the patient is deemed to be a danger to themselves.	10.4	15.1	16	34	24.5
An extremely sick 16-year-old has the right to override their parents' decision when deciding whether or not to participate in an experimental trial of a new drug treatment.	3.8	9.4	23.6	45.3	17.9
An extremely sick 7-year-old has the right to override their parents' decision when deciding whether or not to participate in an experimental trial of a new drug treatment.	17.9	36.8	24.5	14.2	6.6
An adult suffering from a painful, terminal disease has the right to a medically assisted death.	2.8	0	9.4	39.6	48.1
It is unethical to genetically modify an embryo because the resulting child cannot consent to this decision.	13.2	40.6	22.6	18.9	4.7
A doctor fails to obtain proper informed consent for a procedure that saves the life of a patient. The doctor should not be punished because they helped the patient.	7.5	20.8	33	26.4	12.3
A doctor should be able to withhold medical information from a patient if the doctor believes that this will encourage the patient to make the health decision that is in the best interest of their physical health.	31.1	38.7	18.9	10.4	0.9

Table 1: Participants' agreement on Respect for Persons-related questions. Nine statements relating to Respect for Persons were given to participants in the survey and participants were asked to rate their agreement with each statement on the Likert scale (Appendix). The percentage of participants that selected each ranking for each question is given. N = 106,

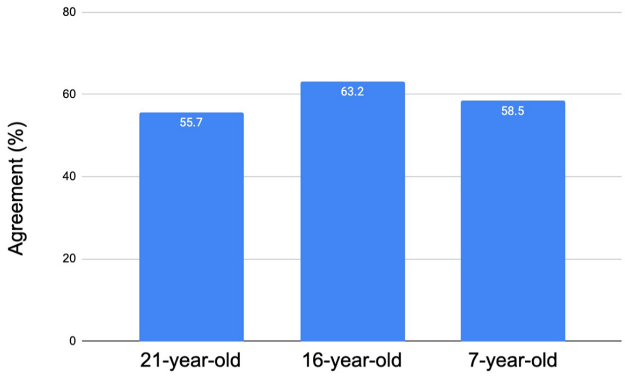

Figure 1: Participants' opinion on forced admission of individuals with mental health issues to hospitals. Students were asked to rate their agreement with the following statements: A doctor should be able to forcibly admit a 21-year-old, a 16-year-old, or a 7-year-old with a long history of mental health issues to a hospital if the patient is deemed to be a danger to themselves (Questions 4-6, Appendix). Percentage of participants that selected number 4 or 5 on the Likert scale for statements 4-6 on the survey. N = 106.

To further understand participant perceptions of Beneficence, we asked participants whether they agreed with scientists infecting consenting people with mild or severe forms of diseases to study them. Interestingly, a majority of participants agreed that consenting people should be able to be infected with a mild form of a disease (63.2%). When it came to infecting consenting people with a severe disorder for research purposes, excluding the "strongly agree" category, the data distribution was somewhat even. The percentage of participants choosing each ranking ranged from 21.7% to 26.4% (**Figure 2**). The response that had the highest number of participants was "neutral" (26.4%). This was the same case when participants were asked whether the opinion of five doctors outweighed the opinion of one. Similar to the previous scenario, the highest percentage of participants responded neutrally (34.9%) (**Table 2**)**.** In multiple questions related to Beneficence, we observed high levels of neutrality, indecision, and spread throughout the Likert Scale.

Justice is the third key principle of the Belmont Report which emphasizes doing right by those who have been wronged (7). Participants were given six questions focusing on Justice. Participants were presented with two diseases: Disease A, which affects 50% of the population but has mild, non-life-threatening symptoms and Disease B, which affects 5% of the population but is severe and deadly. Participants were given two similar statements with the only difference between the two being which disease should be prioritized for curing. In both questions, the exact same percentage of 69.8% of participants believed in prioritizing curing the more severe disease (**Table 3**).

Additionally, a question was provided about protectionism—a commonly criticized concept in the Belmont Report that promotes the protection of subjectively vulnerable peoples (3). Participants were asked about the ethicality of recruiting marginalized communities for research, even if the data could potentially help these communities. A majority of participants (60.4%) were against protectionism (**Table 3**). Lastly, participants were asked to reflect on Justice for genetic privacy. When asked if genetic information should be private, the vast majority of participants agreed (80.2%). However, two other questions indicated a greater assortment of values. The first question asked if an employer should have access to the genetic information of their employees if it concerns the employee's ability to perform the job. 56.5% of participants disagreed and 18.8% of participants agreed with this statement. The second question further challenged the notion of genetic privacy by using genetics as a means of job qualification. When two otherwise equally qualified people are applying for a job, 31.2% of participants thought it was justified for the employer to not hire an employee who has a genetic mutation that would render them unable to perform the job in five years (**Table 3**). Survey results for Justice-related questions were mixed, with some responses showing strong bias toward a majority opinion, and others showing a more even distribution between responses with high levels of neutrality.

In addition to survey questions about the main principles of the Belmont Report, seven statements about biotechnological innovations were provided to participants to assess Generation Z's feelings about the emerging technologies of today. Firstly, participants were asked whether artificial intelligence (AI) technology should be used to create new drugs for the treatment of diseases. A majority of participants (67.9%) believed that this technology should be used. However, when participants were asked the same question but with the caveat that AI could potentially be used for the creation of biological weapons, 33% of participants did not want the technology to be used and 42.5% of participants believed it should be used despite the possibility that the AI could be used for harm (**Table 4**).

Moving on from AI, participants were given a series of

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
A patient needs to undergo a necessary medical procedure for their physical health but has extreme anxiety about the procedure. In this case, the doctor should prioritize their patient's mental health over their physical health and not perform the procedure, even if the procedure could alleviate long-term physical suffering.	19.8	46.2	21.7	10.4	1.9
A patient desires a non-necessary medical procedure that they believe will improve their mental health. In this case, the doctor should prioritize a patient's mental health over their physical health, even if the doctor is worried about significant physical risks to the patient.	11.3	35.8	40.6	8.5	3.8
Scientists should be able to infect consenting people with a mild, non-threatening disease in order to study it.	7.5	7.5	21.7	40.6	22.6
Scientists should be able to infect consenting people with a serious, life-threatening disease in order to study it.	25.5	21.7	26.4	21.7	4.7
A patient's life is at risk and a medical decision needs to be made. Five doctors believe one route is best and one doctor believes another route is best. The route that the five doctors agree on should always outweigh the other doctor's opinion.	5.7	26.4	34.9	27.4	5.7

Table 2: Participants' agreement on Beneficence-related questions. Five statements relating to Beneficence were given to participants in the survey and participants were asked to rate their agreement with each statement on the Likert Scale (Appendix). The percentage of participants that selected each ranking for each question is given. N = 106.

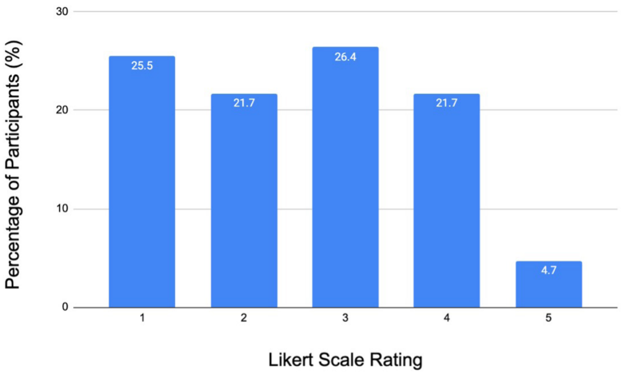

Figure 2: Participants' opinion on using harmful human experimentation as a method to study a disease. Students were asked to rate their agreement to the following statement on a scale of 1-5: Scientists should be able to infect consenting people with a serious, life-threatening disease to study it (Question 24, Appendix). Percentage of participants that selected each number on the Likert scale for statement 24 on the survey. The Likert scale ranges from 1 (strongly disagree) to 5 (strongly agree). N = 106.

questions that asked if gene editing was ethical for plants, animals, and humans. A majority of participants (75.5%) thought it was ethical to genetically edit plants. Conversely, only 18.9% of participants were pro-genetically editing animals. Compared to plants and animals, genetically editing humans gathered the least support from participants, with only 7.5% of participants in favor (**Figure 3**). While participants claimed not to be in favor of genetically editing humans, specific usages of gene editing brought to light the intricacies of their opinions. For example, when asked if one should be able to use gene editing to prevent severe hereditary disease from being passed down to their children, a vast majority of participants (76.4%) believed this should be allowed and is ethical (**Figure 3**). On the other hand, when participants were asked if one should be able to use gene editing to select desired physical characteristics in their children, only a small minority (7.5%) thought this was justified (**Table 4**). Overall, questions that encompassed perceptions on new biotechnology gained support from Generation Z participants, supporting our hypothesis that Generation Z would express openness to revolutionary, albeit potentially dangerous technologies.

We found that of all the categories, most people answered neutrally in response to scenarios related to Beneficence (29.06%), and the least amount of people responded neutrality to Justice (19.50%). The percentage range of participants that responded neutrally was 9.56% and this range is not statistically significant (chi-square test statistic = 0.347; degrees of freedom = 3; $p < 0.05$) (**Figure 4**).

DISCUSSION

Respect for Persons is a crucial principle of the Belmont Report that emphasizes consent and autonomy. With the exception of two scenarios, participants' ethical beliefs supported our hypothesis that Generation Z highly prioritizes autonomy and that informed consent should always be used in the absence of extenuating circumstances.

Because the principle of Respect for Persons is open to interpretation, we were interested in examining how far Generation Z would extend this respect to people of different ages. The majority of participants did not believe the mentally unstable patients should have autonomy, regardless of patient age. That being said, the 21-year-old patient received the most support for maintaining autonomy, showing that the legal distinction between an adult and a minor carries some weight with Generation Z. These results suggest that a majority of Generation Z believes that having autonomy is contingent on the mental stability of a patient rather than their age.

On the contrary, age became a larger factor for consideration when participants were asked if a sick minor (either 16 or 7 years old) should have the right to override their parents' decision regarding experimental drug treatment in survey questions 8 and 9. While the results for the 7-year-old reinforce current laws that define a 7-year-old as a minor and therefore unable to consent, the results for the 16-year-old show that Generation Z is open to 16-year-olds having full adult autonomy (**Figure 1**). Given that many of the participants taking the survey were 16 years old themselves, participants offered an interesting perspective on the relationship between age and autonomy, particularly when it is not in accordance with current laws regarding minors.

Respect for Persons extends beyond questions of age and consent, and we were interested in exploring whether autonomy extends to issues that are more ethically complex. The first of these topics was medically assisted death, a practice that is illegal in 30 U.S. states (15). Surprisingly, a vast majority of participants believed that patients' wishes should be respected in this scenario. It is possible that this level of

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
Disease A affects 50% of the population but has mild, non-life-threatening symptoms. Disease B affects 5% of the population but is severe and deadly. Curing Disease A should be prioritized over curing Disease B.	24.5	45.3	17	10.4	2.8
Disease A affects 50% of the population but has mild, non-life-threatening symptoms. Disease B affects 5% of the population but is severe and deadly. Curing Disease B should be prioritized over curing Disease A.	5.7	8.5	16	41.5	28.3
Scientists are studying the impact of air quality on health outcomes and are advertising the study for compensation to potential participants from low-income communities who have been historically impacted by poor air quality. This is unethical because they are targeting marginalized communities, even though the data could potentially help these communities.	21.7	38.7	18.9	17.9	2.8
One's genetic information is private and this privacy should be protected.	1.9	0.9	17	36.8	43.4
An employer should have access to the genetic information of their employees if it concerns the employee's ability to perform the job.	33	23.6	24.5	17.9	0.9
When two otherwise equally qualified people are applying for a job, it is justified for the employer to not hire the employee who has a genetic mutation that will render them unable to perform the job in five years.	17	28.3	23.6	22.6	8.5

Table 3: Participants' agreement on Justice-related questions. Six statements relating to Justice were given to participants in the survey and participants were asked to rate their agreement with each statement on the Likert Scale (Appendix). The percentage of participants that selected each ranking for each question is given. N = 106.

	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)
AI technology should be used to create new drugs for the treatment of diseases.	4.7	5.7	21.7	38.7	29.2
AI technology should be used to create new drugs for the treatment of diseases, even if that technology could potentially be used for the creation of biological weapons.	15.1	17.9	25.5	26.4	15.1
Gene editing is ethical when used on plants.	2.8	4.7	17	47.2	28.3
Gene editing is ethical when used on animals.	7.5	29.2	44.3	12.3	6.6
Gene editing is ethical when used on humans.	14.2	38.7	39.6	6.6	0.9
One should be able to use gene editing to prevent a severe hereditary disease from being passed down to their children.	3.8	3.8	16	39.6	36.8
One should be able to use gene editing to select desired physical characteristics in their children.	34	37.7	20.8	7.6	0

Table 4: Participants' agreement on biotechnology-related questions. Seven statements relating to perceptions of new technology were given to participants in the survey and participants were asked to rate their agreement with each statement on the Likert Scale (Appendix). The percentage of participants that selected each ranking for each question is given. N = 106.

agreement was so high because medically assisted deaths are legal in California, where this survey was conducted (16). This reveals Generation Z's belief that one should have autonomy to live as much as one should have the autonomy to die. Another controversial topic concerned embryo editing and the consent of the resulting child. Although one might expect Generation Z to strongly favor obtaining the child's consent, most believed that the parent could make a decision about their unborn child's genetics independently and ethically. In a way, this is not surprising. Since the overturning of Roe versus Wade, Generation Z has come out strongly in support of pro-choice regulations that emphasize the autonomy of a pregnant person (17). Overall, these results show that Respect for Persons and questions of autonomy are of paramount importance to Generation Z, even in the face of controversial issues such as those presented in the survey questions.

Conversely, in two scenarios, participants demonstrated that Respect for Persons is conditional. There was no unanimous consensus that a doctor who failed to obtain a patient's consent but saved their life should be punished, nor was there a consensus that patients' informed consent should always be required in medical scenarios. This could suggest that Generation Z has a more lenient stance on punishment and a greater empathy for others. These responses also illuminated ambivalent feelings about Respect for Persons, given that informed consent was not the priority for the majority of participants who were neutral or believed that no punishment should be given. It is possible that Respect for Persons is not always a priority for Generation Z and that some individuals may be open to challenging its relevance as presented in the Belmont Report.

Beneficence is key in both the Belmont Report and bioethics on the whole because the two other Belmont principles, Respect for Persons and Justice, are reliant on Beneficence-inspired goals to minimize harm to individuals. The data gathered from questions related to Beneficence supports our hypothesis that many participants would struggle to strongly agree or disagree with questions asked; no consensus or only a slight majority suggest a struggle with the varied and complex nature of the topic.

One key area related to Beneficence is mental health. Unlike any generation before it, Generation Z has prioritized mental health and created a social movement around this cause. However, 42% of Generation Z battles depression, nearly double the 23% reported among Americans who are over 25 (18). Still, a majority of participants in our study felt that physical health comes before mental health when making medical decisions, supported by the data for survey questions 10 and 11, indicating Generation Z's possible belief that minimizing harm can be achieved by prioritizing physical health issues.

It was interesting to see that there was not a consensus on whether consenting patients could be infected with a disease to advance scientific understanding. Participants were unsure about the ethicality of gathering this kind of data to help others. A reason for this could be that it feels counterintuitive to minimize harm to others by causing harm to study participants. Perhaps the most fascinating finding from the questions related to Beneficence was when participants

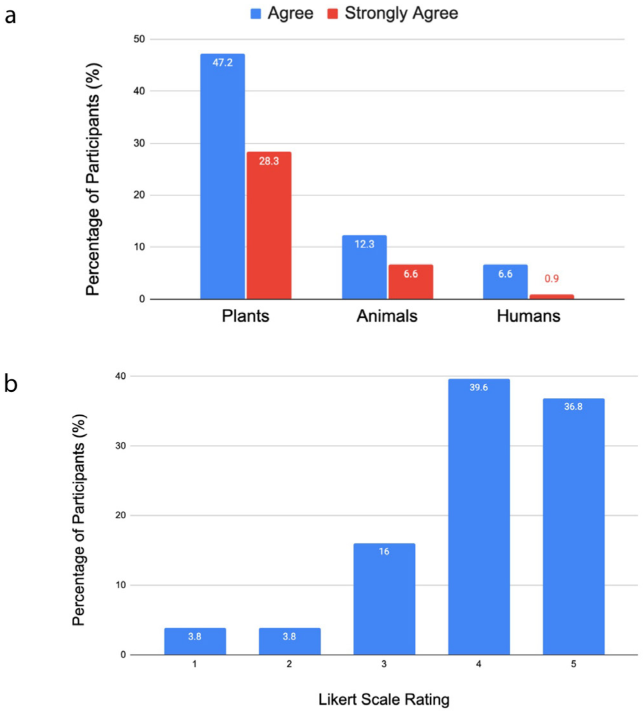

Figure 3: Participants' opinions on the use of gene editing. Students were asked to rate their agreement to the following on a scale of 1–5. A) Participants' positive agreement with genetically editing plants, animals, and humans. (Questions 14–16, Appendix). On the Likert scale, agree was listed as 4 and strongly agree was listed as 5. N = 106. B) Participants' opinions on whether gene editing should be used to prevent a severe hereditary disease from being passed down to their children (Question 18, Appendix). Percentage of participants that selected each number on the Likert scale. The Likert scale ranges from 1 (strongly disagree) to 5 (strongly agree). N = 106.

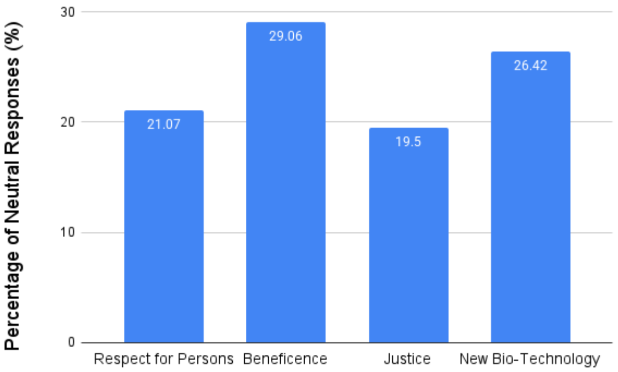

Figure 4: Participants' neutrality concerning the Belmont principles and biomedical innovations. Participants were considered "neutral" when they selected 3 on the Likert scale for a given statement. The percentage of neutral participants for each of the categories is given. The difference in the percentage of neutral responses across categories was not statistically significant (chi-square test statistic = 0.347; degrees of freedom = 3; $p > 0.05$).

were challenged to think about whether groupthink minimized harm to the patient. Slightly more participants felt that, in decision-making, an opinion shared by a group, no matter what it may be, outweighed an opinion only held by one person. It is concerning that slightly more people agreed with this statement because this might indicate Generation Z's comfortability with groupthink, the tendency to agree with the dominant group, even if one personally disagrees with their ideas or views them as harmful, in order to avoid being different (19). This question brought to light that Generation Z's care for Beneficence could be hurt by herd mentality.

Justice, the third key pillar of the Belmont Report, has an enormous significance in our world today with equality and equity being a common debate among all demographics. Thirty-two percent of Generation Z is regularly engaged in social justice work or activism (20). In support of our hypothesis, Justice-related questions received the smallest number of participants who responded neutrally to scenarios, suggesting that these questions were of great importance. Even when participants were presented with the same question phrased slightly differently in order to challenge their true beliefs, the same percentage of participants agreed that a severe disease that impacts fewer people should be more important to scientists and doctors than a less severe disease that affects more of the population. This illuminates a potential generational idea about Justice: it is most just to protect vulnerable minorities over a majority of people. Our data indicates that Generation Z views Justice as bringing people to a more level playing field; equity over equality.

Within the discussion of Justice in the Belmont Report, protectionism was brought up, criticisms of which were highlighted in the introduction. While we hypothesized that Generation Z would still be in support of protectionism given the social justice movements that it has brought about to protect the vulnerable, the majority of participants were against protectionism (20). This question was carefully worded to include the downside of excluding marginalized communities from data collection: a lack of understanding of a community, even if it is vulnerable, will minimize the ability to help it long term. However, when the downside of protectionism is not laid out for Generation Z, it is unclear if they would have the same extent of ethical clarity; further questions would need to be added in order to determine if Generation Z truly finds protectionism unjust. The most surprising data from the Justice questions was when participants were challenged about genetic privacy, and many were either unsure about or in support of an employer having access to their employee's genetic information and even using this information to make hiring decisions. While each of these opinions were in the minority individually, they represent an emerging group within Generation Z that may have little concern for genetic privacy. A reason for this group's existence could be that they view genetic information as equivalent in value to all the other kinds of data that companies collect on them. Perhaps this group has become accustomed to surveillance, often in the form of algorithms or internet cookies, and has fully accepted this invasion of privacy as a way of life. Generation Z's inability to see the interconnection of Justice and privacy could have potential ramifications on hiring practices and workplace discrimination. Allowing genetic information to factor into the evaluation of one's capabilities provides a new method to segregate the population and hinder opportunities for many. Though some of the responses to our Justice-related questions supported our hypothesis that Generation Z would present strong opinions on Justice issues, other responses reveal a much more nuanced spread of agreement with high levels of neutrality. This suggests that our hypothesis that Generation Z feels strongly about the bioethical principle of Justice may not be fully supported for complex areas related to Justice in the healthcare setting.

Since the Belmont Report's creation decades ago, the world has gone through incredible technological and medical advancements that have created generational differences. We hypothesized that Generation Z would be inclined to agree or be comfortable with new technological applications given their familiarity with technology, such as AI. However, our hypothesis is only somewhat supported by our data given that participants showed discomfort with new technology is various scenarios.

The Pew Research Center found that of the U.S. adolescent Generation Z members that have heard of ChatGPT, a generative AI platform, one in five teens have used the technology for schoolwork (21). Given Generation Z's use of AI technology, we correctly anticipated that most participants were generally accepting of the use of AI to help others by creating new drugs to treat diseases. Yet, this comfort diminished when AI's negative effects were considered. Another notable generational difference is that Generation Z has also grown up in an age of exponential genetic advancement. Given gene technology's pervasiveness, we were curious about how the subject would be received by Generation Z. Most participants were only in support of genetically editing plants. However, the vast majority of participants supported using this technology to prevent severe hereditary diseases, showing that Generation Z likely believes hereditary diseases to be a valid justification for the use of such technology and will likely prioritize preventing hereditary diseases when creating regulations surrounding genetically editing humans. While only a small minority of participants approved of the use of gene editing to select desired physical characteristics, this shows that the ethical implications of gene editing for the selection of desired physical characteristics remain highly debated.

While we hypothesized that participants would exhibit low levels of neutrality across all categories, we believed some categories would be more controversial to participants and therefore increase the proportion of neutral responses. Due to these politically turbulent times in which “cancel culture” reigns, Generation Z may be hesitant to push the envelope, leading to indecisiveness (12, 13). We hypothesized that Justice would have the least neutrality due to the prevalence of justice movements and conversations about justice in America, the home of our participants (14). While the category with the least uncertainty for Generation Z was Justice, we accept the null hypothesis; the difference in neutral responses between categories was not significant (**Figure 4**). However, in the past couple of years, Generation Z has made civil rights a priority (20). This could explain why survey respondents demonstrated greater certainty about the ethics of Justice. The category with the most uncertainty for Generation Z is Beneficence. This could be because it is hard for Generation Z to rationalize what it means in practice to do no harm. This is concerning because Beneficence is the principle of the Belmont Report with the most impact on individual cases. A greater amount of confusion surrounding what is best for patients may lead to indecision surrounding ethical policies.

There are many different motivations for participants to respond the way that they did. When analyzing the data, we broadly applied the participants’ opinions to represent their generation. However, there are some limitations to this approach. Students of 16 or 17 years of age were chosen to study because they are nearing the maturity of adulthood yet are still legally minors. In 2024, Generation Z ranges from ages 12 to 27; therefore, the range of the ages of participants was not representative of the full Generation Z age range (22). Additionally, the high school students surveyed, who attend a private school in Los Angeles, are likely not representative of the majority of their generation. Surveying this group of students provides a glimpse into the opinions of teenagers in one urban city in the United States. In order to protect all participants who were minors, we did not collect personal information or the political leanings of the students. In the future, when the population of Generation Z fully surpasses the legal, 18-year-old distinction of adulthood, it would be interesting to see how this personal information correlates to perceptions of the Belmont principles within Generation Z. To fully understand the reasoning behind participants’ answers to these questions, additional data beyond these responses would need to be collected. Each individual could have different justifications for the same response, which could be uncovered in future open-ended surveys that allow participants to explain their reasoning. Additionally, a potential limitation is that students may not have understood the questions fully when responding. It is essential to understand the ethics of Generation Z and how those ethics impact the relevance of the Belmont Report; our present and future lie in the hands of Generation Z.

MATERIALS AND METHODS

Participants

Study participants consisted of 106 eleventh graders (ages 16-17) attending a private school in Los Angeles, California, with a total of 293 students making up the eleventh-grade class. Classes of eleventh-grade students were provided with the survey link. Each class consisted of 14–20 students (23). All teachers emailed the link to their students, with some providing class time for participants to complete the survey. Only eleventh-graders were surveyed so that each participant had received similar school curriculum. Participants were not compensated because we aimed to gather thoughtful, truthful responses, unrelated to financial incentives.

Survey

The survey consisted of bioethics-related statements that participants were asked to rate their agreement with on the Likert Scale from “strongly agree” or 5 to “strongly disagree” or 1 (Appendix). Once the survey was created, it was sent to an Institutional Review Board (IRB) consisting of a science teacher at the school, a member of the administration from the school, and a counselor/licensed social worker from the school. No IRB members had personal connections to the researchers. The IRB gave minor feedback about language sensitivity. Revisions were made, and all members of the IRB approved the final version of the survey.

The survey was administered online via Google Forms with settings for each student to take the survey only once and to remain anonymous. Many questions were left purposely vague to avoid potentially upsetting specifics. Each survey question was placed in one of four categories with no repetition amongst categories: Beneficence, Respect for Persons, Justice, or perceptions of new technology. The topics of gene editing and AI were chosen to represent biotechnological innovations broadly, as both have been subject to increased media attention (24–26).

At the beginning of the survey, participants filled out a minor assent form to confirm that they understood their participation in the study. The IRB did not feel that parental permission was necessary. Participants clicked a box to assent rather than sign their names for the purpose of anonymity. Before beginning the survey, participants were also required to confirm that they were in the eleventh grade and between the ages of 16 and 17 by selecting a checkbox. Participants were not allowed to ask questions once they began their survey in order to restrict outside influence.

Analysis

Findings from each question’s data were extracted and analyzed for their significance in the study. Findings were either when the majority of participants agreed with one side of the Likert spectrum, when there was a noteworthy data point, or if there was an interesting even spread of participants across the entire spectrum. This information was determined by percentages calculated by Google Forms for each question. Additionally, for each category, the percentage of people who selected “neutral” (3 on the Likert scale) was added to a table to illustrate how the level of neutrality of Generation Z’s opinions ranges among the three different principles of the Belmont Report and new innovations.

Statistics

A chi-square test was done to assess the significance of the difference in neutrality between the four categories. First, the percentage of neutral (Likert scale value of 3) and non-neutral (Likert scale values of 1, 2, 4, or 5) responses was tallied for each of the four categories. The observed values for each were then tallied. The expected values were calculated using the following formula: ((100% * # of categories)/total number of participants). Then, a chi-square test ($\chi^2 = \sum(Oi - Ei)2/Ei$) was run to find the critical value, which was compared to a chi-square table to determine significance. We set a significance level of $p = 0.05$; we calculated p to be greater than 0.05 ($p > 0.05$), indicating statistical insignificance.

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REFERENCES

1. Resnik, David B. “Bioethics.” *National Institute of Environmental Health Sciences, U.S. Department of Health and Human Services,* https://www.niehs.nih.gov/research/resources/bioethics#:~:text=Bioethics%20is%20the%20study%20of,in%20biomedicine%20and%20biomedical%20research. Accessed 16 July 2024.
2. Nagai, Hiroyuki et al. “The creation of the Belmont Report and its effect on ethical principles: a historical study.” *Monash Bioethics Review,* vol. 40, no. 2, 2022, pp.157-170. https://doi.org/10.1007/s40592-022-00165-5
3. Office for Human Research Protections. “The Belmont Report.” *US Department of Health and Human Services*, 10 July 2024, https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/index.html#:~:text=The%20Belmont%20Report%20was%20written,of%20Biomedical%20and%20Behavioral%20Research. Accessed 16 July 2024.
4. Friesen, Phoebe et al. “Rethinking the Belmont Report?” *The American Journal of Bioethics*, vol. 17, no. 7, 2017, pp. 15-21. https://doi.org/10.1080/15265161.2017.1329482
5. Office for Human Research Protections . “Read the Belmont Report.” *US Department of Health and Human Services*, 27 Sept. 2022, https://www.hhs.gov/ohrp/regulations-and-policy/belmont-report/read-the-belmont-report/index.html. Accessed 16 July 2024.
6. Mondragón Barrios, Liliana et al. “Rethinking Benefits in Health Research, Reflections of an Ethics Committee.” *The Yale Journal of Biology and Medicine*, vol. 95, no. 3, pp. 389-398. 30 Sep. 2022
7. Adashi, Eli Y et al. “The Belmont Report at 40: Reckoning With Time.” *American Journal of Public Health*, vol. 108, no.10, 2018, pp. 1345-1348. https://doi.org/10.2105/AJPH.2018.304580
8. Childress, James F., et al. Belmont Revisited: Ethical Principles for Research With Human Subjects. *Georgetown University Press*, 2005.
9. Kedet. “How Gen Z Is Re-Defining Digital .” *War Room Inc*, 11 July 2024, https://www.warroominc.com/institute-library/blog/how-gen-z-is-re-defining-digital/. Accessed 16 July 2024.
10. “Black Mirror or Black Hole? American Phone Screen Time Statistics.” *OKW News*, 10 Feb. 2024, https://okwnews.com/news/lifestyle/health-wellness/black-mirror-or-black-hole-american-phone-screen-time-statistics. Accessed 16 July 2024.
11. “CTA Research: Exploring Gen Z Views and Preferences in Technology.” *Consumer Technology Association*, 20 Feb. 2023, https://www.cta.tech/Resources/Newsroom/Media-Releases/2024/February/CTA-Research-Exploring-Gen-Z-Views-and-Preferences. Accessed 16 July 2024.
12. Vogels, Emily A., et al. “Americans and ‘Cancel Culture’: Where Some See Calls for Accountability, Others See Censorship, Punishment.” *Pew Research Center*, 19 May 2021, https://www.pewresearch.org/internet/2021/05/19/americans-and-cancel-culture-where-some-see-calls-for-accountability-others-see-censorship-punishment/. Accessed 16 July 2024.
13. Gonyea, Judith G, and Robert B Hudson. “In an Era of Deepening Partisan Divide, What Is the Meaning of Age or Generational Differences in Political Values?” *Oxford Academic*, vol. 30, no. 2, 2020, pp. 52–55, https://doi.org/10.1093/ppar/praa003
14. Smith, Deonna. “Should We Still Be Talking about Social Justice in 2023?” *Forbes*, 11 Apr. 2023, https://www.forbes.com/sites/forbeseq/2023/04/11/should-we-still-be-talking-about-social-justice-in-2023/. Accessed 16 July 2024.
15. “States Where Medical Aid in Dying Is Authorized.” *Compassion and Choices*, https://compassionandchoices.org/resource/states-or-territories-where-medical-aid-in-dying-is-authorized/. Accessed 16 July 2024.
16. “Qualifying at UC Davis Health.” *UC Davis Health*, https://health.ucdavis.edu/end-of-life-option-act/. Accessed 16 July 2024.
17. Deckman, Melissa. “The Numbers Show Gen Z Is Actually the Pro-Choice Generation.” *The Hill*, 21 July 2022, https://thehill.com/opinion/civil-rights/3567581-the-numbers-show-gen-z-is-actually-the-pro-choice-generation/. Accessed 16 July 2024.
18. “Gen Z’s Progressive Stance on Therapy and Mental Health.” *Pacific Oaks College*, 3 Mar. 2024, https://www.pacificoaks.edu/voices/blog/gen-z-view-on-mental-health/#:~:text=Gen%20Z%20Mental%20Health%20Statistics,are%20over%2025%20(23%25). Accessed 16 July 2024.
19. Booth, Jerome. “Have We All Gone Mad?: Why Groupthink Is Rising and How to Stop It.” *Biteback Publishing*, 2023.
20. United Way NCA. “The Gen Z Activism Survey.” *United Way of the National Capital Area*, 5 Mar. 2024, https://unitedwaynca.org/blog/gen-z-activism-survey/. Accessed 16 July 2024.
21. Sidoti, Olivia, and Jeffrey Gottfried. “About 1 in 5 U.S. Teens Who’ve Heard of CHATGPT Have Used It for Schoolwork.” *Pew Research Center*, 16 Nov. 2023, https://www.pewresearch.org/short-reads/2023/11/16/about-1-in-5-us-teens-whove-heard-of-chatgpt-have-used-it-for-

schoolwork/#:~:text=Roughly%20one%2Din%2Dfive%20teenagers,teens%20ages%2013%20to%2017. Accessed 16 July 2024.
22. Mata, William, et al. “Which Generation Are You? Age Ranges from Gen Z to Baby Boomers Explained.” *The Standard*, 9 May 2024, https://www.standard.co.uk/news/uk/which-age-range-who-generation-z-millennial-boomer-zoomer-b1073540.html. Accessed 16 July 2024
23. “HW at a Glance.” *Harvard Westlake*, https://www.hw.com/about/HW-at-a-Glance. Accessed 16 July 2024.
24. Farooq, Ahmad. “The Rise of Artificial Intelligence: A Technological Revolution.” *Medium*, 3 Jan. 2024, https://medium.com/@ahmadfarooq710/the-rise-of-artificial-intelligence-a-technological-revolution-c690e6301cd2#:~:text=Artificial%20Intelligence%20(AI)%20has%20emerged,processes%20and%20enabling%20unprecedented%20advancements. Accessed 16 July 2024.
25. Bharadiya, Jasmin Praful, et al. “Rise of Artificial Intelligence in Business and Industry.” *Journal of Engineering Research and Reports*, vol. 25, no. 3, June 2023, https://doi.org/10.9734/jerr/2023/v25i3893.
26. Li, Tianxiang, et al. “CRISPR/Cas9 Therapeutics: Progress and Prospects.” *Signal Transduction and Targeted Therapy*, vol. 8, no. 1, 16 Jan. 2023. https://doi.org/10.1038/s41392-023-01309-7

Appendix

Survey questions and the Likert scale used within the survey have been included.

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

Likert Scale, given to all participants before each statement. Participants were asked to rate their agreement with each statement in the survey on this scale.

Participants were given these statements on the survey in the order as follows:

1. Scientists are studying the impact of air quality on health outcomes and are advertising the study for compensation to potential participants from low-income communities who have been historically impacted by poor air quality. This is unethical because they are targeting marginalized communities, even though the data could potentially help these communities.
2. AI technology should be used to create new drugs for the treatment of diseases.
3. AI technology should be used to create new drugs for the treatment of diseases, even if that technology could potentially be used for the creation of biological weapons.
4. A doctor should be able to forcibly admit a 21-year-old with a long history of mental health issues to a hospital if the patient is deemed to be a danger to themselves.
5. A doctor should be able to forcibly admit a 16-year-old with a long history of mental health issues to a hospital if the patient is deemed to be a danger to themselves.
6. A doctor should be able to forcibly admit a 7-year-old with a long history of mental health issues to a hospital if the patient is deemed to be a danger to themselves.
7. An adult suffering from a painful, terminal disease has the right to a medically assisted death.
8. An extremely sick 16-year-old has the right to override their parents’ decision when deciding whether or not to participate in an experimental trial of a new drug treatment.
9. An extremely sick 7-year-old has the right to override their parents’ decision when deciding whether or not to participate in an experimental trial of a new drug treatment.
10. A patient needs to undergo a necessary medical procedure for their physical health but has extreme anxiety about the procedure. In this case, the doctor should prioritize their patient’s mental health over their physical health and not perform the procedure, even if the procedure could alleviate long-term physical suffering.
11. A patient desires a non-necessary medical procedure that they believe will improve their mental health. In this case, the doctor should prioritize a patient's mental health over their physical health, even if the doctor is worried about significant physical risks to the patient.
12. Disease A affects 50% of the population but has mild, non-life-threatening symptoms. Disease B affects 5% of the population but is severe and deadly. Curing Disease A should be prioritized over curing Disease B.
13. Disease A affects 50% of the population but has mild, non-life-threatening symptoms. Disease B affects 5% of the population but is severe and deadly. Curing Disease B should be prioritized over curing Disease A.
14. Gene editing is ethical when used on plants.
15. Gene editing is ethical when used on animals.

16. Gene editing is ethical when used on humans.
17. It is unethical to genetically modify an embryo because the resulting child cannot consent to this decision.
18. One should be able to use gene editing to prevent a severe hereditary disease from being passed down to their children.
19. One should be able to use gene editing to select desired physical characteristics in their children.
20. An employer should have access to the genetic information of their employees if it concerns the employee's ability to perform the job.
21. When two otherwise equally qualified people are applying for a job, it is justified for the employer to not hire the employee who has a genetic mutation that will render them unable to perform the job in five years.
22. One's genetic information is private and this privacy should be protected.
23. Scientists should be able to infect consenting people with a mild, non-threatening disease in order to study it.
24. Scientists should be able to infect consenting people with a serious, life-threatening disease in order to study it.
25. A doctor fails to obtain proper informed consent for a procedure that saves the life of a patient. The doctor should not be punished because they helped the patient.
26. A doctor should be able to withhold medical information from a patient if the doctor believes that this will encourage the patient to make the health decision that is in the best interest of their physical health.
27. A patient's life is at risk and a medical decision needs to be made. Five doctors believe one route is best and one doctor believes another route is best. The route that the five doctors agree on should always outweigh the other doctor's opinion.