

# Effect of Demographic Factors on Openness to Medical Technology

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**Abstract** - What are the factors that cause societies to readily accept some technologies and resist other technologies? The success or failure of a variety of technologies, including vaccines, gene editing, artificial intelligence, and brain-computer interfaces, depends on societal acceptance of these technologies. The objective of this research is to examine the relationship between technological acceptance and geography, gender, lifestyle, religion, and age. A review of the current literature reveals that gender may influence technological acceptance. For example, a study of adults in Germany, Poland, and Turkey found that women displayed much higher acceptance of medical technology than men. Lifestyle factors also play a role, as individuals who exercised more frequently were more open to technological innovations. Differences in economic development may influence acceptance of novel technologies, as those who live in less developed countries may be more open to technological advancements that will bring about economic advancement, whereas those who live in more developed societies may be more focused on the risks of new technologies. Finally, religious beliefs can play an important part in technological acceptance or resistance. In the United States, adults who expressed a high level of religious commitment were more likely to view new technologies such as gene editing as meddling with nature, while adults who expressed a low level of religious commitment were more likely to view new technologies positively. Education level additionally correlates with acceptance to technological innovation. Cultural factors may also account for the differences in technological acceptance; further research is required in this area.

**Keywords:** medical technology, openness, gender, geography, age, religion, education

## 1. Introduction

Historically, the introduction of new medical technology or breakthroughs has saved countless lives. The administration of Jonas Salk's polio vaccine in the early 1950's drastically reduced the number of polio cases in the United States, nearly eradicating the disease merely years after it was first administered. In a new era of globalization, unforeseen risks from the increase in travel and the increasing population densities in urban cities has made it even more imperative for medical technology to adapt to these new stressors. Despite the efforts of policy makers and government officials to push out new health measures and fund medical technology, these efforts will be futile if individuals are not open to these new treatments. This is exacerbated by the advent of social media creating echo chambers of misinformation and conspiracies about these medical technologies, further discouraging certain individuals from pursuing these treatments. During the COVID-19 pandemic, rumors circulated through social media platforms including Facebook, Instagram, and X (formerly known as Twitter) that the vaccines and mask mandates were part of a government initiative to strike fear or even regulate overpopulation. Unfortunately, this prolonged the effects of the pandemic particularly in the United States which likely caused thousands of more deaths. With new medical concerns including antibiotic resistance on the horizon, a lack of compliance to these new treatments could be detrimental for society. The objective of this research paper is to examine the relationship between technological acceptance and geography, gender, lifestyle, religion, and age.

## 2. Differences in Technological Acceptance Based on Gender and Geography and Age

Previous studies have yielded conflicting results regarding the relationship between gender and acceptance of technological innovation. A study of 126 adults aged 20-80 found that men and women overall had a similar willingness to use medical assistive technologies [1]. When presented with a specific medical assistive technology, namely smart textiles

that have the ability to continuously monitor nutritional status and hydration, men and women expressed similar intentions to use the technology [1]. However, the same study found that the willingness to use medical assistive technologies is highest in women in the 20-30 age group and decreases as women age, whereas the willingness to use these technologies peaks in men in the 31-45 age group [1]. Specifically, women's trust in the privacy of eHealth applications declined as women's age increased [1]. The study additionally examined the underlying factors that correlate with intentions to use medical assistive technologies in men and women, and revealed that usage motives affect men's acceptance of such technologies, whereas usage motives, usage barriers, and attitudes affect women's acceptance of such technologies [1].

However, another study of 300 respondents, 56% of whom were women and 38% of whom were chronically ill, aged 19-85 across Germany, Poland, and Turkey found that women displayed much higher acceptance of medical technology although men and women tended to share the same doubts [2]. The acceptance of medical technology was measured in this study by presenting a survey containing 9 statements that would indicate that the individual was open to using medical technology and 10 statements that would indicate the individual was not open to using medical technology. Statements that were used to evaluate if respondents were open to medical technology included "Yes, I use/world use medical technology, because I would feel safer" and "Yes, I use/would use medical technology, because I would not be a burden for others" [2]. Statements that were used to evaluate if respondents were not open to medical technology included "No, I do not use/I would not use medical technology, because I do not want to be ruled by technology" and "No, I do not use/I would not use medical technology, because I am afraid of false information" [2]. Participants then used the 4-point Likert scale ranging from "agree" to "do not agree" to evaluate each statement. When comparing the overall results between men and women, women on average scored 8% higher than men when it came to evaluating statements that indicated openness to medical technology usage [2]. The paper also took into account the variable of exercise frequency, and found that individuals who exercised once a week or more scored 9% higher than those who did not, when it came to evaluating statements that indicated openness to medical technology [2]. When conflating age and exercise habits, it was found that individuals over the age of 50 who exercised once a week or more were more open to medical technology compared to those of the same age bracket who did not exercise once a week or more. For individuals under the age of 50, no strong correlation between exercise and openness to medical technology could be found [2].

Regarding the geographic differences in responses between Germany, Poland, and Turkey, it was noted that individuals over the age of 50 from Turkey and Poland tended to be more open toward medical technology than those from Germany. This trend cannot be extrapolated for younger individuals; for individuals under 50, German and Polish individuals scored similarly in terms of medical technology acceptance while Turkish individuals scored lower [2]. It can be posited that the differences in economic development between the three countries, with Germany being a more developed country, are linked to the differences in openness to medical technology. German individuals may be more wary of the potential downsides of medical technology due to their increased exposure and knowledge of potential risks, while Polish and Turkish individuals may be more focused on the prospect of economic advancement [2]. Cultural factors may also account for the differences in technological acceptance between countries; further research is required in this area.

### **3. Differences in Technological Acceptance Based on Religion**

In regard to individuals with varying religious backgrounds, the difference in technological acceptance seems rather stark. A 2016 Pew Research Center study surveyed US adults who were categorized to be either high, medium, or low religious commitment based on the importance of religion in a person's life and their frequency of prayer and attendance at religious services. The researchers gave the participants several questions regarding potential physical and cognitive enhancements including robotic exoskeletons for manual labor, gene editing for babies, and computer chip implants for information processing as participants either opined that the enhancement was "meddling with nature and crosses a line we should not cross" to indicate disapproval or "we are always trying to better ourselves and this is no different" [3]. Among US adults who considered themselves of high religious commitment, 72% believed that the widespread use of gene editing for babies to reduce their risk of serious conditions would be meddling with nature and crossing a line we should not cross. Contrast this with only 36% of US adults out of the low religious commitment group who believe that this would be considered meddling with nature [3].

The same 2016 Pew Research study of US adults across varying religious denominations and racial groups found significant differences within religious denominations in regard to their receptiveness toward gene editing for babies. Individuals who classified themselves among the religious groups including White evangelical Protestants, White mainline Protestants, Black Protestants, White Catholics, Hispanic Catholics, Atheists, and Agnostics were surveyed. These groups were asked if gene editing was either “no different than other ways we try to better ourselves” to signify approval or if it was “[crossing] a line [and] meddling with the future” [4]. 61% of White evangelical Protestants indicated that gene editing for babies crosses a line, the highest rate out of any religious group. In contrast, only 17% of atheists agreed with that sentiment, the lowest rate out of any religious group.

A qualitative study in 2021 studying the perception of Assisted Reproductive Technology in Ghana across its different religious groups found similar apprehension to the technology among certain faiths. Some Catholic patients of fertility clinics were initially apprehensive toward IVF procedures due to the fear of going against Catholic doctrine. Those who were unsure but were still seeking the treatment sought their priests to seek clarity as one participant stated “if [the priest] felt it was against Catholic beliefs, he wouldn’t have gone ahead to bless me”. A man who was engaged in a polygynous marriage stated that “I don’t believe there is anywhere in the Quran that Allah speaks against this. No!” [5]. Religion may drive individuals to view medical technology with apprehension due to fear of ostracization from their religious community if one receives aid from the medical technology while others fear disobeying the rules of the religion itself.

#### **4. Differences in Technological Acceptance Based on Education**

Education level is another factor that correlates with an individual’s openness to medical technology. The same 2016 Pew Research study surveyed US adults with a high school diploma (HS) or less, some college degree, a college graduate degree, and a postgraduate degree for their input on whether or not gene editing to reduce a baby’s risk of developing disease would either be a “bad idea” or a “good idea.” Among those with a HS or less, 34% of participants indicated that gene editing would be a “bad idea” while 43% indicated that they were not sure. Among participants with some college degree, 28% indicated that it would be a “bad idea” while 39% indicated that they were not sure. Among participants with a college graduate degree, 29% indicated that it would be a “bad idea” while 38% indicated that they were not sure. Among those with a postgraduate degree, 28% of participants indicated it would be a “bad idea” while 34% indicated that they were not sure [3]. Compared to those with a HS or less, the other 3 groups show less adverse thoughts toward gene editing even though amongst the 3 groups with a tertiary education, there is little difference between them in terms of negative opinion toward gene editing. However, we can see that as education levels rise, individuals tend to be more accepting of gene editing.

Another study conducted by the National Bureau of Economic Research delved into the effect of education level on individuals’ openness to using newer drugs. Using the National Drug File Data, they calculated that on average, 4.74 drugs were available to treat a specific condition [6]. However, since drugs are used to treat a broader range of conditions than originally approved for, the researchers used the MEPS to calculate that there are 22 drugs for a given condition. One could theorize that more educated patients select better doctors who are better informed about new innovations and likely prescribe newer drugs that more recently hit the market. The same study showed that having ten more years of education lowered the average age of the drug used to treat a particular condition by 1.6 years. However, this number was comparable to the effect of being white and having private insurance, which decreased the age of the drug by 1.6 years. It was calculated that this decrease results in a life expectancy gain of on average 2.5 weeks, showing that despite the seemingly significant difference in drug adoption across education levels, the overall impact on their health may not be as significant [6].

#### **5. Conclusion**

A review of the relevant literature showed that, despite there not being a strong correlation between gender and openness to medical technology, the willingness to use technology among men peaked at ages 31-45 while it declined among women as they aged. There is research to suggest however that women are more open to medical technology than men. As for the differences between Turkey, Poland, and Germany, individuals over the age of 50 in Turkey and Poland tended to be more open to medical technology while those from Germany tended to be less inclined to accept it. Future research can look into

aspects of each religion and examine how they may influence followers' beliefs or views on medical technology. It was also found that atheists and agnostics and other individuals with less religious commitment tended to be more open to medical technology while those with higher religious commitment, particularly white evangelical Protestants, tended to oppose it. Level of education was also correlated with openness to medical technology as those with a HS degree or less tended to be less in favor of medical technology, while those with a postgraduate degree tended to be more in favor. More educated individuals also seemed to pursue medication that was more recently released into the market.

Future research on this topic could look into different types of technology that are non-medical including AI and manufacturing technology, and see if certain demographics favor these technologies. Also, acceptance for treatments and technologies for acute conditions vs. chronic conditions could be compared. Shortcomings of the study exist in that it lacks substantial qualitative data or interviews that would help us understand why these differences exist. The study would benefit from an understanding of the meaning that different people attach to medical technology and the aspects of their background that may cause these differences.

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