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# AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns

*Public views are tied to how these technologies would be used, what constraints would be in place*

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## How we did this

Pew Research Center conducted this study to understand Americans' views about artificial intelligence and human enhancement technologies. For this analysis, we surveyed 10,260 U.S. adults from Nov. 1 to 7, 2021.

Everyone who took part in the survey is a member of the Center's American Trends Panel (ATP), an online survey panel that is recruited through national, random sampling of residential addresses. This way, nearly all U.S. adults have a chance of selection. The survey is weighted to be representative of the U.S. adult population by gender, race, ethnicity, partisan affiliation, education and other categories. Read more about the [ATP's methodology](#).

Here are the [questions used for this report](#), along with responses, and its [methodology](#).

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# AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns

*Public views are tied to how these technologies would be used, what constraints would be in place*

Developments in artificial intelligence and human enhancement technologies have the potential to remake American society in the coming decades. A new Pew Research Center survey finds that Americans see promise in the ways these technologies could improve daily life and human abilities. Yet public views are also defined by the context of how these technologies would be used, what constraints would be in place and who would stand to benefit – or lose – if these advances become widespread.

Fundamentally, caution runs through public views of artificial intelligence (AI) and human enhancement applications, often centered around concerns about autonomy, unintended consequences and the amount of change these developments might mean for humans and society. People think economic disparities might worsen as some advances emerge and that technologies, like facial recognition software, could lead to more surveillance of Black or Hispanic Americans.

This survey looks at a broad arc of scientific and technological developments – some in use now, some still emerging. It concentrates on public views about six developments that are widely discussed among futurists, ethicists and policy advocates. Three are part of the burgeoning array of AI applications: the use of facial recognition technology by police, the use of algorithms by social media companies to find false information on their sites and the development of driverless passenger vehicles.

The other three, often described as types of human enhancements, revolve around developments tied to the convergence of AI, biotechnology, nanotechnology and other fields. They raise the possibility of dramatic changes to human abilities in the future: computer chip implants in the brain to advance people's cognitive skills, gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions, and robotic exoskeletons with a built-in AI system to greatly increase strength for lifting in manual labor jobs.

The current report builds on previous Pew Research Center analyses of attitudes about emerging scientific and technological developments and their implications for society, including opinion about [animal genetic engineering](#) and the potential to “[enhance](#)” [human abilities](#) through biomedical interventions, as well as views about [automation](#) and computer algorithms.

As Americans make judgments about the potential impact of AI and human enhancement applications, their views are varied and, for portions of the public, infused with uncertainty.

Americans are far more positive than negative about the widespread use of facial recognition technology by police to monitor crowds and look for people who may have committed a crime: 46% of U.S. adults think this would be a good idea for society, while 27% think this would be a bad idea and another 27% are unsure.

By narrower margins, more describe the use of computer algorithms by social media companies to find false information on their sites as a good rather than bad idea for society (38% vs. 31%), and the pattern is similar for the use of robotic exoskeletons with a built-in AI system to increase strength for manual labor jobs (33% vs. 24%).

## Majority says brain chip implants for improved cognitive abilities would be bad idea for society; public more open to other applications of human enhancement and AI

*% of U.S. adults who say the widespread use of each of the following artificial intelligence and human enhancement applications has been/would be a ...*

ARTIFICIAL INTELLIGENCE APPLICATIONS			
	Good idea for society	Bad idea for society	Not sure
<b>Facial recognition technology</b> that would be used by police to look for people who may have committed a crime or to monitor crowds	46	27	27
Computer programs, called <b>algorithms</b> , used by social media companies to find false information on their sites	38	31	30
<b>Driverless passenger vehicles</b> that are equipped with software allowing them to operate with computer assistance, and expected to be able to operate entirely on their own	26	44	29
HUMAN ENHANCEMENT APPLICATIONS			
	Good idea for society	Bad idea for society	Not sure
<b>Robotic exoskeletons</b> with built-in artificial intelligence computer systems that would greatly increase strength for manual labor	33	24	42
<b>Gene editing</b> that would greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime	30	30	39
<b>Computer chip implants</b> in the brain that would allow people to far more quickly and accurately process information	13	56	31

Note: Respondents who did not give an answer are not shown. Respondents were randomly assigned to answer questions about artificial intelligence applications or human enhancement applications.

Source: Survey conducted Nov. 1-7, 2021.

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By contrast, the public is much more cautious about a future with widespread use of computer chip implants in the brain to allow people to far more quickly and accurately process information: 56% say this would be a bad idea for society, while just 13% think this would be a good idea. And when it comes to the much-discussed possibility of a future with autonomous passenger vehicles in widespread use, more Americans say this would be a bad idea (44%) than a good idea (26%).

Still, uncertainty is among the themes seen in emerging public views of AI and human enhancement applications. For instance, 42% are not sure how the widespread use of robotic exoskeletons in manual labor jobs would impact society. Similarly, 39% say they are not sure about the potential implications for society if gene editing is widely used to change the DNA of embryos to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime.

Ambivalence is another theme in the survey data: 45% say they are equally excited and concerned about the increased use of AI programs in daily life, compared with 37% who say they are more concerned than excited and 18% who say they are more excited than concerned.

A survey respondent summed up his excitement about the increased use of artificial intelligence in an open-ended question by saying:

*“AI can help slingshot us into the future. It gives us the ability to focus on more complex issues and use the computing power of AI to solve world issues faster. AI should be used to help improve society as a whole if used correctly. This only works if we use it for the greater good and not for greed and power. AI is a tool, but it all depends on how this tool will be used.” –Man, 30s*

Another respondent explained her ethical concerns about the increased use of AI this way:

*“It's just not normal. It's removing the human race from doing the things that we should be doing. It's scary because I've read from scientists that in the near future, robots can end up making decisions that we have no control over. I don't like it at all.” –Woman, 60s*

It is important to note that views on these specific applications do not constitute the full scope of opinions about the growing number of uses of AI and the [proliferating possible advances](#) being contemplated to boost human abilities.

The survey was built around six vignettes, to root opinion in a specific context and allow for a deeper exploration of views. Thus, our questions about public attitudes about facial recognition

technology are not intended to cover all possible uses but, instead, to measure opinions about its use *by police*. Similarly, we concentrated our exploration of brain chip implants on their potential to allow people to far more efficiently process information rather than on the use of brain implants to address therapeutic needs, such as helping people with spinal cord injuries restore movement.

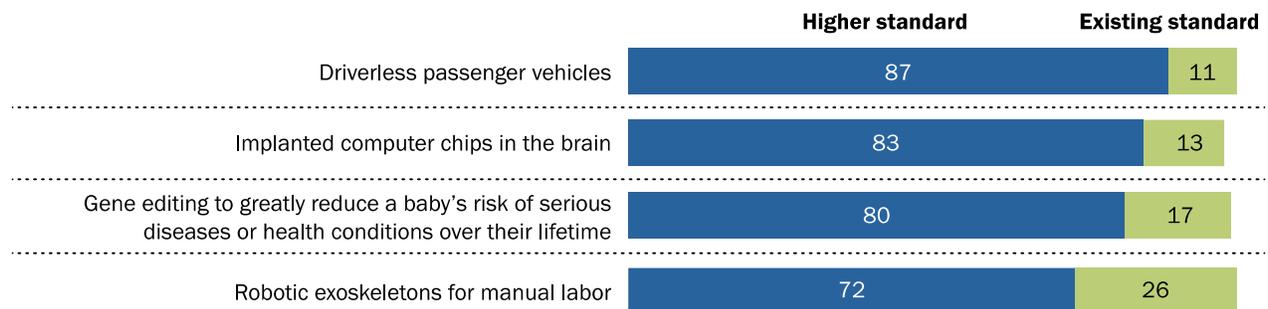
The survey findings underscore how public opinion is often contingent on the goals and circumstances around the uses of AI and human enhancement technologies. For example, in addition to exploring views about the use of facial recognition by police in depth, the survey also sought opinions about several other possible uses of facial recognition technology. It shows that more U.S. adults oppose than favor the idea of social media sites using facial recognition to automatically identify people in photos (57% vs. 19%) and more oppose than favor the idea that companies might use facial recognition to automatically track the attendance of their employees (48% vs. 30%).

Some of the key themes in the survey of 10,260 U.S. adults, conducted in early November 2021:

**A new era is emerging that Americans believe should have higher standards for assessing the safety of emerging technologies.** The survey sought public views about how to ensure the safety and effectiveness of the four technologies still in development and not widely used today. Across the set, there is strong support for the idea that higher standards should be applied, rather than the standards that are currently the norm. For instance, 87% of Americans say that higher standards for testing driverless cars should be in place, rather than using existing standards for passenger cars. And 83% believe the testing of brain chip implants should meet a higher standard than is currently in use to test medical devices. Eight-in-ten Americans say that the testing regime for gene editing to greatly reduce a baby’s risk of serious diseases should be higher than that currently applied to testing medical treatments; 72% think the testing of robotic exoskeletons for manual labor should use higher standards than those currently applied to workplace equipment.

### Majorities think higher standards should be used in testing the safety of some developing technologies, not just existing standards

*% of U.S. adults who say that when it comes to ensuring safety and effectiveness, each of the following technologies should be tested using ...*



Note: Respondents who did not give an answer are not shown. Respondents were randomly assigned to answer questions about artificial intelligence applications or human enhancement applications.

Source: Survey conducted Nov. 1-7, 2021.

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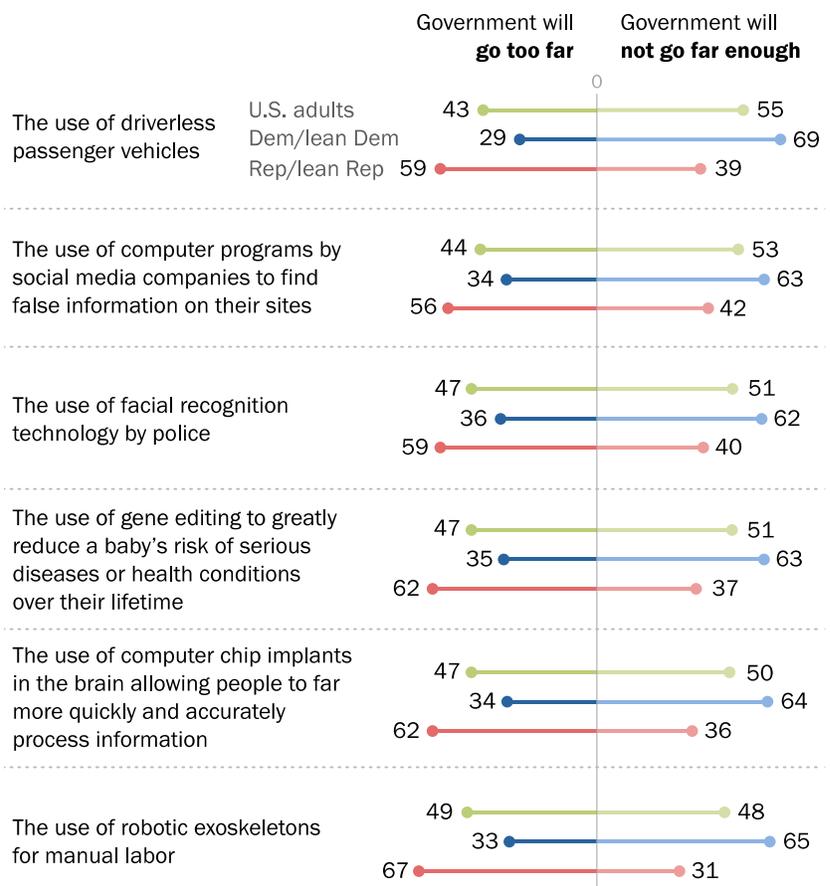
**Sharp partisan divisions anchor people’s views about possible government regulation of these new and developing technologies.** As people think about possible government regulation of these six scientific and technological developments, which prospect gives them more concern: that government will go too far or not far enough in regulating their use?

Majorities of Republicans and independents who lean to the Republican Party say they are more concerned about government overreach, while majorities of Democrats and Democratic leaners worry more that there will be too little oversight.

For example, Republicans are more likely than Democrats to say their greater concern is that the government will go too far regulating of the use of robotic exoskeletons for manual labor (67% vs. 33%). Conversely, Democrats are more likely than Republicans say their concern is that government regulation will not go far enough.

**Partisans differ in their concerns about government regulation of technologies for AI, human enhancement**

*% of U.S. adults who say that if/as each of the following becomes widespread, their greater concern about regulating their use is that ...*



Note: Respondents who did not give an answer are not shown. Respondents were randomly assigned to answer questions about artificial intelligence applications or human enhancement applications.

Source: Survey conducted Nov. 1-7, 2021.

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People are relatively open to the idea that a variety of actors – in addition to the federal government – should have a role in setting the standards for how these technologies should be regulated. Across all six applications, majorities believe that federal government agencies, the creators of the different AI systems and human enhancement technologies and end users should play at least a minor role in setting standards.

**Less than half of the public believes these technologies would improve things over the current situation.** One factor tied to public views of human enhancement is whether people think these developments would make life better than it is now, or whether reliance on AI would improve on human judgment or performance. On these questions, less than half of the public is convinced improvements would result.

For example, 32% of Americans think that robotic exoskeletons with built-in AI systems to increase strength for manual labor would generally lead to improved working conditions. However, 36% think their use would not make much difference and 31% say they would make working conditions worse.

In thinking about a future with widespread use of driverless cars, 39% believe the number of people killed or injured in such accidents would go down. But 27% think the number killed or injured would go up; 31% say there would be little effect on traffic fatalities or injuries.

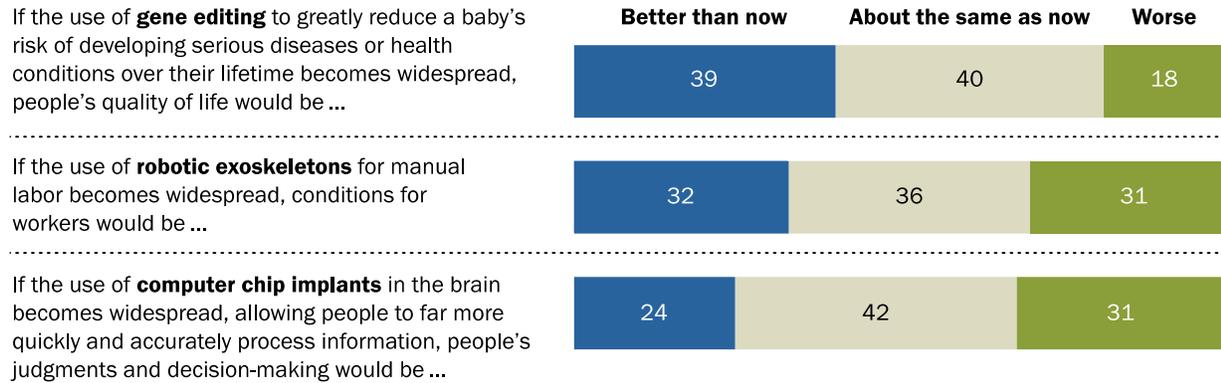
Similarly, 34% think the widespread use of facial recognition by police would make policing more fair; 40% think that it would not make much difference, and 25% think it would make policing less fair.

Another concern for Americans ties to the potential impact of these emerging technologies on social equity. People are far more likely to say the widespread use of several of these technologies would increase rather than decrease the gap between higher- and lower-income Americans. For instance, 57% say the widespread use of brain chips for enhanced cognitive function would increase the gap between higher- and lower-income Americans; just 10% say it would decrease the gap. There are similar patterns in views about the widespread use of driverless cars and gene editing for babies to greatly reduce the risk of serious disease during their lifetime.

## Public not convinced that certain physical and cognitive enhancements would lead to clear improvements in people’s lives ...

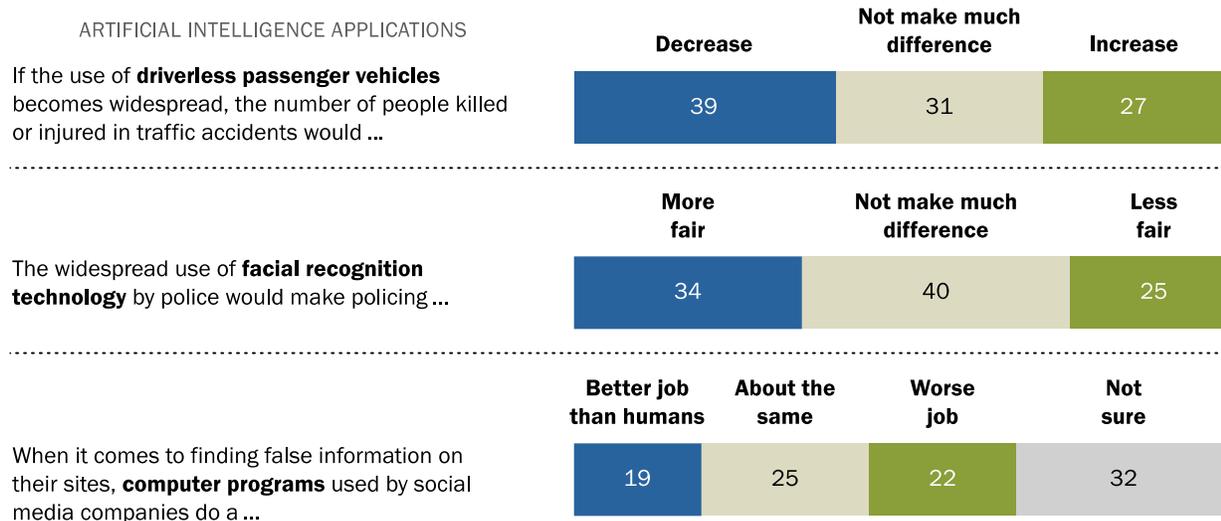
% of U.S. adults who say ...

### HUMAN ENHANCEMENT APPLICATIONS



## And some are skeptical that several AI applications would have a positive impact

### ARTIFICIAL INTELLIGENCE APPLICATIONS



Note: Respondents who did not give an answer are not shown. Respondents were randomly assigned to answer questions about artificial intelligence applications or human enhancement applications.

Source: Survey conducted Nov. 1-7, 2021.

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**Even for far-reaching applications, such as the widespread use of driverless cars and brain chip implants, there are mitigating steps people say would make them more acceptable.** A desire to retain the ability to shape their own destinies is a theme seen in public views across AI and human enhancement technologies. For even the most advanced technologies, there are mitigating steps – some of which address the issue of autonomy – that Americans say would make the use of these technologies more acceptable.

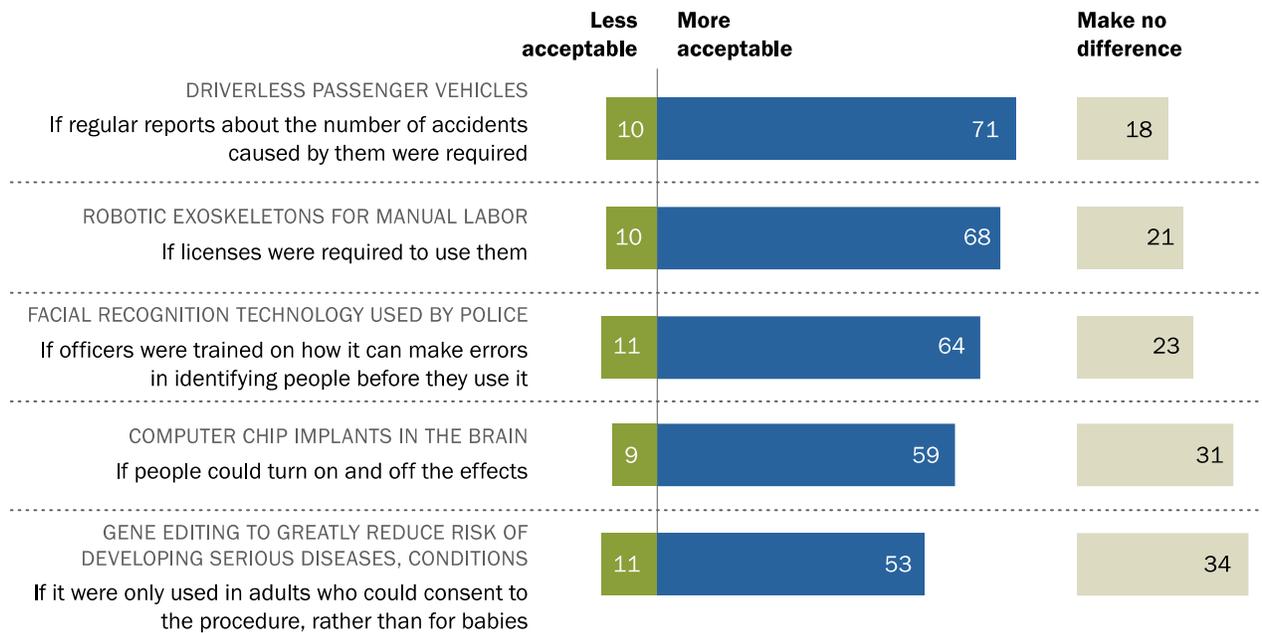
Seven-in-ten Americans say they would find driverless cars more acceptable if there was a requirement that such cars were labeled as driverless so they could be easily identified on the road, and 67% would find driverless cars more acceptable if these cars were required to travel in dedicated lanes. In addition, 57% say their use would be more acceptable if a licensed driver was required to be in the vehicle.

Similarly, about six-in-ten Americans think the use of computer chip implants in the brain would be more acceptable if people could turn on and off the effects, and 53% would find the brain implants more acceptable if the computer chips could be put in place without surgery.

About half or more also see mitigating steps that would make the use of robotic exoskeletons, facial recognition technology by police and gene editing in babies to greatly reduce the risk of serious disease during their lifetime more acceptable.

## Across AI and human enhancement applications, public sees mitigating steps that would make their use more acceptable

*% of U.S. adults who say for each technology, the following condition would make its use ...*



Note: Respondents who did not give an answer are not shown. Respondents were randomly assigned to answer questions about artificial intelligence applications or human enhancement applications.

Source: Survey conducted Nov. 1-7, 2021.

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## A map to this report

The chapters that follow cover a broad terrain.

*How Americans think about artificial intelligence:* Chapter 1 looks at people's views about the increasing use of AI in everyday life and summarizes their written responses to an open-ended question about their concerns and excitement. It identifies some of the potential uses of AI that prompt more excitement than concern from the public – for instance, AI systems that can help with household chores. And it highlights some applications that would concern the public, including the potential of AI programs to know people's thoughts and behaviors or make important life decisions for people. The chapter also looks at the common themes and demographic differences in how Americans think about the three specific contexts for AI in the survey.

*Public more likely to see facial recognition use by police as good, rather than bad for society:* Some 21% of Americans say they have heard or read a lot about this use of technology, 58% have heard a little and 20% have heard nothing at all. A plurality (46%) believe it is a good idea for society. Still, a 57% majority say that if widespread use of facial recognition by police occurs, crime would stay about the same. And 66% say police definitely or probably would use facial recognition to monitor Black and Hispanic neighborhoods much more often than other neighborhoods.

*Mixed views about social media companies using algorithms to find false information:* About a quarter (24%) of Americans have heard or read a lot about this, 51% have heard a little and 24% have heard nothing at all. Many social media users have seen information on these sites that has been flagged or labeled as false. Seven-in-ten think the widespread use of algorithms to find false information is leading to censorship of political viewpoints, and 69% say it's leading to news and information being wrongly removed from the sites.

*Americans cautious about the deployment of driverless cars:* About a quarter of U.S. adults (26%) have heard a lot about driverless cars, compared with 62% who have heard a little and 12% who have heard nothing at all. Some 45% would be not too or not at all comfortable sharing the road with them, and more say they would not want to ride in a driverless vehicle themselves than say they would want to do this (63% vs. 37%).

*What Americans think about possibilities ahead for human enhancement:* Chapter 5 looks at how people anticipate a future where scientific and technological advances could bring fundamental shifts in human abilities. Americans are more enthusiastic about possibilities that could bring therapeutic benefits to people, such as by allowing increased movement for people who are

paralyzed. There is generally far less enthusiasm for using these technologies to enhance human abilities in ways that don't address a clear need. Across possible uses, men are generally more supportive of potential changes to human abilities than women. Those with higher levels of religious commitment often express concern and are more likely to see such changes as meddling with nature, compared with those who have lower levels of religious commitment.

*Public cautious about enhancing cognitive function using computer chip implants in the brain:* A 62% majority foresees potential benefits for job productivity from brain chip implants for far faster and more accurate information processing. But most Americans (78%) say they, personally, would not want a brain chip implant if it were available. And 63% say widespread use of brain chips for cognitive enhancement would be meddling with nature and crossing a line we should not cross; far fewer (35%) say this would be in keeping with other ways humans have tried to better themselves over time.

*Americans are closely divided over editing a baby's genes to reduce serious health risk:* On a personal level, about half of Americans say they would want gene editing for their own baby to greatly reduce the baby's risks of developing serious disease or health conditions, while roughly the same share say they would not want this (48% to 49%). At the same time, a majority (73%) thinks most parents would feel pressure to get this for their baby if the use of this technology becomes widespread.

*Mixed views about a future with widespread use of robotic exoskeletons to increase strength for manual labor jobs:* Americans anticipate both benefits and downsides for workers from the possibility of widespread use of robotic exoskeletons with a built-in AI system to increase strength for manual labor jobs such as manufacturing or construction. About two-thirds (65%) see the potential for a wider array of people to fill such jobs, and 70% think the use of robotic exoskeletons would help prevent injuries on the job. At the same time, large majorities see this development as leading to worker layoffs (81%) and anticipate loss of strength for workers who rely on these devices (73%).

# 1. How Americans think about artificial intelligence

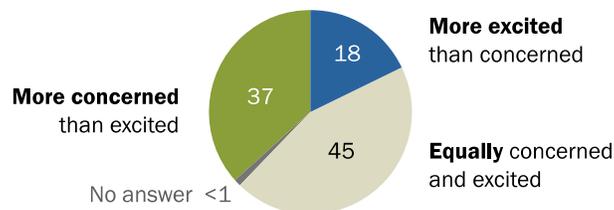
Artificial intelligence (AI) is spreading through society into some of the most important sectors of people’s lives – from health care and legal services to agriculture and transportation.<sup>1</sup> As Americans watch this proliferation, they are worried in some ways and excited in others.

In broad strokes, a larger share of Americans say they are “more concerned than excited” by the increased use of AI in daily life than say the opposite. Nearly half of U.S. adults (45%) say they are equally concerned and excited. Asked to explain in their own words what concerns them most about AI, some of those who are more concerned than excited cite their worries about potential loss of jobs, privacy considerations and the prospect that AI’s ascent might surpass human skills – and others say it will lead to a loss of human connection, be misused or be relied on too much.

But others are “more excited than concerned,” and they mention such things as the societal improvements they hope will emerge, the time savings and efficiencies AI can

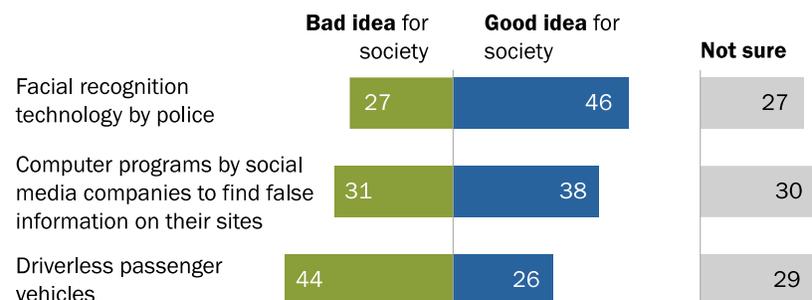
## Americans lean toward concern over excitement when it comes to the increased use of AI in daily life ...

*% of U.S. adults who say that overall, the increased use of artificial intelligence computer programs in daily life makes them feel ...*



## And public views are varied when it comes to three specific AI applications

*% of U.S. adults who think widespread use of each of the following has been/would be a ...*



Note: Respondents who did not give an answer are not shown. Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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<sup>1</sup> Pew Research Center has explored the spread of artificial intelligence in several reports about the future of the internet, including “[Experts Doubt Ethical AI Design Will Be Broadly Adopted as the Norm Within the Next Decade](#),” “[Artificial Intelligence and the Future of Humans](#),” “[Visions of the Internet in 2035](#)” and “[AI, Robotics and the Future of Jobs](#).”

bring to daily life and the ways in which AI systems might be helpful and safer at work. And people have mixed views on whether three specific AI applications are good or bad for society at large.

This chapter covers the general findings of the survey related to AI programs. It also runs through highlights from in-depth explorations of public attitudes about three AI-related applications that are fully explored in the three chapters after this. Some key findings:

**Use of facial recognition by police:** We chose to explore the use of facial recognition by police because police reform has been a [major topic of debate](#), especially in the wake of the killing of George Floyd in May 2020 and the [ensuing protests](#). The survey shows that a plurality (46%) thinks use of this technology by police is a good idea for society, while 27% believe it is a bad idea and 27% say they are not sure. At the same time, 57% think crime would stay about the same if the use of facial recognition by the police becomes widespread, while 33% think crime would decrease and 8% think it would rise.

Moreover, there are divided views about how the widespread use of facial recognition technology would impact the fairness of policing. Majorities believe it is definitely or probably likely that widespread police use of this technology would result in more missing persons being found by police and crimes being solved more quickly and efficiently. Still, about two-thirds also think police would be able to track everyone's location at all times and that police would monitor Black and Hispanic neighborhoods much more often than other neighborhoods.

**Use of computer programs by social media companies to find false information on their sites:** We chose to study attitudes about the use of computer programs (algorithms) by social media

### How Pew Research Center approached this topic

The Center survey asked respondents a series of questions about three applications of artificial intelligence (AI):

- Facial recognition technology that could be used by police to look for people who may have committed a crime or to monitor crowds in public spaces.
- Computer programs, called algorithms, used by social media companies to find false information about important topics that appears on their sites.
- Driverless passenger vehicles that are equipped with software allowing them to operate with computer assistance and are expected to be able to operate entirely on their own without a human driver in the future.

Other questions asked respondents their feelings about AI's increased use, the way AI programs are designed and a range of other possible AI applications.

This study builds on prior Center research including surveys on Americans' views about [automation in everyday life](#), the [role of algorithms](#) in parts of society and the use of [facial recognition technology](#). It also draws on insights from several canvassings [of experts](#) about the [future of AI and humans](#).

companies because social media [is used by a majority of U.S. adults](#). There are also concerns about [the impact of made-up information](#) and how efforts to target misinformation might affect [freedom of information](#). The survey finds that 38% of U.S. adults think that the widespread use of computer programs by social media companies to find false information on their sites has been a good idea for society, compared with 31% who say it is a bad idea and 30% who say they are not sure.

When asked about specific possible impacts, public views are largely negative. Majorities believe widespread use of algorithms by social media companies to find false information is definitely or probably causing political views to be censored and news and information to be wrongly removed from the sites. And majorities *do not think* these algorithms are causing beneficial things to happen like making it easier to find trustworthy information or allowing people to have more meaningful conversations. There are substantial partisan differences on these questions, with Republicans and those who lean toward the GOP holding more negative views than Democrats and Democratic leaners.

**Driverless passenger vehicles:** We chose to study public views about driverless passenger vehicles because they are being [tested on roads now](#) and their rollout on a larger scale [is being debated](#). The survey finds that a plurality of Americans (44%) believe that the widespread use of driverless passenger vehicles would be a bad idea for society. That compares with the 26% who think this would be a good idea. Some 29% say they are not sure. A majority say they definitely or probably would not want to ride in a driverless car if they had the opportunity. Some 39% believe widespread use of driverless cars would decrease the number of people killed or injured in traffic accidents, while 31% think there would not be much difference and 27% think there would be an increase in these types of deaths or injuries.

People envision a mix of positive and negative outcomes from widespread use of driverless cars. Majorities believe older adults and those with disabilities would be able to live more independently and that getting from place to place would be less stressful. At the same time, majorities also think many people who make their living by driving others or delivering things with passenger vehicles would lose their jobs and that the computer systems in driverless passenger vehicles would be easily hacked in ways that put safety at risk.

In their responses to survey questions about other possible developments in artificial intelligence, majorities express concern about the prospect that AI could know people's thoughts and behaviors and make important life decisions for people. And when it comes to the use of AI for decision-making in a variety of fields, the public is more opposed than not to the use of computer programs (algorithms) to make final decisions about which patients should get a medical treatment, which

people should be good candidates for parole, which job applicants should move on to a next round of interviews or which people should be approved for mortgages.

Still, there are some possible AI applications that draw public appeal. For example, more Americans are excited than concerned about AI applications that can do household chores. That is also the pattern when people are asked about AI apps that can perform repetitive workplace tasks.

## **There are patterns in views of three AI applications, but other opinions are unique to particular AI systems**

The chapters following this one cover extensive findings about people's views about three major applications of AI, including demographic differences and patterns that emerge.

Americans are split in their views about the use of facial recognition by police. Among these differences: While majorities across racial and ethnic groups say police would use facial recognition to monitor Black and Hispanic neighborhoods much more often than other neighborhoods if the technology became widespread, Black and Hispanic adults are more likely than White adults to say this. As for the way algorithms are being used by social media companies to identify false information, there are clear partisan differences in the public's assessment of the use of those computer programs. And people believe that a mix of both positive and negative outcomes would occur if driverless cars became widely used.

When it comes to public awareness of these AI applications, majorities have heard at least a little about each of them, but some Americans have not heard about them at all and awareness can relate to views of these applications. For instance, those who have heard a lot about driverless passenger vehicles are more likely than those who have not heard anything about such cars to believe they are a good idea for society. But when it comes to the use of facial recognition by the police, those who have heard a lot are more likely to say it is a bad idea for society than those who have not heard anything about it. Views about whether the use of algorithms by social media companies to detect false information on their sites is good or bad for society lean negative among those who have heard a lot, while among those who have heard nothing, over half are not sure how they feel about this practice.

In addition to awareness being a factor associated with Americans' views about these AI applications, there are patterns related to education. Those with higher levels of education often hold different views than those who have less formal education. For example, those with a postgraduate education are more likely than those with a high school education or less to think the widespread use of algorithms by social media companies to root out false information on the

platforms and the use of driverless vehicles are good ideas for society. The reverse is true for facial recognition – those with a postgraduate degree are more likely to think its widespread use by police is a bad idea for society than those with a high school diploma or less education.

Additionally, the views of young adults and older adults diverge at times when these three AI applications are assessed. For instance, adults ages 18 to 29 are more likely than those 65 and older to say the widespread use of facial recognition by police is a bad idea for society. At the same time, this same group of young adults is more likely than those 65 and older to think the widespread use of self-driving cars is a good idea for society.

The next sections of this chapter cover the findings from the survey’s general questions about AI.

### **Americans more likely to be ‘more concerned than excited’ about increased use of AI in daily life than vice versa**

In this survey, artificial intelligence computer programs were described as those designed to learn tasks that humans typically do, such as recognizing speech or pictures. Of course, an array of AI applications are being implemented in everything from [game-playing](#) to [food growing](#) to [disease outbreak detection](#). [Synthesis efforts](#) now regularly chart the [spread of AI](#).

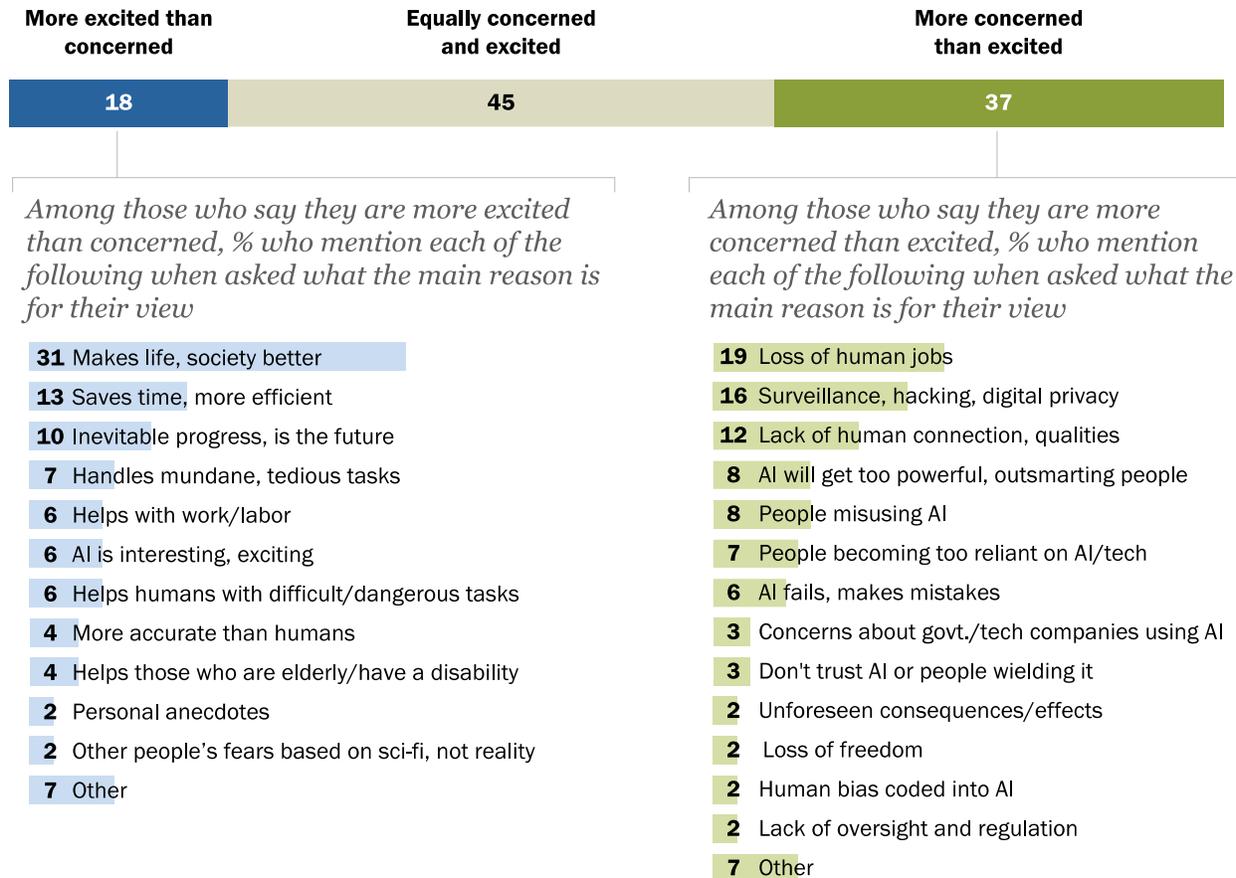
As these developments unfold, a larger share of Americans say they are “more concerned than excited” about the increased use of AI in everyday life than say they are “more excited than concerned” about these prospects (37% vs. 18%). And nearly half (45%) say they are equally excited and concerned.

There are some differences by educational attainment and political affiliation. For instance, a larger share of those who have some college experience or a high school education or less say they are more concerned than excited, compared with their counterparts who have a bachelor’s or advanced degree (40% vs. 32%). Republicans are more likely than Democrats to say they are more concerned than excited (45% vs. 31%). Full details about the views of different groups on this question can be found in the [Appendix](#).

When those who say they are more excited than concerned about the increased use of AI in daily life are asked to explain in their own words the main reason they feel that way, 31% said they believe AI has the ability to make key aspects of our lives and society better.

## Americans explain in their own words what makes them either more concerned or more excited about the increased presence of AI in daily life

% of U.S. adults who say that overall, the increased use of artificial intelligence computer programs in daily life makes them feel ...



Note: Open-ended responses have been coded into categories. The 22% who received but did not give an answer for the more excited than concerned question and the 20% who received but did not give an answer for the more concerned than excited question are not shown. Including these groups, figures for each question may add up to more than 100% because multiple responses were allowed.

Source: Survey conducted Nov. 1-7, 2021.

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As one man explained in his written comments:

*“AI, if used to its fullest ‘best’ potential, could help to solve an unbelievable number of major problems in the world and help solve massive crises like world hunger, pollution, climate change, joblessness and others.” – Man, 30s*

A woman made a similar point:

*“[AI has] the ability to learn and create things that humans are incapable of doing. [AI programs] will have massive impacts to our daily life and will solve issues related to climate change and healthcare.” – Woman, 30s*

Smaller shares of those who express more excitement than concern over AI mention its ability to save time and make tasks more efficient (13%), see it as a reflection of inevitable progress (10%), or cite the fact that it could handle mundane or tedious tasks (7%) as the main reasons why they lean enthusiastic about the prospect of AI’s increased presence in daily life.

Those who are excited about the increased use of AI in daily life also cite AI’s ability to improve work, their sense that AI is interesting and exciting and the ability of AI programs to perform difficult or dangerous tasks as a reason: 6% of those more excited than concerned mentioned each.

In addition, 4% of those who are more excited say AI is more accurate than humans, while an identical share say they are excited because AI can make things more accessible for those who have a disability or who are older. Some 2% offer personal anecdotes of how AI has already been beneficial to their lives, and another 2% wrote that many of the fears about AI are misplaced due to what they believe to be unrealistic depictions of AI in science fiction and popular culture.

The 37% of Americans who are more concerned than excited about AI’s increasing use in daily life also mention a number of reasons behind their reticence. About one-in-five among this group (19%) express concerns that increased use of AI will result in job loss for humans. As a woman in her 70s put it:

*“[AI programs] will eventually eliminate jobs. Then what will those people do to survive in life?” – Woman, 70s*

Meanwhile, 16% of those who are more concerned about the increased use of AI say it could lead to privacy problems, surveillance or hacking. A woman in her 30s wrote of this concern:

*“I am concerned that the increased use of artificial intelligence programs will infringe on the privacy of individuals. I feel these programs are not regulated enough and can be used to obtain information without the person knowing.” – Woman, 30s*

Another 12% of these respondents are concerned about dehumanization, or the belief that human connections and qualities will be lost, while 8% each mention the potential for AI becoming too powerful or for people to misuse the technology for nefarious reasons.

Some 7% who express more concern than excitement about AI offer that it would make people overly reliant on this technology, and 6% worry about the failures and flaws of the technology.

Small shares of those who are worried about the integration of AI also mention other concerns ranging from what technology companies or the government would do with this type of technology to human biases being embedded into these computer programs to what they see as a lack of regulation or oversight of the technology and the industries that develop them.

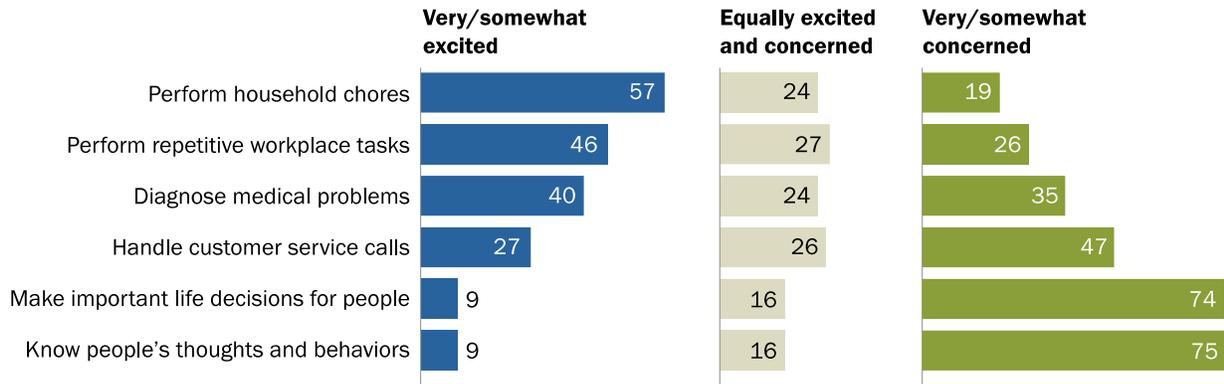
### **Mixed views about some ways AI applications could develop: People are more excited about some, more concerned about others**

In addition to the broad question about where people stand in terms of their general excitement or concern about AI, this survey also asked about a number of more specific possible developments in AI programs.

There are widely varying public views about six different kinds of AI applications that were included in the survey. Some prompt relatively more excitement than concern, and some generate substantial concern. For instance, 57% say they would be very or somewhat excited for AI applications that could perform household chores, but just 9% express the same level of enthusiasm for AI making important life decisions for people or knowing their thoughts and behaviors.

## Americans are concerned about AI systems that could know people's thoughts and make important life decisions for them

% of U.S. adults who say they would be \_\_\_ if artificial intelligence computer programs could do each of the following



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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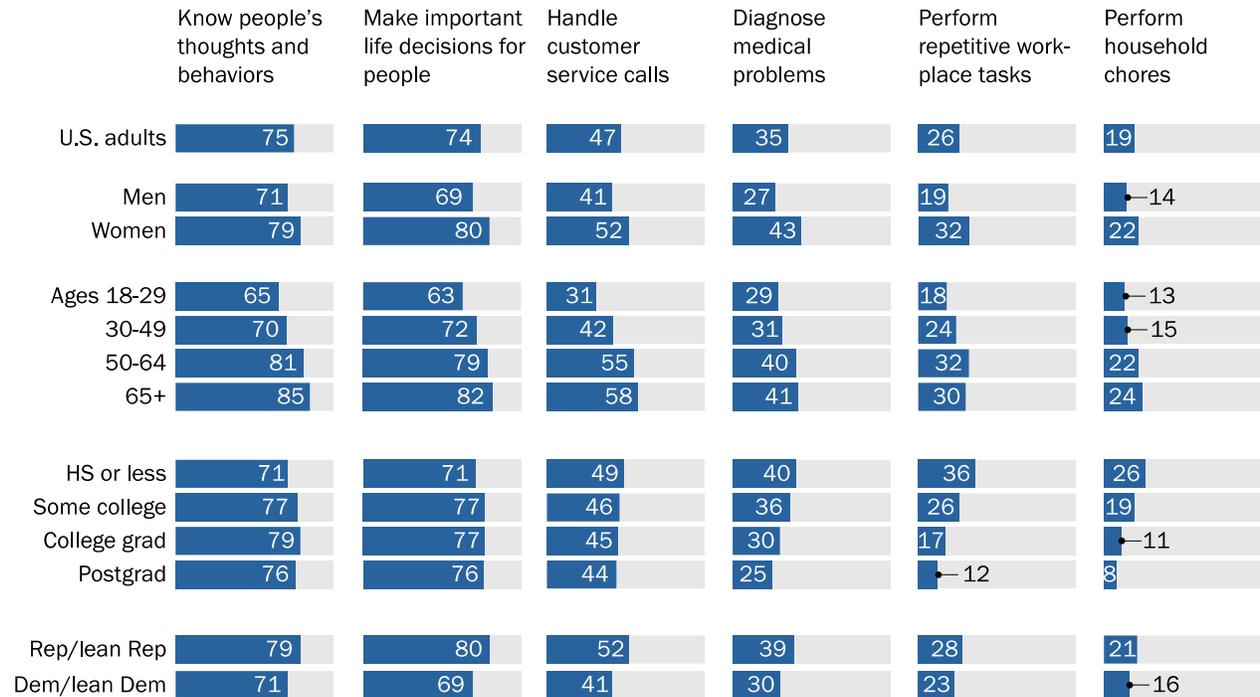
Nearly half (46%) would be very or somewhat excited about AI that could perform repetitive workplace tasks, compared with 26% who would be very or somewhat concerned about that. When it comes to AI that could diagnose medical problems, people are more evenly split: 40% would be at least somewhat excited and 35% would be at least somewhat concerned, while 24% say they are equally excited and concerned. More cautionary views are also evident when people are asked about AI that could handle customer service calls: 47% are very or somewhat concerned about this issue, compared with 27% who are at least somewhat excited.

It is important to note that on these issues, portions of Americans say they are equally excited and concerned about various possible AI developments. That share ranges from 16% to 27% depending on the possible development.

Some differences among groups stand out as Americans assess these various AI apps. Those with a high school education or less are more likely than those with postgraduate degrees to say they are at least somewhat concerned at the prospect that AI programs could perform repetitive workplace tasks (36% vs. 12%). Women are more likely than men to say they would be at least somewhat concerned if AI programs could diagnose medical problems (43% vs. 27%). A larger share of those ages 65 and older (82%) than of those 18 to 29 (63%) say they would be very or somewhat concerned if AI programs could make important life decisions for people.

## Older adults and women are more likely than others to express at least some concern about some possible AI developments

% of U.S. adults who say they would be **very** or **somewhat** concerned if artificial intelligence programs could ...



Note: Respondents who did not give an answer or who gave other responses are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Views of men, White adults seen as better represented than those of other groups when designing AI programs

In recent years, there have been significant [revelations about](#) and [investigations into](#) potential [shortcomings](#) of artificial intelligence programs. One of the central concerns is that AI computer systems may not factor in a [diversity of perspectives](#), especially when it comes to [gender](#), [race and ethnicity](#).

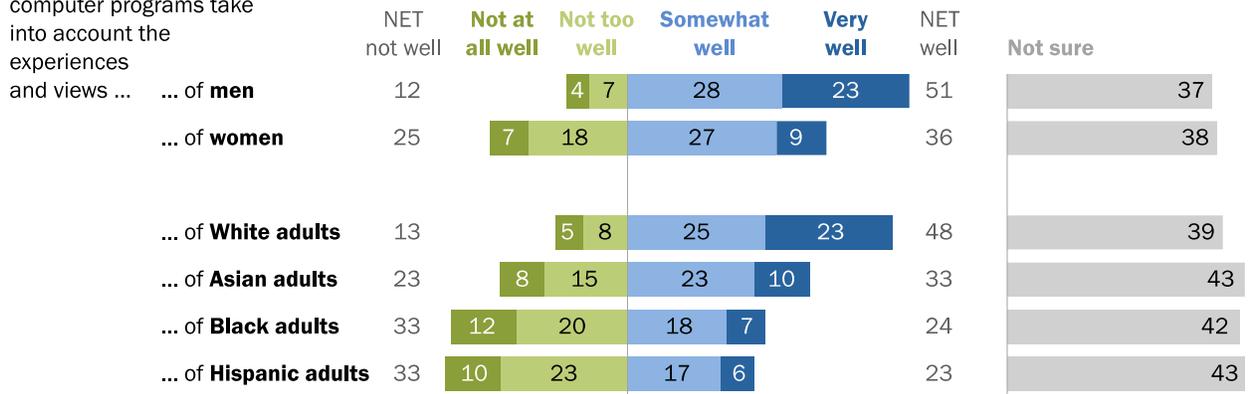
In this survey, people were asked how well they thought that those who design AI programs take into account the experiences and views of some groups. Overall, about half of Americans (51%) believe the experiences and views of men are very or somewhat well taken into account by those who design AI programs. By contrast, smaller shares feel the views of women are taken into

account very or somewhat well. And while just 12% of U.S. adults say the experiences of men are not well taken into account in the design of AI programs, about twice that share say the same about the experiences and views of women.

### Whose experiences and views are taken into account when AI programs are designed? Views vary depending on the demographic group in question

% of U.S. adults who say each of the following ...

The people who design artificial intelligence computer programs take into account the experiences and views ...



Note: Figures may not add up to NET values due to rounding, Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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Additionally, 48% think the views of White adults are at least somewhat well taken into account in the creation of AI programs, versus smaller shares who think the views of Asian, Black or Hispanic adults are well-represented. Just 13% feel the views and experiences of White adults are *not* well taken into account; 23% say the same about Asian adults and a third say this about Black or Hispanic adults.

Still, there are about four-in-ten in each case who, when asked these questions, say they are not sure how the experiences and views of different groups are taken into account as AI programs are designed.

Views on this topic vary across racial and ethnic groups:

**Among White adults:** They are more likely than other racial and ethnic groups to say they are “not sure” how well the designers of AI programs take into account each of the six sets of experiences and views queried in this survey. For instance, 45% of White adults say they are not sure if the experiences and views of White adults are well accounted for in the design of AI programs. That compares with 30% of Black adults, 28% of Hispanic adults and 21% of Asian adults who say they are not sure about this. Similar uncertainty among White adults appears when they are asked about other groups’ perspectives.

**Among Black adults:** About half of Black adults (47%) believe that the experiences and views of Black adults are *not well* taken into account by the people who design artificial intelligence programs, while a smaller share (24%) say Black adults’ experiences are well taken into account. Compared with Black adults, a similar share of Asian adults (39%) feel the experiences and views of Black adults are not well taken into account when AI programs are designed, while Hispanic adults (35%) and White adults (29%) are less likely than Black adults to hold this view.

**Among Hispanic adults:** About one-third of Hispanic Americans (34%) believe the experiences and views of Hispanic adults are well taken into account as the programs are designed. This is the highest share among the groups in the survey: 24% of Asian adults, 22% of Black adults and 21% of White adults feel this way. Meanwhile, 36% of Hispanic adults say the experiences and views of Hispanic adults are *not well* taken into account as AI programs are designed. About three-in-ten Hispanic adults (29%) say they are not sure on this question.

**Among Asian adults:** Some 41% of Asian adults think that the experiences of Asian adults are well taken into account. Similar shares of Hispanic adults (42%) and Black adults (36%) say this about Asians’ views, versus a smaller share of White adults (29%) who think that is the case.

## A plurality of Americans are not sure whether AI can be fairly designed

In addition to gathering opinion on how well various perspectives are taken into account, the survey explored how people judge AI programs when it comes to fair decisions. Asked if it is possible for the people who design AI to create computer programs that can consistently make fair decisions in complex situations, Americans are divided: 30% say AI design for fair decisions is possible, 28% say it is not possible, while the largest share – 41% – say they are not sure.

### Public is divided on whether AI programs can be designed to make fair decisions consistently

*% of U.S. adults who say it is \_\_\_ for people to design artificial intelligence computer programs that can consistently make fair decisions in complex situations*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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Some noteworthy differences among different groups on this question are tied to gender. Men are more likely than women to believe it is possible to design AI programs that can consistently make fair decisions (38% vs. 22%), and women are more likely to say they are not sure (46% vs. 35%).

## 2. Public more likely to see facial recognition use by police as good, rather than bad for society

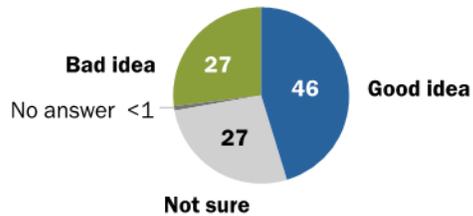
Facial recognition technology [dates back to the 1960s](#), with [techniques](#) that relied on hand coding facial features of each face in the database. The rise of [massive databases](#), [automation](#), [complex analytical tools](#) and [machine learning](#) has vastly transformed the capacity and reach of this technology. Facial recognition is now used in a [variety of contexts](#), such as unlocking a phone with the user's face, [diagnosing certain diseases](#) and [finding lost pets](#).

Perhaps one of the most well-known applications of facial recognition technology is law enforcement, where agencies can use it to [find missing people](#), aid in [solving crimes](#) and help [monitor large crowds](#) of people. There is not comprehensive data about how many law enforcement agencies use facial recognition technologies. The federal Government Accountability Office reported in July 2021 that 42 federal agencies that employ law enforcement officers have [used facial recognition technology](#) in one form or another. The capacity of law enforcement organizations to identify faces has prompted both [controversy and excitement](#) over the years. While some say they [appreciate](#) how the technology can [aid in policing](#), others have concerns regarding how police use of it can [impact privacy](#) and [how inaccurate it can be](#) when it comes to identifying [Black and Hispanic adults](#).

This study explores Americans' thoughts and perspectives regarding widespread use of facial recognition technology by law enforcement and beyond. It finds that majorities of the American public believe widespread use of facial recognition would likely help find missing persons and solve crimes, but majorities also think it is likely that police would use this technology to track everyone's location and surveil Black and Hispanic communities more than others. In terms of potential impact, 46% of U.S. adults say widespread use of facial recognition technology by police would be a good idea for society while 27% believe it would be a bad idea. An additional 27% say they are unsure whether it would be a good or bad idea for police to widely use facial recognition technology.

## Plurality of Americans think widespread use of facial recognition by police would be a good idea

*% of U.S. adults who say the widespread use of facial recognition technology by police would be a \_\_\_ for society*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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### Here's how people were asked to think about facial recognition:

"Facial recognition technology can identify someone by scanning their face in photos, videos or in real time. This technology could be used by police to look for people who may have committed a crime or monitor crowds in public spaces."

## More see the widespread use of facial recognition technology in policing as a good than bad idea, but a majority says it won't change crime rates

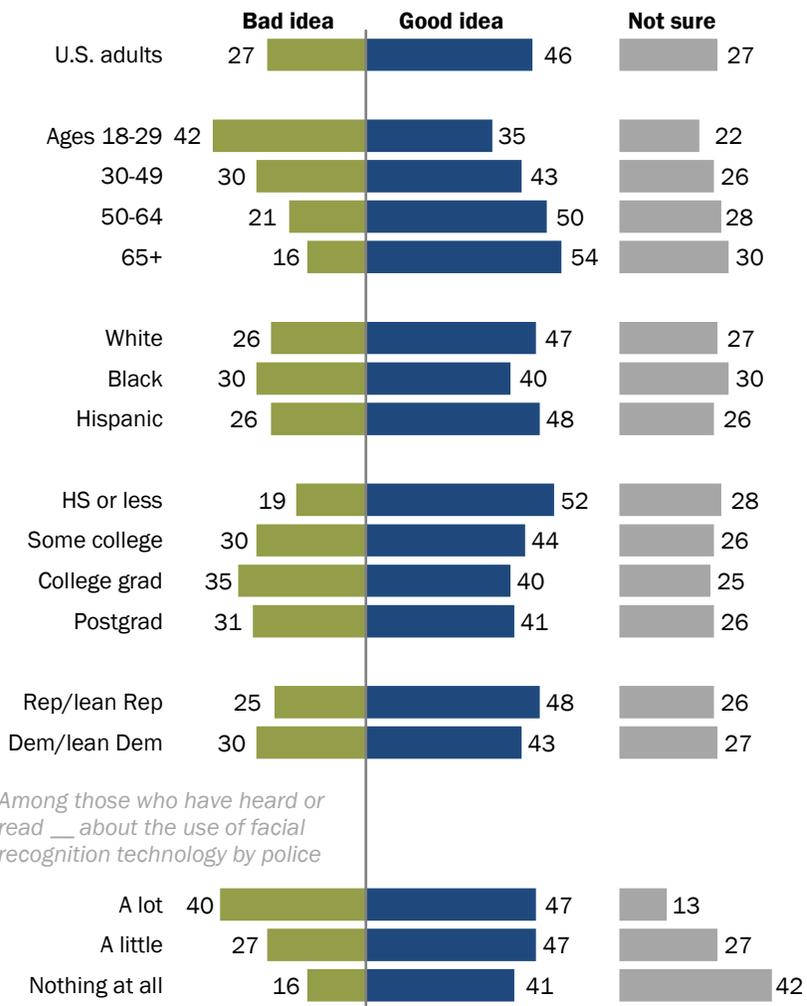
Facial recognition technology use by police has generated media attention, which has not gone unnoticed by the public. Eight-in-ten Americans say they have heard or read at least a little about the use of facial recognition technology by police, with 21% having heard a lot.

Adults 50 and older are more likely than those under 50 to say widespread use of facial recognition technology by police would be a good idea for society (52% vs. 40%). Similarly, 52% of adults with a high school diploma or less say it would be a good idea, while somewhat smaller shares of those with more formal education say the same.

People who have heard or read a lot about the use of facial recognition technology by police are more likely to say it's a bad idea for society, compared with those who have heard a little or nothing at all on the topic.

### Widespread use of facial recognition technology by police seen more negatively by younger adults, those who have hear a lot about the topic

*% of U.S. adults who say the widespread use of facial recognition technology by police would be a \_\_\_ for society*



Note: Respondents who did not give an answer are not shown. White and Black adults include those who report being only one race and are not Hispanic. Hispanics are of any race.

Source: Survey conducted Nov. 1-7, 2021.

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While a plurality of Americans think widespread use of facial recognition by police is a good idea, a majority are not convinced such usage would cut crime. Some 57% say crime in the U.S. would stay about the same if the use of facial recognition technology by police becomes widespread and 8% say crime would increase. A third of Americans think crime would decline if police used facial recognition widely.

## 57% of Americans say the widespread use of facial recognition technology by police won't change crime rates in the U.S.

*% of U.S. adults who say crime would \_\_\_ in the U.S. if the use of facial recognition technology by police becomes widespread*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Majorities say wide use of facial recognition technology would help police find missing persons, solve crimes but also lead to less privacy

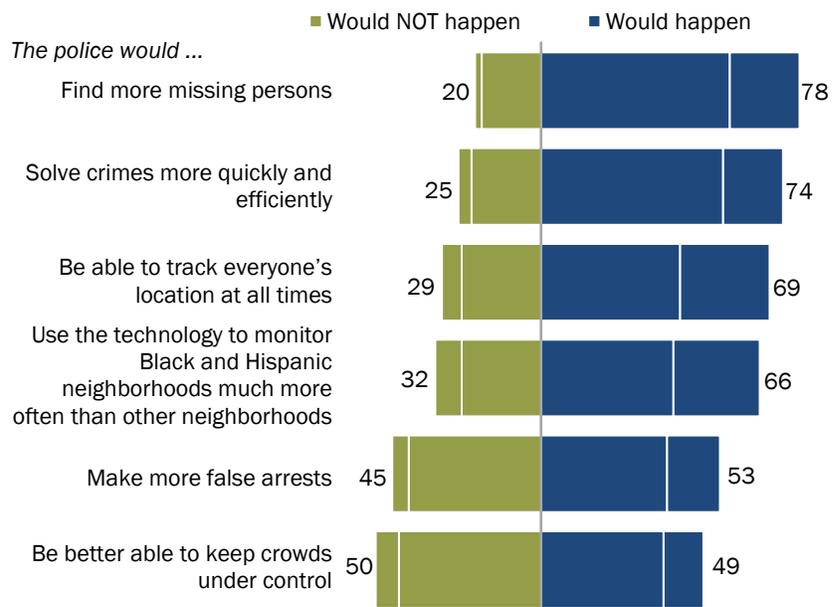
Americans see widespread use of facial recognition technology by police as likely to usher in both benefits and risks. In terms of potential benefits, about three-fourths or more say police would probably or definitely find more missing persons (78%) and solve crimes more quickly and efficiently (74%). The public is divided when it comes to crowd control: About half of Americans say if the use of facial recognition technology by police becomes widespread, police would be better able to keep crowds under control, while the other half think this would not happen.

When it comes to potential risks, 69% believe police would probably or definitely be able to track everyone's location at all times, while 66% say police

would use this technology to monitor Black and Hispanic neighborhoods much more often than other neighborhoods. Americans are more divided on the effects facial recognition would have on false arrests. Some 53% of U.S. adults say police probably or definitely would make more false arrests if use of facial recognition technology was widespread among police, while 45% say this probably or definitely would not happen.

### Majorities believe facial recognition would help find missing persons, solve crimes but also think it would be used to surveil Black, Hispanic neighborhoods

*% of U.S. adults who say that if the use of facial recognition technology by police becomes widespread, each of the following definitely or probably ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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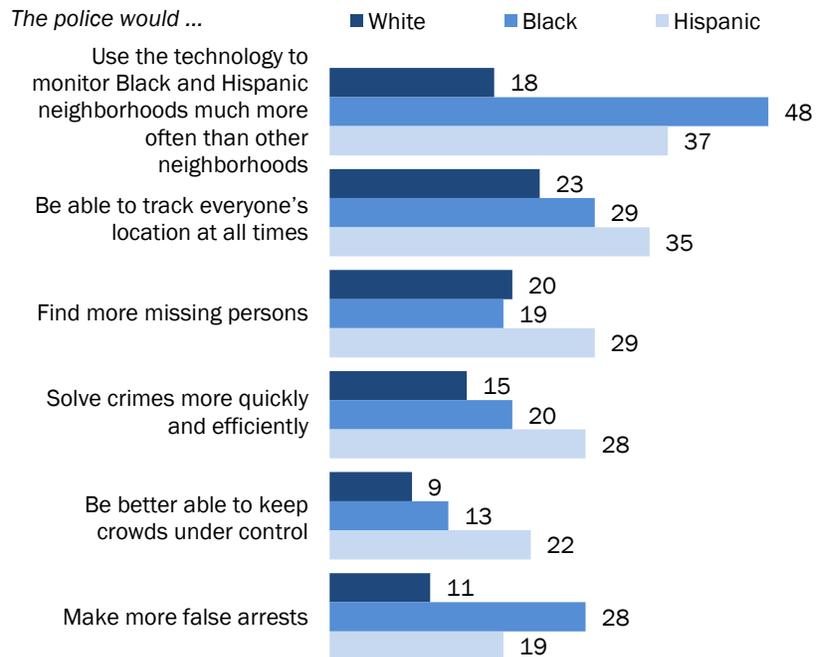
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There are some notable differences among racial and ethnic groups on these issues, especially when it comes to those who think these impacts definitely would occur. For instance, 48% of Black adults think police definitely would use facial recognition technology to monitor Black and Hispanic neighborhoods much more often than other neighborhoods, compared with 37% of Hispanic adults. About a fifth of White adults (18%) say the same.

Black adults are also particularly likely to think police would make more false arrests if the use of facial recognition technology by police becomes widespread. Some 28% of Black adults say this would definitely happen, followed by 19% of Hispanics. Just 11% of White adults think police would definitely make more false arrests if they widely used facial recognition technology. Across all six items asked about in this survey, Hispanics are consistently more likely than White adults to think each of these potential outcomes definitely would happen.

### 48% of Black adults say police definitely would use facial recognition to monitor Black, Hispanic neighborhoods more often than other neighborhoods

*% of U.S. adults who say if the use of facial recognition technology by police becomes widespread, each of the following **definitely would happen***



Note: Respondents who did not give an answer are not shown. White and Black adults include those who report being only one race and are not Hispanic. Hispanics are of any race.

Source: Survey conducted Nov. 1-7, 2021.

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## Majority of Americans say people should assume they are being monitored when they are in public

Notable [portions of people's lives](#) are now being [tracked and monitored](#) by police, government agencies, corporations and advertisers. Prior [Pew Research Center work](#) finds that a majority of Americans do not think it is possible to go through daily life without the government or companies collecting data about them. Facial recognition technology adds an extra dimension to this issue because surveillance cameras of all kinds can be used to pick up details about what people do in public places and sometimes in stores. A 2016 study out of Georgetown Law found that half of American adults' faces were already in law enforcement's [facial recognition databases](#).

In light of these findings, the Center asked people to pick which of these assertions best describes their views: "People should assume they are being monitored when they are in public spaces" or "People should have a right to privacy when they are in public spaces." Six-in-ten Americans say people should assume they are being monitored when they are in public spaces, while 39% say people should have a right to privacy when they are in public spaces.

### 60% of Americans say people should assume they are being monitored in public

*% of U.S. adults who say ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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Those who think widespread use of facial recognition technology by police is a good idea are more likely to say people should assume they are being monitored in public (71%), compared with those who see this technology as a bad idea for society (46%). People who say they are unsure about the effects of widespread use fall between those who say it's a good idea and those who say it's a bad idea, with some 57% saying people should assume they are being monitored when they are in public spaces.

## Americans have mixed views on whether use of facial recognition technology will make policing fairer

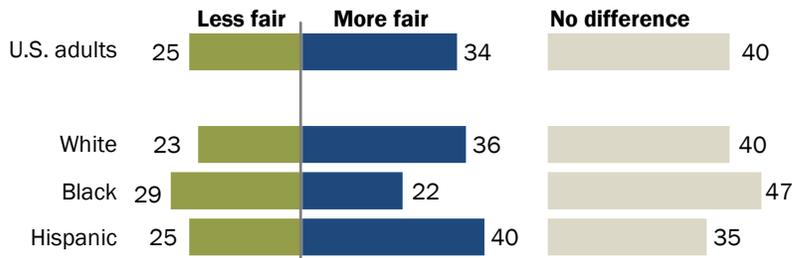
When considering how use of facial recognition technology may affect the fairness of policing, Americans are divided. Some 34% say the widespread use of this technology by police will make policing more fair, while 25% say it will become less fair. Still, four-in-ten do not think this will make a difference.

Hispanic adults (40%) and White adults (36%) are more likely than Black adults (22%) to say the widespread use of facial recognition technology will make policing more fair.

There are also some differences between those who generally have positive or negative feelings about the police's use of facial recognition technology. For example, Americans who say the use of this technology by police is a good idea for society are far more likely than those who say it is a bad idea to say widespread use of the technology by police will make policing more fair (58% vs. 10%).

### Black adults less likely than Hispanic and White counterparts to say facial recognition will make policing fairer

*% of U.S. adults who say the widespread use of facial recognition technology by police will make policing ...*



Note: Respondents who did not give an answer are not shown. White and Black adults include those who report being only one race and are not Hispanic. Hispanics are of any race.

Source: Survey conducted Nov. 1-7, 2021.

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The Center asked a more general question of how facial recognition findings should be considered as evidence: “If a facial recognition program said that someone was involved in a crime, should that be good enough evidence for police to arrest them, even if there was a small chance the program was wrong?” A majority of Americans say they do not think a facial recognition match is sufficient cause for arrest.

Seven-in-ten say that if a facial recognition program said that someone was involved in a crime, it should *not* be good enough evidence for police to arrest them. Roughly a quarter of Americans (27%) say that such a program should be good enough evidence for arrest, even if there was a small chance the program was wrong.

**Majority of Americans don’t think facial recognition technology should be good enough evidence for arrest**

*% of U.S. adults who say that if a facial recognition program said someone was involved in a crime, it \_\_\_, even if there was a small chance the program was wrong*



Note: Respondents who did not give an answer are not shown.  
 Source: Survey conducted Nov. 1-7, 2021.  
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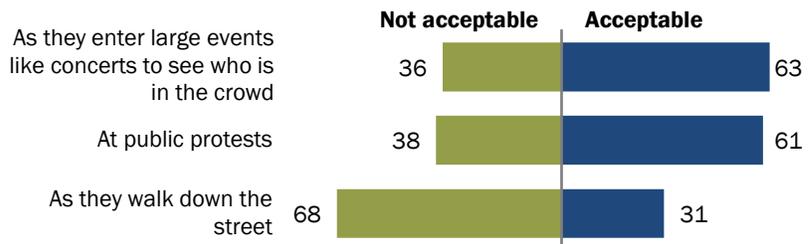
Those who say that the use of facial recognition technology by police is a good idea are more likely to say that a facial recognition program should be good enough evidence for police to make an arrest. Some 40% of these adults say this, compared with 15% of those who say that the use of this tech by police is a bad idea.

Americans are more accepting of the idea that police could use facial recognition in places where crowds gather. About six-in-ten adults say it is an

acceptable use of this technology by police to scan people as they enter large events like concerts to see who is in the crowd (63%) or to scan people at public protests (61%). Conversely, 68% of adults

**About six-in-ten say it’s acceptable for police to use facial recognition to monitor crowds, but 68% are not OK with scanning people walking down the street**

*% of U.S. adults who say that scanning people during the following is a(n) \_\_\_ use of facial recognition technology by police*



Note: Respondents who did not give an answer are not shown.  
 Source: Survey conducted Nov. 1-7, 2021.  
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say it is not acceptable to scan people as they walk down the street. Just 31% say this is an acceptable use of facial recognition technology by police.

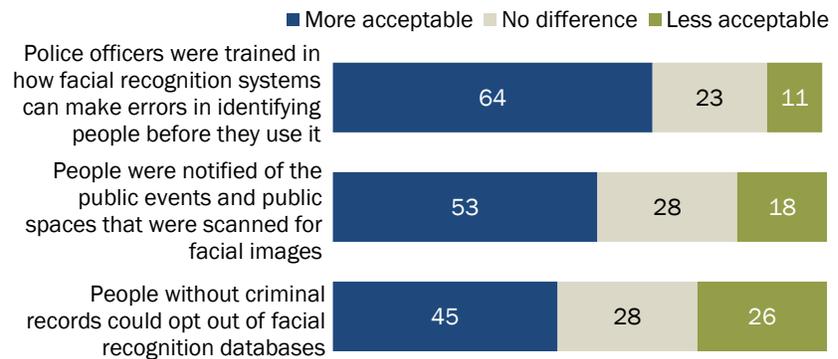
Substantial shares say they would find the use of facial recognition by police more acceptable if certain conditions were met.

Some 64% say the use of the technology by police would be more acceptable if police officers were trained in how facial recognition systems can make errors in identifying people before they use it. About half (53%) would find the tech use more acceptable if people were notified of the public events and spaces that were scanned for facial images. By comparison, 45% of Americans say the use of facial recognition technology by police would be more acceptable if people without criminal records could opt out of the facial recognition databases.

And roughly a quarter (26%) say the use would be less acceptable under this condition.

### A majority of Americans say use of facial recognition software by police would be more acceptable if cops were trained in how these tools can make errors

*% of U.S. adults who say each of the following would make the use of facial recognition technology by police ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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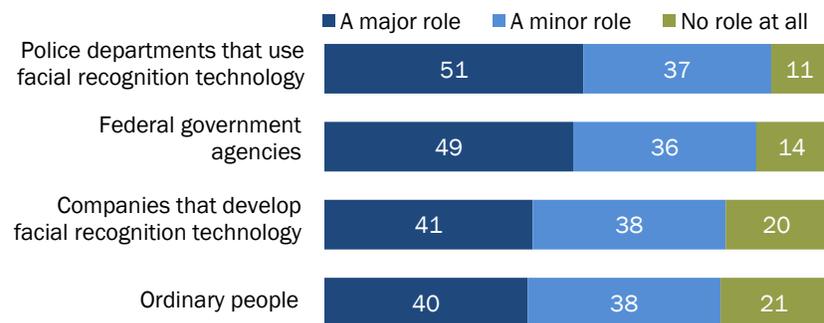
## About half think police departments, federal agencies should play a major role in setting standards for facial recognition use

When asked about who should be setting standards for facial recognition use by the police, roughly half of Americans say the police departments that use this technology (51%) and federal government agencies (49%) should play a major role. Smaller shares say that companies that develop facial recognition technology (41%) and ordinary people (40%) should play a major role in setting standards for how the technology is used by police.

There are differences by party affiliation when it comes to views on the role that the government or police should play in regulating this type of technology. For example, Democrats and those who lean toward the Democratic Party are more likely than Republicans and their leaners to say federal government agencies should play a major role in regulating police use of facial recognition (61% vs. 35%). And 56% of Republicans say police departments using this tech should play a major role in regulating the use, compared with 45% of Democrats.

### About half say police departments, federal agencies should play a major role in setting standards for police use of facial recognition technology

*% of U.S. adults who say each of the following groups should have \_\_\_ in setting standards for how facial recognition technology is used by police*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

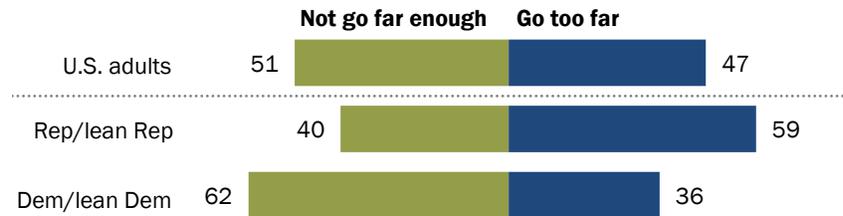
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While the vast majority of Americans say government agencies should play at least a minor role in setting standards for the use of facial recognition by police, there is no clear consensus among the public on their greater concern regarding how far the government will go regulating this technology. Some 47% say the government will go too far regulating the widespread use of facial recognition technology by police, and a similar share (51%) say the government will not go far enough.

### Similar shares say government will go too far or not far enough regulating police's facial recognition use, but this varies by party

*% of U.S. adults who say that if the use of facial recognition technology by police becomes widespread, their greater concern is that the government will \_\_\_ regulating its use*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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However, there are some differences by party affiliation on this question. Republicans are more likely than Democrats to say the government will go too far regulating the technology (59% vs. 36%). At the same time, Democrats are especially likely to say the government will not go far enough in their regulation: 62% say this, compared with 40% of Republicans.

## Majority opposes facial recognition use by social media sites; about half favor its use by retail stores, apartment buildings

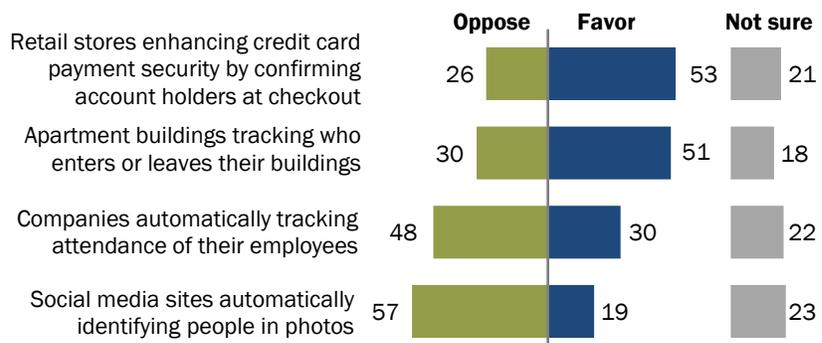
There are a number of other possible uses of facial recognition technology beyond law enforcement applications, and this survey sought public views about several of them. Americans' views about facial recognition technology vary depending on the application and context.

Roughly half of U.S. adults say they favor the use of facial recognition technology for security purposes, such as retail stores enhancing credit card payment security by confirming account holders at checkout (53%) or apartment buildings tracking who enters or leaves their building (51%).

Conversely, 57% of Americans oppose social media sites automatically identifying people in photos, and about half of Americans say they oppose companies automatically tracking the attendance of their employees.

### Roughly half of Americans favor use of facial recognition in retail stores and apartment buildings, they view other uses less favorably

*% of U.S. adults who say they \_\_\_ each of the following uses of facial recognition technology*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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There are also segments of the population that are not sure whether they oppose or favor these applications. About a fifth of Americans across each of these four applications say they are not sure whether they favor or oppose the use of facial recognition for these purposes.

### 3. Mixed views about social media companies using algorithms to find false information

About seven-in-ten Americans [use social media](#) to connect with others, share aspects of their lives and consume information. The connections and content they encounter on these sites are shaped not just by their own decisions, but also by the [algorithms](#) and [artificial intelligence technologies](#) that govern [many aspects](#) of these online environments. Social media companies use algorithms for a [variety of functions](#) on their platforms, including to decide and structure [what flow of content users see](#); figure out [what ads a user will like](#); [make recommendations](#) for content users might like; and assist with [content moderation](#) like detecting and removing [hate speech](#).

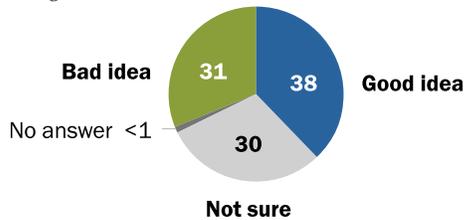
The companies also use these algorithms to scale up efforts to [identify false information](#) on their sites – recognizing the [pressing challenge](#) of halting the [spread of misinformation](#) on their platforms, but also faced with vast amounts of content and [the constant emergence of new false claims](#). While a [variety of approaches](#) can be used to find content that does not pass fact-checking standards and predict similar posts, the challenges of modern [content moderation](#) often require [more efficient and scalable approaches](#) than human review alone.

Pew Research Center’s November survey reveals a public relatively split when it comes to whether algorithms for finding false information on these platforms are good or bad for society at large – and similarly mixed views on these algorithms’ performance and impact. It also finds Republicans particularly opposed to such algorithms, echoing partisan divides in other Center research related to technology and online discourse – from the [seriousness of offensive content online](#) to [whether tech companies should take steps](#) to restrict false information online in the first place.

Asked about the widespread use of these computer programs by social media companies to find false information on their sites, 38% of U.S. adults think this has been a good idea for society. But 31% say this has been a bad idea, and a similar share say they are not sure.

## Mixed views about whether social media firms' use of algorithms to find false information is a good idea or not

*% of U.S. adults who say the widespread use of computer programs by social media companies to find false information on their sites has been a \_\_\_ for society*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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Companies have taken action on posts they determine contain falsehoods, including adding fact-check labels to misinformation relating to the [2020 presidential election](#) and the [coronavirus](#). Many people say they have seen these downstream impacts of algorithms' work: About three-quarters of social media users (74%) say they have ever seen information on social media sites that has been flagged or labeled as false.

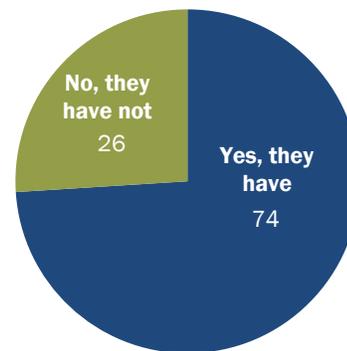
And three-quarters of adults say they have heard or read at least a little about computer programs used by social media companies to detect misinformation, including 24% who have heard a lot. Yet another 24% say they have heard nothing at all about these issues.

### Here's how people were asked to think about algorithms used by social media companies to detect false information on their sites:

"Computer programs can be trained to review large amounts of information and learn to identify patterns. These programs, called algorithms, are widely used by social media companies to find false information about important topics that appears on their sites."

## About three-quarters of social media users say they have seen information flagged or labeled as false on the sites

*% of U.S. social media users who say \_\_\_ ever seen information on social media sites that has been flagged or labeled as false*



Note: Based on social media users. Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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## Republicans especially likely to think social media companies' use of false information-detecting algorithms negatively impacts online environment

Overall, majorities of Americans believe that the algorithms companies use to find false information are not helping the social media information environment and at times might be worsening it. And even with this across-the-aisle agreement, there are stark partisan differences on the four potential impacts the survey explored – two that are positive in nature and two that are negative.

On the negative end, seven-in-ten adults say political viewpoints are definitely or probably being censored on social media sites due to the

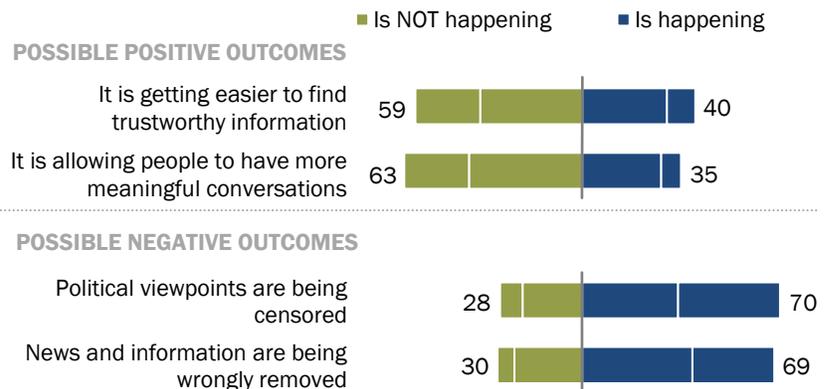
widespread use of algorithms to detect false information, and a similar share (69%) says that news and information are definitely or probably being wrongly removed from the sites.

Far smaller shares say the widespread use of such algorithms are leading to the two positive outcomes the survey explored. In fact, about six-in-ten (63%) say that their use is *not* allowing people to have more meaningful conversations on the platforms, and a similar share says it is not making it easier to find trustworthy information.

Those who are most familiar with these algorithms are more likely than those who are least familiar to think they have negative impacts. For example, three-quarters of those who say they have heard or read a lot about them say news and information is being wrongly removed, while six-in-ten of those who have heard nothing at all say this.

### Seven-in-ten Americans say political viewpoints are being censored due to social media companies' widespread use of algorithms to find false information

*% of U.S. adults who say that due to widespread use of computer programs by social media companies to find false information, each of the following definitely or probably \_\_\_ on the companies' sites*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

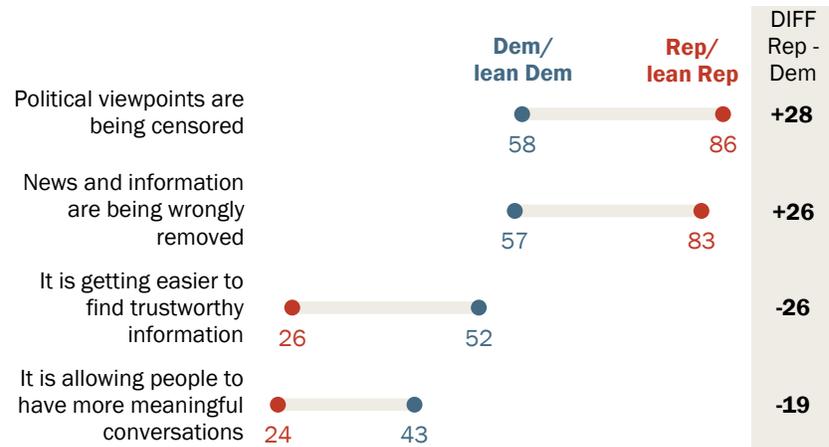
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Views also vary dramatically by partisanship. While majorities in both major political parties say political censorship and wrongful removal of information are definitely or probably happening as a result of the widespread use of these algorithms, Republicans and those who lean toward the GOP are far more likely than Democrats and leaners to say so, with differences of 28 percentage points on political censorship and 26 points on wrongful removal. This pattern appears in other Center research. For example, even as most Americans said in 2020 that social media companies likely censor political viewpoints, Republicans were [especially likely to say so](#).

### Majorities in both parties say social media companies using algorithms to find false information is leading to censorship, but Republicans far more likely to say so

*% of U.S. adults who say that due to widespread use of computer programs by social media companies to find false information, each of the following is definitely or probably happening on the companies' sites*



Note: All differences shown in the DIFF column are statistically significant. The difference values shown are based on subtracting the rounded values in the chart. Respondents who gave other responses or who did not give an answer are not shown.  
Source: Survey conducted Nov. 1-7, 2021.

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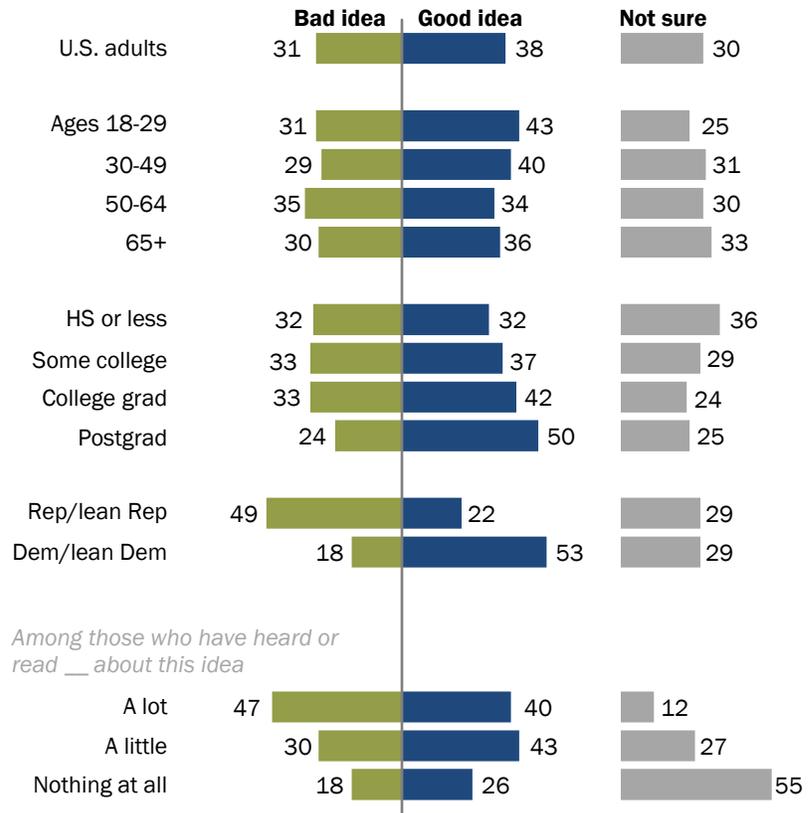
At the same time, Democrats are more likely than Republicans to say the positive impacts the survey explored are realities. Democrats are twice as likely to say it is getting easier to find trustworthy information on social media sites due to widespread use of algorithms to find false information, and the share of Democrats who say that this is allowing people to have more meaningful conversations is 19 points higher than among their GOP counterparts.

Political party and awareness also color Americans' views when asked about the broader impact of these algorithms on society. The share of Republicans who say these programs have been a bad idea for society is about 30 points higher than the parallel share of Democrats.

These findings echo double-digit partisan divides found when asking about the role of social media and the companies that run these sites in society more generally. For example, a 2020 Center study found Republicans more likely than Democrats to say technology companies have [too much power in the economy](#), even as majorities across parties said so. In a separate 2020 survey, those who identified with the GOP were also more likely to think social media have a [mostly negative impact](#) on the way things are going in the country.

### Republicans more likely than Democrats to say social media companies' widespread use of algorithms for finding false information is a bad idea for society

*% of U.S. adults who say widespread use of computer programs by social media companies to find false information on their sites has been a \_\_\_ for society*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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The balance of views also shifts by how much people have heard about the topic. Views lean negative among those who have heard a lot, with about half saying widespread use of these algorithms is a bad idea. Compared with this group, those who have heard a little are less skeptical – a smaller share of them say this is a bad idea, but at the same time they are more likely to express uncertainty. And among those who have heard nothing at all, over half say they are not sure whether it's a good or bad idea for society. When it comes to formal educational attainment,

those with postgraduate degrees stand out in their views – half say these algorithms are a good idea for society.

People’s perceptions of the social media experience may factor into their views about societal impact as well. For example, a majority of Americans say people have at least a little control over the things they see on social media sites, but just one-in-ten say people have a lot of control. And a third of adults say users have no control at all. Previous Center work has also found this perceived lack of user control in other social media contexts – from [the mix of news people see](#) to [what appears in their feeds](#).

Those who think users have no control over the social media content they see are particularly likely to say algorithms for detecting false information are a bad idea for society. Some 41% of this group say social media companies’ widespread use of such programs is a bad idea – about twice as high as the share who say so (20%) among those who think users have a lot of control and 11 points higher compared with those who say users have a little control (30% of this group say use of the programs is a bad idea for society).

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### Only one-in-ten adults think people have a lot of control over what they see on social media

*% of U.S. adults who say users have \_\_\_ control over the things they see on social media sites*



Note: Respondents who did not give an answer are not shown.

Figures may not add up to NET value due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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## Majorities say decisions about false information on social media should be made with some human input and algorithms should favor accuracy over speed

Even as social media companies work to improve the [accuracy](#), [clarity](#) and [efficiency](#) of their algorithms, some experts say the programs are vulnerable to [mistakes](#) and [bias](#). Others argue that even social media firms [do not fully understand](#) what their algorithms do. Yet the alternative of [human reviewers](#) poses [challenges](#) as well – from the sheer volume of posts to the potential harm to the reviewers themselves.

This survey probed three key tensions that relate to the quality of the decisions made by these algorithms: How Americans perceive algorithmic decisions compared with decisions made by people, how important it is to include diverse perspectives in the creation of algorithms and whether they should prioritize speed or accuracy.

A majority of Americans say decisions about what is false on social media should be made with some human input – that is, by a mix of both people and computer programs. About a fifth say they should be mostly made by people, and just 6% say they should be mostly made by computer programs.

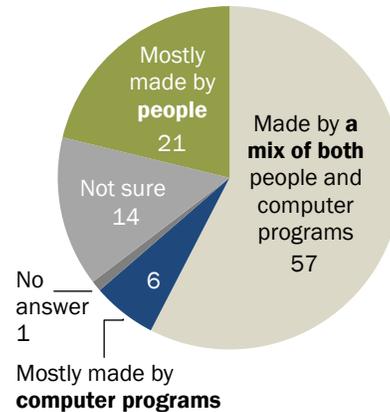
However, people are split when asked whether computers or humans do a better job finding false information. The largest share say they are not sure; another quarter say they do about the same job, while about one-in-five each say computers do a worse job (22%) or a better job (19%).

Views on relative performance vary by awareness of these algorithms – nearly half (45%) of those who have seen or heard nothing say they are not sure what does a better job, compared with 30% among those who have heard a little and 22% of those who have heard a lot. At the same time, one-third of those who have heard a lot say computer programs do a worse job than humans, versus 21% of those who have heard a little and 14% of those who have heard nothing.

Human judgment can make its way into assessments about what information is false on social media via [fact-checker judgments](#), [crowdsourced](#) labeling of false information and [review processes](#) in place for contested decisions or to judge context. Even when decisions are made primarily by algorithms, various steps in creating these programs – including using fact-checker judgments to [“train” computer programs](#) – can introduce human influence into the process.

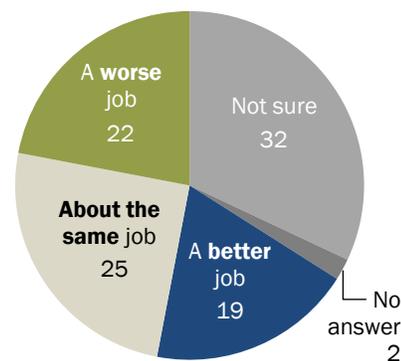
## Majority say social media companies should use a mix of people, algorithms to decide what’s false on their sites ...

*% of U.S. adults who say the decisions made by social media companies about what information is false should be ...*



## And about a third aren’t sure if people or algorithms do a better job

*% of U.S. adults who say when it comes to finding false information on social media sites, computer programs used by social media companies do \_\_\_ than/as humans*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

“AI and Human Enhancement: Americans’ Openness Is Tempered by a Range of Concerns”

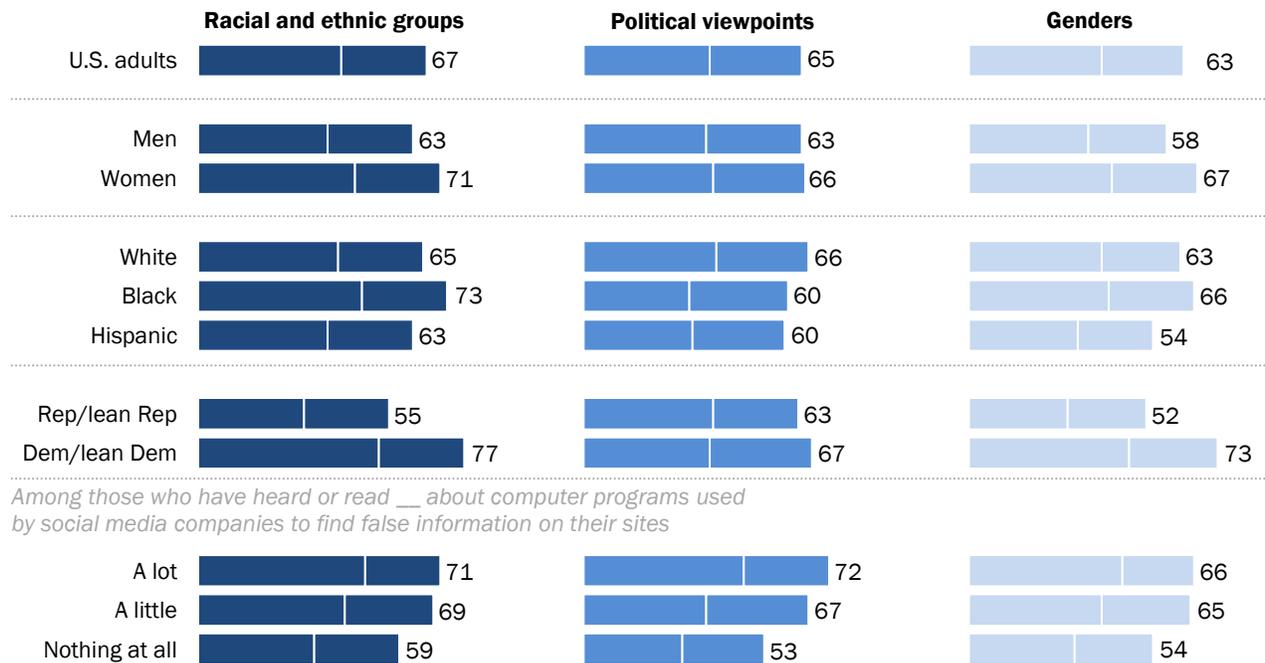
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The resulting potential for algorithms to also [codify bias](#) has been increasingly in the public eye. For example, recently released documents describe concerns with programs designed to detect hate speech [failing to protect Black people from harassment](#), and Black social media users have expressed frustration over content [being flagged as inappropriate](#), mistakenly or intentionally. Other investigations have focused on whether algorithms promote [some political viewpoints over others](#) amid widely perceived [censorship](#) by social media companies. When it comes to the public's views, a majority of Americans said in 2018 that computer programs [always reflect the biases of their creators](#), though 40% thought it possible to make decisions free from human bias.

Some have pointed to [the lack of meaningful diversity](#) in the technology companies that create and use these programs as [one contributing factor](#). When asked about who companies should include at the algorithmic design stage, notable shares of Americans say including members of a range of groups is important. About six-in-ten or more say it is extremely or very important that social media companies include people of different racial and ethnic groups (67%), political viewpoints (65%) and genders (63%) when creating computer programs to find false information. In each case, about four-in-ten Americans say it is *extremely* important to include these groups.

## Majorities say including people of various backgrounds is important when developing programs to detect false information on social media; those who have heard at least a little about these algorithms are particularly likely to say so

% of U.S. adults who say it is **extremely** or **very important** for social media companies to include people of different \_\_\_ when creating computer programs to find false information



Among those who have heard or read \_\_\_ about computer programs used by social media companies to find false information on their sites

Note: Respondents who gave other responses or who did not give an answer are not shown. White and Black adults include those who report being only one race and are not Hispanic. Hispanics are of any race.

Source: Survey conducted Nov. 1-7, 2021.

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Those who have heard at least a little about the use of computer programs by social media companies to find false information on their sites place more importance on diversity in algorithmic design than do those who have heard nothing at all. And partisans differ dramatically in how important they view including people of different racial, ethnic and gender groups to be, with Democrats being more likely than Republicans to say these things are extremely or very important.

Women are more likely than men to say that including people of different genders is extremely or very important (67% vs. 58%), and Black adults (73%) are more likely than White (65%) or Hispanic adults (63%) to say the same when it comes to people of different racial and ethnic

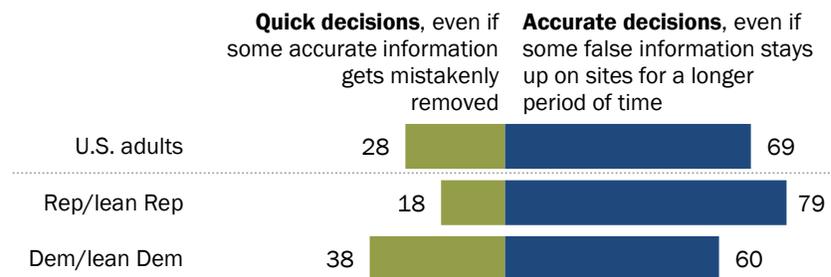
groups. There is little difference by political party in the importance placed on diversity of political viewpoints at the creation stage of these algorithms.

(The survey also sought Americans' opinions about whether the experiences and views of various groups are taken into account when artificial intelligence programs are created; these varying perspectives are covered in [Chapter 1](#).)

Finally, the survey explored Americans' views of the tension between the speed with which decisions can be made versus the accuracy of these decisions. Fully 69% of Americans say social media companies should prioritize accurate decisions, even if some false information stays up on sites for a longer period of time – while 28% say they should give priority to quick decisions, even if some accurate information gets mistakenly removed.

### About seven-in-ten say social media companies should prioritize accuracy over speed when using algorithms to find false information on their sites

*% of U.S. adults who say when using computer programs to find false information on their sites, social media companies should give priority to ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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Compared with accuracy, relatively small shares in both parties say speed should be prioritized; however, the share of Democrats who say so is 20 points higher than the share of Republicans who say the same (38% vs. 18%). Women are also more likely than men to say speed should be the priority (32% vs. 24%), as are Black (41%) or Hispanic (32%) adults compared with White adults (24%).

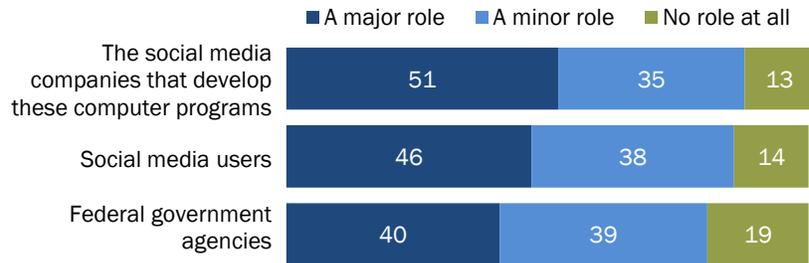
### 53% worry government will not go far enough in regulating social media companies' algorithms for finding false information

[Whistleblower testimony](#) has [reignited debate](#) about regulating the algorithms social media companies use. At the same time, [federal agencies](#) are pushing social media companies to disclose more about the data they collect and how their algorithms work. While some have called for more [regulation of algorithms](#) generally, there is still debate about how this should be accomplished – in part because of [internet and free speech](#) issues that could eventually [end up in the courts](#).

This survey asked Americans about the role they think three key groups should play in setting standards for algorithms used by social media companies. Some 51% say the social media companies that develop these computer programs should play a major role in setting standards for the use of algorithms for finding false information. Nearly half (46%) say social media users should play a major role in setting these standards. And four-in-ten say the same about federal government agencies.

### 51% say social media companies should play a major role in setting standards for use of algorithms to find false information; 40% say federal agencies should

*% of U.S. adults who say each of the following groups should play \_\_\_ in setting standards for how social media companies use computer programs to find false information on their sites*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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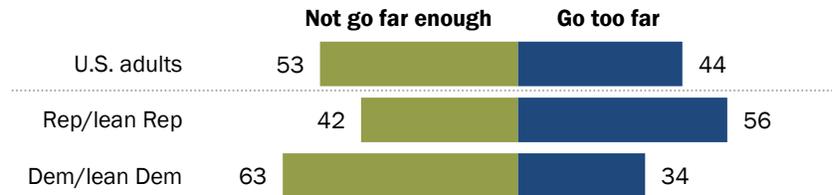
Democrats are far more likely than Republicans to say federal government agencies should play a major role in setting these standards (51% vs. 27%). They are also more likely to say that the social media companies themselves should play a major role (58% vs. 42%).

[Other Center research](#) shows that over the past several years Americans have grown slightly more open to the general idea of the U.S. government taking steps to restrict false information online. About half said in 2021 that the government should do this, even if it limits freedom of information, with Democrats far more likely to say this than Republicans.

When asked what their greater concern is in terms of regulating social media companies' use of these algorithms, 53% of Americans say it is that the government will not go far enough – while 44% are more worried the government will go too far. These views again vary by party, with Democrats more likely than Republicans to be concerned that the government will not go far enough.

### 53% say their greater concern is that government will not go far enough regulating social media companies' use of algorithms aimed at false information

*% of U.S. adults who say that as use of computer programs by social media companies to find false information on their sites has become widespread, their greater concern is that the government will \_\_\_ regulating their use*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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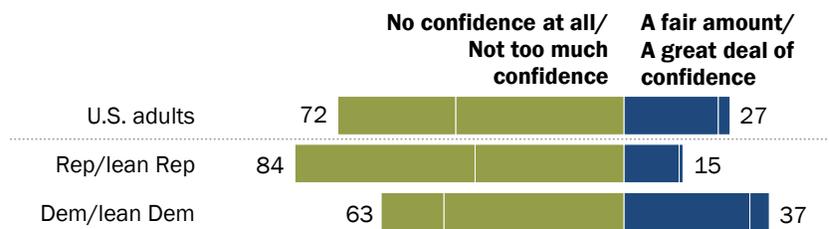
Americans also do not have much confidence in social media companies' appropriate use of these algorithms. Fully 72% of Americans have little or no confidence that social media companies will use computer programs appropriately to determine which information on their sites is false, including three-in-ten who have no confidence at all. On the other hand, just 3% of Americans have a great deal of confidence that social media companies will do this.

Partisans diverge dramatically in these respects. Majorities across both parties are not confident, but Republicans are much more likely to have little or no confidence than Democrats – a difference of 21 percentage points.

This pattern also appears in [previous Center work](#) on Americans' confidence in social media companies to determine which posts should be labeled as inaccurate or misleading in the first place – algorithmically or not. Republicans stood out in their lack of confidence, according to the June 2020 survey.

### Majorities across parties not confident in social media firms to use algorithms aimed at false information appropriately, but Republicans stand out

*% of U.S. adults who have \_\_\_ that social media companies will use computer programs appropriately to determine which information on their sites is false*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Majorities of Americans oppose use of algorithms for final say over mortgages, jobs, parole, medical treatments

The basic principles behind the algorithms that social media companies use to detect certain types of content on their sites are also used in [other contexts throughout society](#) – sometimes with far-reaching implications that can affect people’s lives and livelihoods.

Majorities of Americans oppose the use of algorithms to make final decisions about which patients should get a medical treatment (70%), which people should be good candidates for parole (64%), which job applicants should move on to a next round of interviews (60%) or which people should be approved for mortgages (56%). About one-in-five or fewer favor each of these ideas. And roughly a quarter or fewer say they are not sure.

### Proponents of algorithms

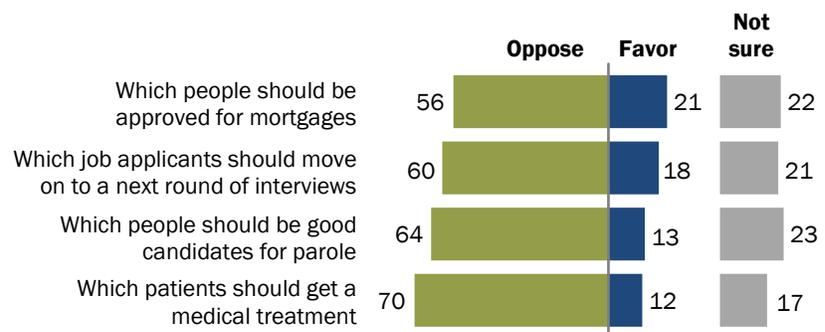
sometimes make the case that

automated systems [can reduce discrimination](#). But the issue has been debated widely, especially when it comes to race and ethnicity, with others saying algorithms themselves can be inherently discriminatory in settings from [the criminal justice system](#) to [the job market](#).

While small shares of adults across demographic groups favor computer programs making the final decisions in each case, there are some modest differences by race and ethnicity.

### Americans resist deferring to algorithms on key decisions, particularly for medical treatments

*% of U.S. adults who \_\_\_ the use of computer programs like the ones used by social media companies to find false information to make final decisions about each of the following*



Note: Respondents who did not give an answer are not shown.

Source: Survey of U.S. adults conducted Nov. 1-7, 2021.

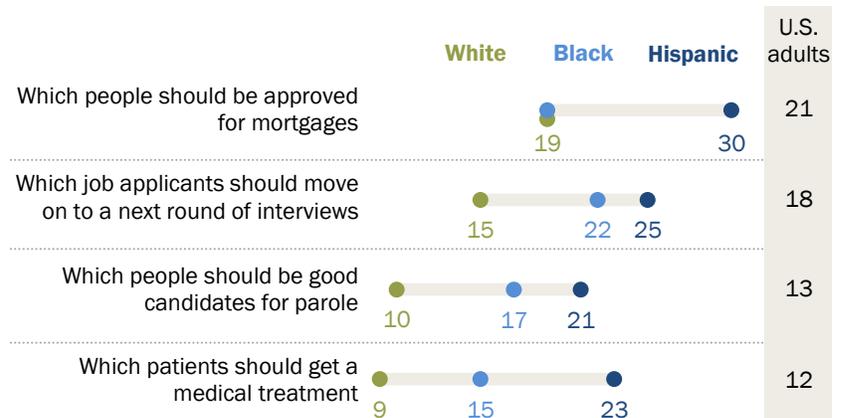
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Hispanic or Black adults are more likely than their White counterparts to *favor* algorithmic final decisions in three of these contexts – medical treatments, job interviews and parole. Hispanic adults are also more likely than either Black or White adults to say this about mortgages.

### Hispanic or Black adults more likely than White adults to favor using algorithms to make final decisions for job interviews, parole, medical treatments

% of U.S. adults who **favor** the use of computer programs like the ones used by social media companies to find false information to make final decisions about each of the following



Note: Respondents who gave other responses or who did not give an answer are not shown. White and Black adults include those who report being only one race and are not Hispanic. Hispanics are of any race.  
 Source: Survey of U.S. adults conducted Nov. 1-7, 2021.

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## 4. Americans cautious about the deployment of driverless cars

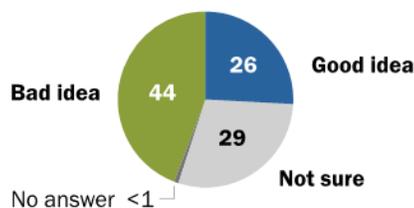
Driverless cars may evoke images from sci-fi films to Saturday morning cartoons, but the prospect is hardly remote now. While Americans today cannot purchase a fully autonomous vehicle, there are some cars that already operate with minimal human assistance and others that are expected to be able to run without human drivers in the future. Several companies like Google's parent company Alphabet and Amazon have been piloting these vehicles in cities around the U.S. for years.

These advancements have the potential to create both new opportunities and less desirable outcomes. Proponents say driverless vehicles could reduce the stress of commuting, lower the number of accidents and make traveling more sustainable. But critics have raised a number of concerns – ranging from safety risks, to cost, to their potential to hurt the environment by making car travel easier.

This technology has also generated pressing questions related to work, human agency and ethics: How will this impact people who drive for a living? Are Americans willing to give up control to a machine? And whose safety should be prioritized in a potential life-or-death situation?

### Americans more likely to say the widespread use of driverless cars would be bad rather than good for society

*% of U.S. adults who say the widespread use of driverless cars would be a \_\_\_ for society*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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#### Here's how people were asked to think about driverless cars:

"Driverless passenger vehicles, sometimes called self-driving cars, are equipped with software allowing them to operate with computer assistance. In the future, driverless passenger vehicles are expected to be able to operate entirely on their own without a human driver."

When posed these questions – and more – the survey reveals that larger shares of U.S. adults think the widespread use of driverless passenger vehicles is a bad idea for society than think it is a good idea (44% vs. 26%). Additionally, 29% say they are not sure if this would be a good or bad idea for society.

A majority of Americans are also wary about riding in an autonomous vehicle. Roughly six-in-ten adults (63%) say they would *not* want to ride in a driverless passenger vehicle if they had the opportunity, while a much smaller share (37%) say they would want to do this.

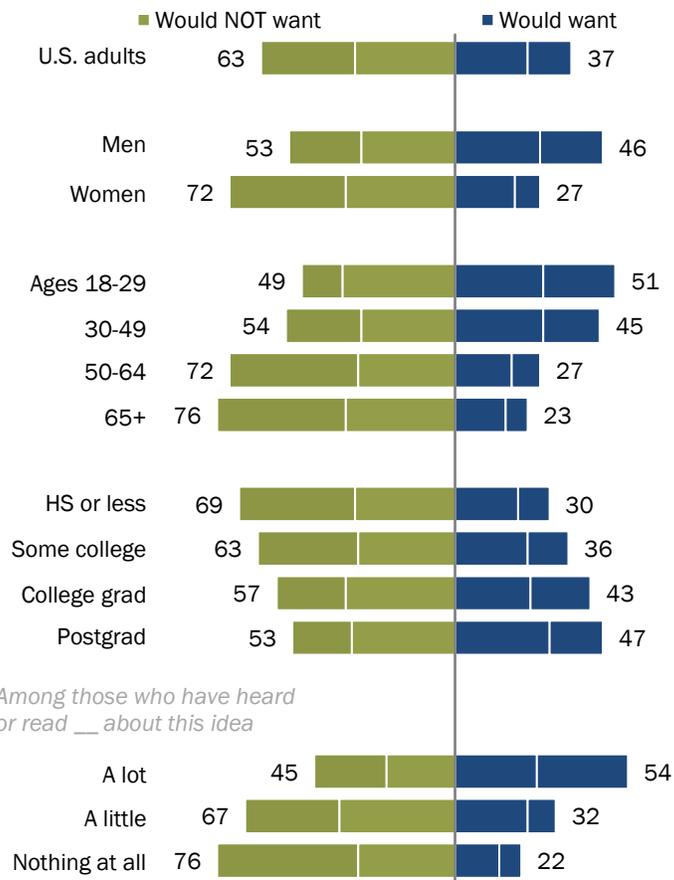
Interest in riding in a driverless vehicle varies across demographic groups, with age being one of the most notable differences. Adults under the age of 50 are about twice as likely as those 50 and older to say they would ride in this type of car (47% vs. 25%).

There are also differences by gender and educational attainment. Some 46% of men say they would want to ride in a driverless car, compared with 27% of women. Additionally, men under the age of 50 stand out for their desire to ride in an autonomous vehicle: 59% of this group say they would want to do this, while those shares drop to

about one-third or less among women under 50 and both men and women 50 and older. And those with a bachelor’s or advanced degree are more likely than those with less formal education to

**Majority of Americans say they wouldn’t want to ride in a driverless vehicle, but men, adults under 50 and those with a college degree are more open to the idea**

*% of U.S. adults who say they definitely or probably \_\_\_ to ride in a driverless passenger vehicle if they had the opportunity*



Note: Respondents who did not give an answer are not shown.  
 Source: Survey conducted Nov. 1-7, 2021.  
 “AI and Human Enhancement: Americans’ Openness Is Tempered by a Range of Concerns”

say they would ride in an autonomous vehicle. For example, roughly half of those with a postgraduate degree say they would like to ride in one of these cars, compared with three-in-ten of those who have completed high school or less.

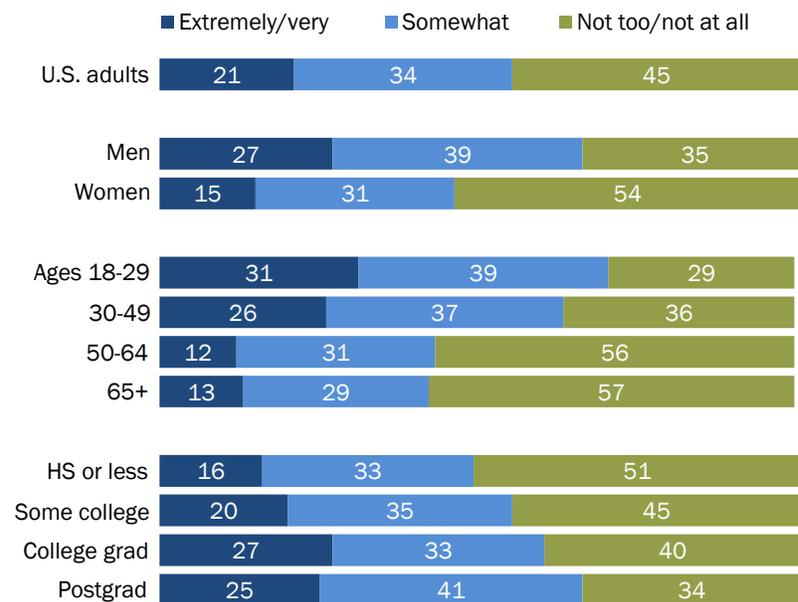
Most adults have heard or read at least a little about driverless cars (88%), including 26% who say they have heard or read a lot. Only 12% of adults say they have heard nothing at all about driverless cars. And those who have heard more about driverless cars are also more likely to want to ride in them. Some 54% of those who have heard a lot say they want to ride in driverless cars, compared with 32% of those who have heard a little and about one-in-five who have heard nothing at all.

Many Americans are not only reluctant to ride in driverless cars, some are also concerned about sharing the road with one. In total, 45% of Americans say they would not feel comfortable sharing the road with driverless vehicles if use of them became widespread, including 18% who would not feel comfortable at all. Smaller shares indicate they would be extremely (7%) or very (14%) comfortable sharing the road with autonomous vehicles.

As was true with wanting to ride in a driverless vehicle, men are more likely than women to say they would be extremely or very comfortable sharing the road with these types of cars (27% vs. 15%). Conversely, 54% of women say they would be uncomfortable with this compared with 35% of men. There are also gaps by age, with adults under 50 being more

### About one-in-five Americans say they'd be extremely or very comfortable sharing the road with driverless cars

*% of U.S. adults who say if the use of driverless passenger vehicles became widespread, they would feel \_\_\_ comfortable sharing the road with them*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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comfortable with sharing the road with driverless cars than those 50 and older. And those with a bachelor's degree or more are more likely than those with less formal education to say the same.

A [2017 Pew Research Center survey](#) also measured the public's views about riding in or sharing the road with autonomous vehicles. While figures are not directly comparable across these two surveys due to changes in question wording, there are clear patterns that emerge in both. Then, as now, a majority of Americans were not interested in riding in a driverless vehicle, and many were wary of sharing the road with vehicles. And those who are more open to this technology continue to skew younger, male or college-educated.

## Those who have heard a lot about driverless cars more likely than those who have heard nothing to think they are a good idea

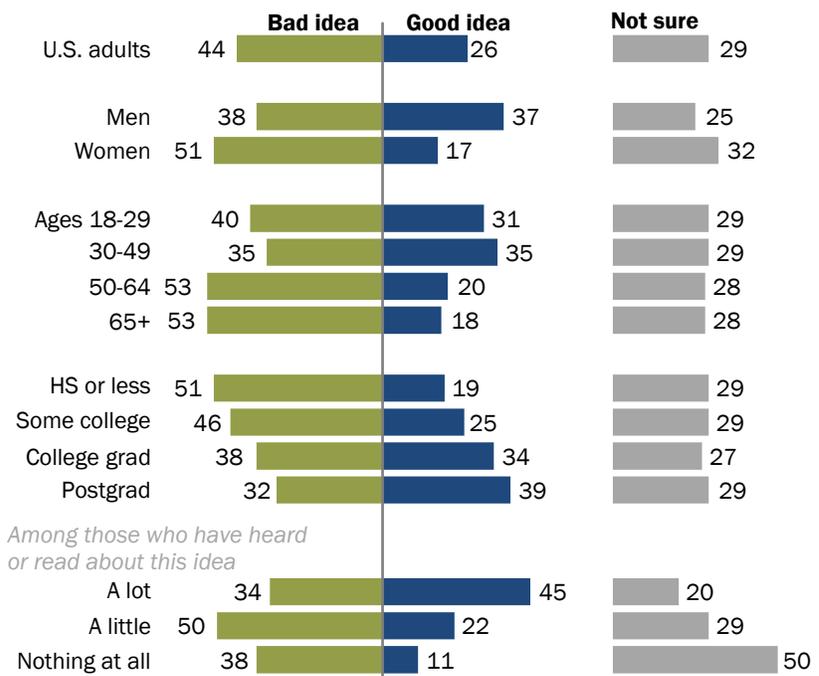
Many of the groups who are more likely to say they would ride in a driverless vehicle are also more likely to say these cars are a good idea for society. For example, adults ages 18 to 49 are more likely than those 50 and older to say driverless cars are a good idea (33% vs. 19%). Men and those with more formal education are also more likely to perceive these cars as a good idea for society.

Those who have heard a lot about driverless cars (45%) are about twice as likely as those who have heard a little (22%) to say they're a good idea, and about four times as likely as those who have heard nothing at all (11%) to say the same.

Relatedly, those who think driverless cars are a good idea on a societal level are also more likely to want to ride in one themselves. Most adults who say driverless cars are a good idea for society say they would want to ride in one (86%), while most who see these vehicles as a bad idea say they would not want to ride in one (89%).

### Men, younger adults and those who have heard a lot about driverless cars more likely to say they would be good for society

*% of U.S. adults who say the widespread use of driverless passenger vehicles would be a \_\_\_ for society*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Public foresees a mix of both positive and negative outcomes if driverless cars become widely used

Americans were asked about several possible outcomes that may occur if driverless cars become widely used, and the findings show the public thinks there could be both pros and cons.

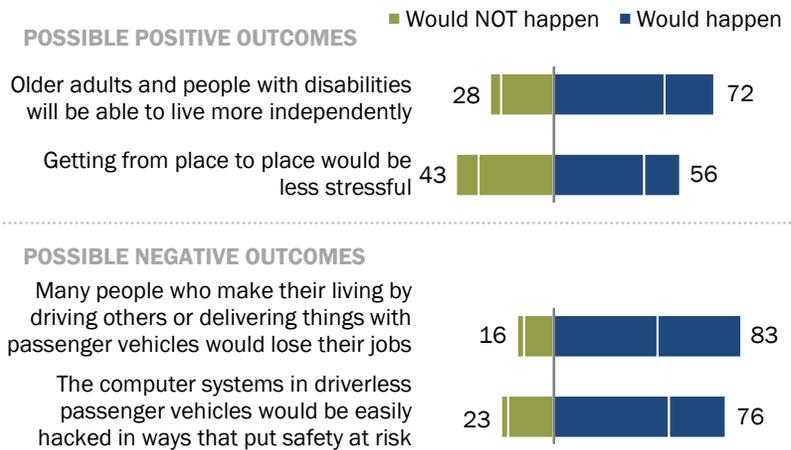
When it comes to possible positive outcomes, 72% say that older adults and people with disabilities would definitely or probably be able to live more independently with widespread use of driverless cars, while 56% say getting from place to place would definitely or probably be less stressful. Still, about four-in-ten do not think autonomous vehicles would alleviate the stress of going places.

On the more negative side, clear majorities say that the widespread use of driverless cars would definitely or probably lead to many people who make a living by driving others or delivering things with passenger vehicles losing their jobs (83%) or that computer systems in the vehicles would be easily hacked in ways that put safety at risk (76%).

Those who generally think driverless cars would be a good idea for society are more likely than those who think they would be a bad idea to say positive outcomes would occur with widespread use. Roughly half of adults who think these vehicles are a good idea say older adults and people with disabilities would definitely be able to live more independently, compared with 8% of those who say driverless cars would be a bad idea. Similarly, only 14% of those who think driverless cars are a good idea say the computer systems would definitely be easily hacked, compared with 37% of those who think these cars are a bad idea.

### Most say the widespread use of driverless cars would result in job loss, system hacking; still, a majority sees benefits for older adults, those with disabilities

*% of U.S. adults who say that if the use of driverless passenger vehicles became widespread, each of the following definitely or probably ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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When asked about the potential impact that the widespread use of driverless passenger vehicles could have on income inequality, 46% say these vehicles would increase the gap between higher- and lower-income Americans, while much smaller shares (8%) expect the economic gaps to decrease. Still, 46% think these disparities would not change if the use of autonomous vehicles became widespread.

### Fewer than one-in-ten adults say driverless vehicles will decrease income gaps among Americans

*% of U.S. adults who say that if the use of driverless passenger vehicles becomes widespread, it would \_\_\_ (in) the gap between higher- and lower-income Americans*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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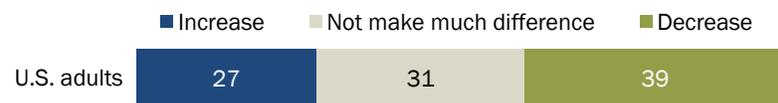
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### Mixed views on whether driverless vehicles would increase or decrease traffic deaths, injuries

A [central question about the deployment](#) of autonomous passenger vehicles is whether these cars would help reduce traffic accidents or instead lead to more injuries or fatalities. This survey finds that 39% of Americans say the widespread use of driverless vehicles would *decrease* the number of people killed or injured in traffic accidents, and 27% believe traffic deaths and injuries would *increase*. Another 31% say it would not make much difference.

### Americans somewhat divided on impact of driverless vehicles on injuries, deaths from traffic accidents

*% of U.S. adults who say that if the use of driverless passenger vehicles becomes widespread, it would \_\_\_ (in) the number of people killed or injured in traffic accidents*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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A [2017 Center survey](#) also found mixed views on whether driverless cars would reduce traffic injuries or deaths. The current figures cannot be directly compared to the previous survey due to changes in question wording, but it does highlight that even with [advancements](#) and [investments](#) in driverless vehicle technology, the public remains divided on the impact these cars will have on traffic safety.

## About four-in-ten are unsure if driverless car systems should prioritize safety of passengers or those outside vehicle if an accident is unavoidable

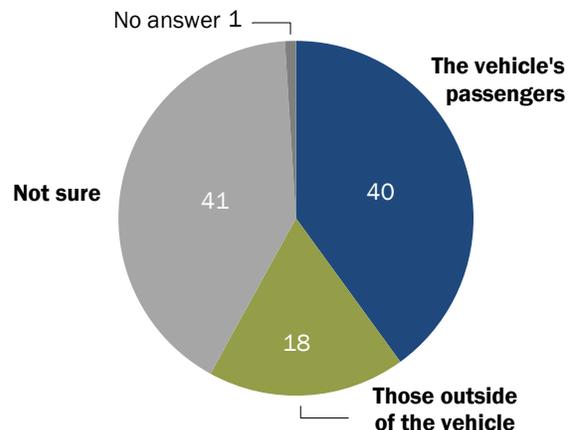
One of the most well-documented debates regarding driverless cars [centers on the “trolley problem.”](#) It is the ethical dilemma of whether a trolley driver who is on a collision course with pedestrians should take action and switch tracks to save several people, even if it results in killing just one person, or if the driver should do nothing in order to spare the life of the single pedestrian, thereby dooming several others.

Software developers, industry leaders and safety experts must grapple with the modern version of this question of whose safety should be the priority in the event of a coming accident involving an autonomous vehicle. This is a question that [some experts](#) themselves are unsure of how to answer, while [others critique](#) the usefulness of this framing altogether.

In this survey, larger shares say that in the case of an unavoidable accident, the computer system guiding the driverless car should prioritize the safety of the vehicle’s passengers, rather than those outside of the vehicle (40% vs. 18%). But some are also uncertain of what these systems should be programmed to do: 41% report being unsure whose safety should be prioritized in the case of an unavoidable accident.

### Public more likely to prioritize saving those inside rather than outside of a driverless car, but many are unsure

*% of U.S. adults who say that in the case of an unavoidable accident, the computer systems guiding driverless passenger vehicles should be designed to prioritize the safety of ...*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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## Who should have a role in setting driverless passenger vehicle standards, and to what degree?

The U.S. Department of Transportation [has been mapping safety standards](#) and plans for introducing autonomous vehicles [onto the nation's roadways](#).

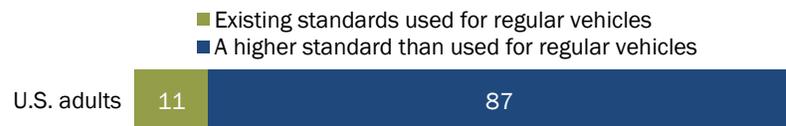
Accordingly, this survey explored people's views about the scope of those regulations and which groups should be involved in setting the standards.

There is strong agreement among Americans that the standards used to test the safety of regular vehicles are inadequate when it comes to driverless ones. A clear majority of Americans (87%) say driverless vehicles should be tested using a higher standard than is used for regular vehicles. Only 11% believe that existing standards used for regular vehicles would be enough to ensure the safety and effectiveness of autonomous vehicles.

In addition to understanding the types of standards people want to see, Americans were also asked to weigh in on the level of involvement they would like to see certain groups play when it comes to setting these

### Strong public support for driverless cars to have higher testing standards than regular vehicles

*% of U.S. adults who say that when it comes to ensuring safety and effectiveness, driverless passenger vehicles should be tested using ...*



Note: Respondents who did not give an answer are not shown.

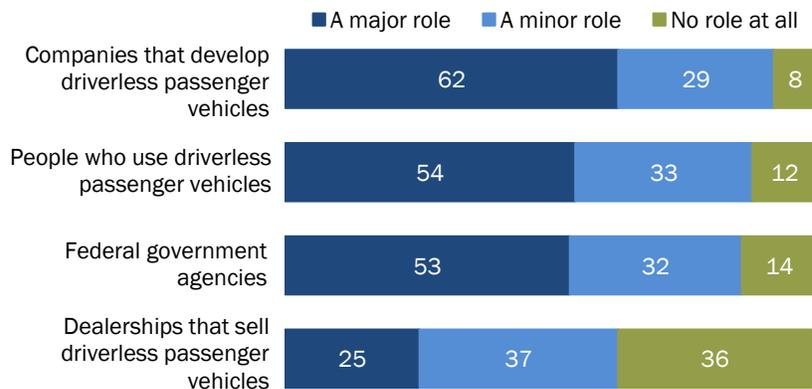
Source: Survey conducted Nov. 1-7, 2021.

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### A majority of Americans say companies that design driverless cars should play a major role in setting standards for them

*% of U.S. adults who say each of the following groups should have \_\_\_ in setting standards for how driverless passenger vehicles are used*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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standards for how driverless vehicles are used.

Some 91% of Americans say the companies that develop driverless passenger vehicles should play a role in setting standards for how these vehicles are used. And 62% say they should play a *major* role.

Similar shares say the individuals who use these driverless vehicles and the federal government should have a major role in this process (54% and 53%, respectively). There are some differences by party when it comes to how much of a role the federal government should have in setting standards: 66% of Democrats and those who lean toward the Democratic Party say it should have a major role, compared with 38% of Republicans and Republican leaners who say the same. And 20% of Republicans say the federal government should have no role at all.

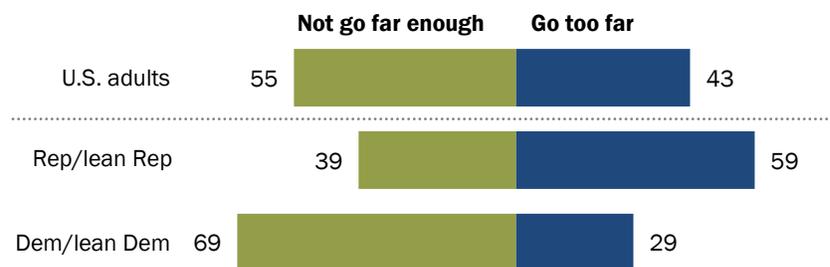
Meanwhile, the public is less enthused about having car dealerships that sell driverless passenger vehicles playing a major role in setting standards – with 36% saying they should have no role at all.

When asked to share their views about the level of regulation that may be in store for autonomous vehicles, 55% say their greater concern is that the government will not go far enough in regulating the use of driverless passenger vehicles, while a smaller share (43%) says the government will go too far.

Roughly seven-in-ten Democrats (69%) say their greater concern is that the government will not go far enough in regulating the use of driverless vehicles in the event it becomes widespread. Republicans' views tilt in the opposite direction: 59% say they are more concerned that government will go too far in regulating these cars.

### A slight majority of Americans are concerned that the government won't go far enough in regulating driverless cars, but views are highly partisan

*% of U.S. adults who say that if the use of driverless passenger vehicles becomes widespread, their greater concern is that the government will \_\_\_ regulating their use*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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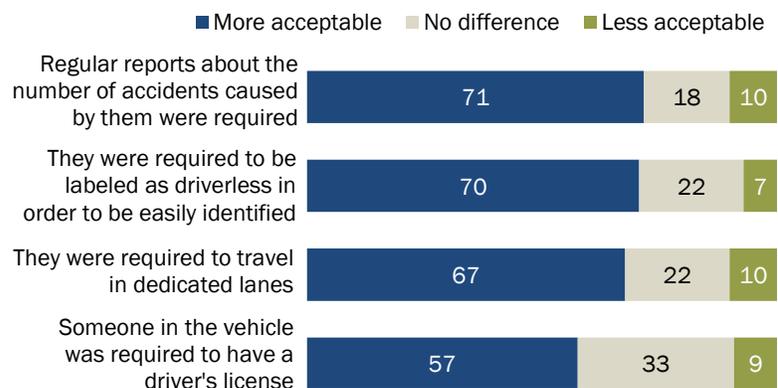
## A majority of Americans say some ideas would make the use of driverless vehicles more acceptable

While a large share of the public is wary of riding in or sharing the road with autonomous vehicles, people say there are steps that could be taken to make the use of driverless cars more acceptable to them.

About seven-in-ten Americans say driverless passenger vehicles would be more acceptable if regular reports about the number of accidents caused by them were required (71%), if autonomous cars were labeled as driverless in order to be easily identified (70%) and if such cars were required to travel in dedicated lanes (67%). Some 57% say use of driverless cars would be more acceptable if someone in the vehicle was required to have a driver's license. Still, a third of Americans say someone having a license would make no difference in how they view driverless cars.

### Driverless cars seen as more acceptable if there were regular reports on accidents, cars clearly labeled

*% of U.S. adults who say each of the following would make the use of driverless vehicles ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Mixed views on deploying driverless technology in some other kinds of vehicles; opinions on using this software in 18-wheelers are negative

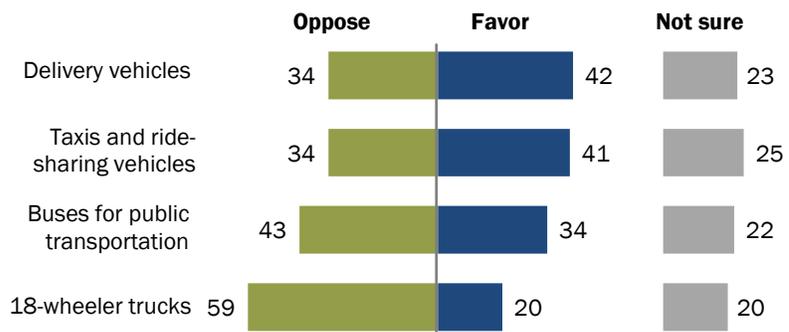
Driverless technology systems can be employed for a variety of purposes. And Americans have reservations about automating other kinds of transit – especially 18-wheeler trucks. Roughly six-in-ten (59%) say they oppose the use of technology used to operate driverless passenger vehicles in these trucks, with just 20% in favor of this.

Sentiment regarding using these technologies in other modes of transportation is somewhat more divided. While 43% say they oppose the use of driverless technology in public buses, 34% are in favor of this. And when it comes to views about driverless delivery vehicles or taxis and ride-sharing vehicles, about four-in-ten each are in favor of using the technology for this purpose. Still, about one-third are opposed to this.

Across each of the types of vehicles measured in this survey, there is some level of uncertainty about how they feel about the technology. For example, 25% of Americans are unsure if the technology used in driverless passenger vehicles should be used in taxis and ride-sharing vehicles.

### About four-in-ten Americans favor using driverless technology for delivery vehicles and taxis, but fewer support self-driving 18-wheelers

*% of U.S. adults who say they would \_\_\_ the use of technology used to operate driverless passenger vehicles for the following purposes*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## 5. What Americans think about possibilities ahead for human enhancement

The prospect of transformative [“enhancement” of human abilities](#) has tantalized and inspired invention and innovation through the ages.

Human enhancement practices encompass a wide range of techniques to augment or improve people’s physical, mental and reproductive capabilities. Laser eye surgery, off-label use of drugs to improve concentration and mental agility, pacemakers, organ transplants, dietary supplements and wearable devices, such as smart watches or augmented reality glasses, are seen as tools and techniques in wide use today to enhance human capabilities.

[Emerging techniques](#) now in use or being tested are generally focused on addressing therapeutic needs, restoring a person’s abilities due to injury, disease or a health condition. Futurists have long pointed to the potential for such techniques to be used more broadly. The route to dramatic changes in human abilities is being fueled by the convergence of innovations in biotechnology, nanotechnology, information technology, artificial intelligence and other fields.

Pew Research Center’s study is focused on public attitudes about future-oriented options for human enhancement that would expand the boundaries of human abilities. These technologies are not currently in wide use but could ultimately hold far-ranging implications for humanity. The findings provide an early lens into public thinking and expectations about these developments. As such, they address some of the key ethical questions American society faces in deciding what changes to human abilities people would find acceptable or unacceptable – and why.

### How Pew Research Center approached this topic

The Center survey asked respondents a series of questions about three potential avenues for human enhancement:

- Robotic exoskeletons with built-in AI computer systems to help guide the device, making it possible to greatly increase a person’s strength and ability to lift heavy objects for manual labor jobs such as manufacturing or construction.
- Gene editing (changing the DNA of embryos before a baby is born) to greatly reduce a baby’s risk of developing serious diseases or health conditions over their lifetime.
- Computer chips surgically implanted in the brain, making it possible to far more quickly and accurately process information.

Other questions asked respondents about a range of goals for human enhancement, without specifying the techniques that would be used to achieve these changes.

This study builds on prior Center research including a survey on Americans’ views about the possibilities of [radical life extension](#), a series of [focus groups](#) and a [survey](#) looking at public views about the possibility of enhanced health from gene editing for babies, for cognitive function from computer chip implants in the brain and for physical strength and stamina from transfusions with synthetic blood.

## The goals of human enhancing technologies are generally met with more excitement than concern, particularly when it comes to improving health

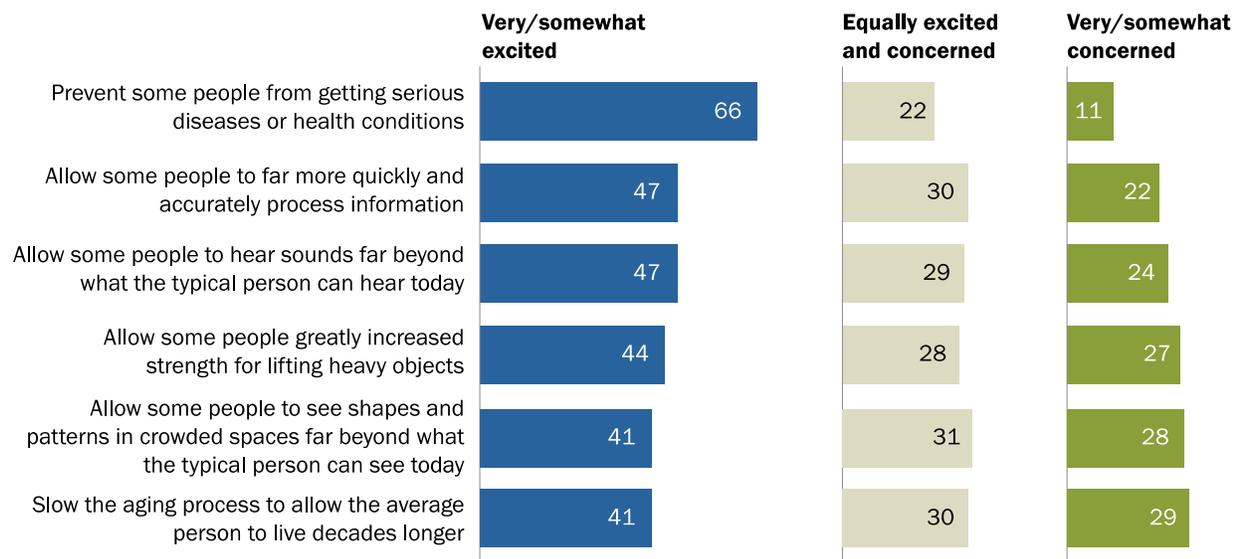
One of the most important takeaways from the new Pew Research Center survey is the variety of reactions to potential changes to human abilities depending on their purpose or goal – with changes holding therapeutic potential widely embraced. Even for goals that are widely supported, however, certain circumstances under which these techniques might be used give people pause.

The Center asked survey respondents how they would feel about making changes in human abilities, without going into detail on how such changes would be achieved. Across this set of six, public excitement is generally higher than concern, although a notable share say they have an equal mix of both reactions.

Two-thirds of U.S. adults say they would be at least somewhat excited about the possibility of changing human capabilities to prevent serious diseases or health conditions (including 41% who would be very excited). Just 11% say they would be at least somewhat concerned and 22% say they would be equally excited and concerned about this development.

### Americans are generally more excited than concerned about the idea of several potential changes to human abilities

*% of U.S. adults who say they would feel \_\_\_ about potential new techniques that could change human abilities in the following ways*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

"AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns"

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Other possible enhancements draw more excitement than concern, but by narrower margins and with greater shares expressing an equal mix of both reactions. For instance:

- *Cognitive enhancement*: Nearly half of Americans (47%) say they would be at least somewhat excited about techniques that allow some people to “far more quickly and accurately process information.”
- *Auditory enhancement*: More Americans say they would be excited (47%) than concerned (24%) about techniques that allow some people “to hear sounds far beyond what a typical person can hear today.” About three-in-ten (29%) say they would respond to such developments with an equal mix of excitement and concern.
- *Physical strength*: Improvements to physical capabilities garner a similar response: 44% of Americans say they would be excited about new techniques that would allow some people greatly increased strength for lifting heavy objects, 27% say they would be concerned and 28% would have an equal mix of both reactions.
- *Visual enhancement*: 41% of Americans say they would be at least somewhat excited by developments that would enhance human vision, allowing some people to see shapes and patterns in crowded spaces to a degree far beyond what is typical today. A larger share say either that they are concerned by (28%) or that they have a mixed reaction to this possible enhancement (31%).
- *Radical life extension*: 41% say they would greet the possibility of a major change to the human lifespan with excitement, a concept called radical life extension because it would slow the aging process and allow the average person to live decades long. Three-in-ten say they would have an equal mix of positive and negative response to this prospect, and a similar share (29%) would primarily be concerned.

Men and those with higher levels of education are generally more supportive of these potential changes to human abilities. Younger adults, ages 18 to 29, stand out as generally more embracing than older age groups of these potential changes, particularly for the idea of enhancing physical strength and changing visual abilities. See details in [Appendix](#).

## **Many Americans hesitant or undecided about the virtues of biomedical interventions to change cognitive abilities or the course of human health**

To better understand the contours of public opinion about human enhancement, the Center survey also asked respondents to consider three possibilities in more detail. These future-oriented scenarios capture public expectations and reactions to promising technologies that could bring dramatic changes for cognitive abilities, human health and physical strength.

One high-profile option stems from developments in neurotechnology that would directly connect the brain to a computer interface. The survey includes a series of questions about the potential to augment people's cognitive abilities, allowing them to far more quickly and accurately process information, by surgically implanting a computer chip in the brain.

A second technique, stemming from discoveries in biotechnology, focuses on the potential use of gene editing for babies in a way that could alter the trajectory of human experience with disease. While gene editing is increasingly used to address therapeutic needs today, in the future gene-editing techniques could change the DNA of an embryo in a way that greatly reduces a baby's risk of developing serious diseases or health conditions over their lifetime.

A third approach to human enhancement featured in the survey is the potential use of wearable devices, in this case robotic exoskeletons to greatly increase strength for lifting in manual labor jobs. There are several types of robotic exoskeletons in use and in development today; the survey focused on devices with an integrated artificial intelligence computer system which uses sensor data to help guide its use.

While by no means exhaustive of the possibilities, these three scenarios underscore the variety of forms that human enhancement can take.

No more than about half of Americans say they, personally, would want any of these potential enhancements for themselves or for their baby.

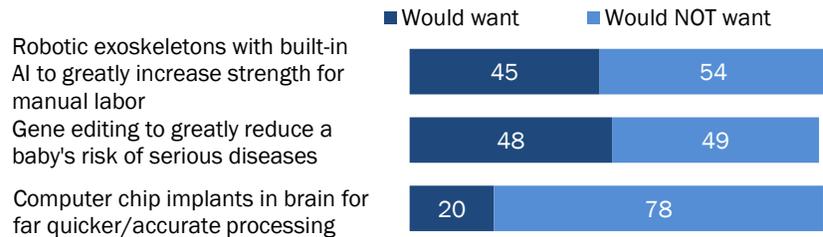
Nearly eight-in-ten (78%) say they would opt *against* computer chip implants to enhance cognitive functioning for themselves. And 49% of Americans think they would be disinclined to have gene editing for their own baby to greatly reduce their chances of developing serious diseases or health conditions.

Even so, many Americans foresee a world where most people would feel social pressure to get these enhancements should they become widespread. Six-in-ten Americans say that most people would feel pressure to get a brain chip implant to augment cognitive function should implanted devices of this sort become widespread. Nearly three-quarters (73%) of the public believes most parents would feel pressure to get gene editing for their baby if such techniques to greatly reduce a baby's risk for serious diseases or other conditions became widespread (as do 68% of those with a child under age 18 at home).

While people make important distinctions among these future enhancement techniques, no more than a third say any of the three would be a "good idea for society." The remainder express caution or are uncertain of their views. People are especially negative about the potential use of brain chip implants to augment cognitive function. Many more say this is a bad idea than a good one for society (56% vs. 13%). Still, some three-in-ten (31%) **do not take a stand** on this matter.

## No more than half of Americans think they would want brain chip implants or robotic exoskeletons for themselves, gene editing enhancements for their baby

% of U.S. adults who say they definitely or probably \_\_\_ each of the following



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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One factor connected with the predominantly hesitant reactions Americans bring to these possibilities is skepticism about whether each would bring broad-scale improvements for people.

About four-in-ten Americans (39%) foresee a future in which widespread use of gene editing to greatly reduce a baby's risk of serious diseases or conditions would make people's overall quality of life better; a majority says people's quality of life would be roughly the same (40%) or worse (18%), overall.

Roughly a third of Americans (32%) think the widespread use of robotic exoskeletons with built-in AI to greatly increase strength for manual labor would lead to better working conditions. The remainder are closely divided between whether working conditions would be about the same (36%) or worse (31%) as a result.

Americans are particularly skeptical that the widespread use of a computer chip implant in the brain to increase the speed and accuracy of cognitive processing would lead to improvements in people's judgment and decision-making; 24% say it would, while 42% say judgment quality would be no different and 31% say it would be worse.

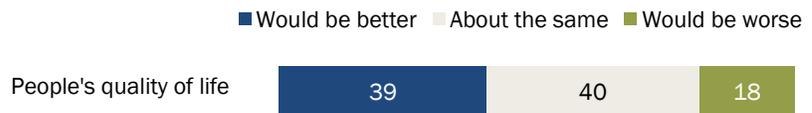
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### Americans are skeptical about improvements from widespread use of several enhancement techniques

*% of U.S. adults who say that if robotic exoskeletons with built-in AI to greatly increase strength for manual labor become widespread ...*



*% of U.S. adults who say that if gene editing for babies to greatly reduce their risk of serious diseases or conditions becomes widespread ...*



*% of U.S. adults who say that if computer chip brain implants to far more quickly and accurately process information become widespread ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

"AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns"

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## People’s familiarity with developments in cognitive and physical enhancement remains limited

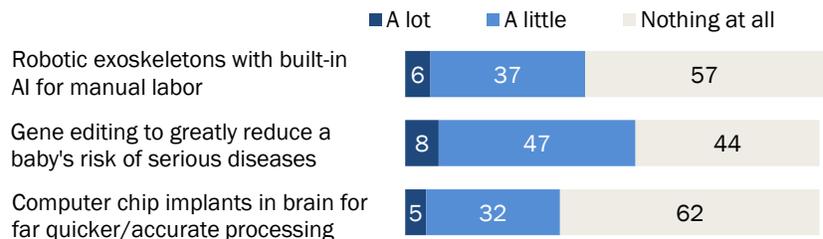
One factor in public attitudes around human enhancement could be simply that these are new ideas and remain largely unfamiliar ones for a majority of Americans.

No more than one-in-ten U.S. adults say they have heard or read “a lot” about any of the three concepts asked about in the survey.

Comparisons with a 2016 Center survey, though based on slightly different descriptions of these ideas, suggest that public awareness of brain chip implants and gene editing to greatly reduce the risk of serious diseases or health conditions has not grown substantially over the past five years.

### Public awareness of several emerging options for human enhancement is limited

*% of U.S. adults who say they have heard or read \_\_\_ about each of the following*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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Familiarity is a strong factor in Americans’ views about the use of robotic exoskeletons with built-in AI, and it is at least modestly associated with views of gene editing and brain chip implants. For example, those who have heard or read at least a little about robotic exoskeletons with built-in AI are largely of the mind that their widespread use would be a good (48%) rather than a bad (23%) thing for society. In contrast, people who have heard nothing about such exoskeletons are closely divided over their potential effect (22% say this would be good, 26% say bad) and many are uncertain (52%).

These findings are in line with a common argument that public reception for new scientific and technological developments is often cautious simply because of their newness. Advocates often posit that as people’s familiarity with these developments increases, so too does public acceptance of them. It’s not clear that this is always the case, however. History suggests that the link between familiarity and public response can go in either a positive or negative direction.

The Center survey includes at least one notable case in point. The use of algorithms by social media companies to detect false information posted on their sites is now at least modestly familiar to a majority of Americans. Still, among the roughly one-in-four people who say they know a lot about these algorithms, more say they represent a bad (47%) rather than a good idea for society (40%). People with “a little” awareness of such computer programs lean positive, as do those who say they have heard or read nothing about these kinds of computer programs.

## **Half or more express concern that brain chip implants to process more quickly, gene editing to prevent disease would be meddling with nature**

One of the key ethical questions about scientific and technological breakthroughs to enhance the mind and body concerns whether Americans see such developments as moving beyond limits set by God, nature or reason. To capture a sense of this, the Center asked people whether they saw each possibility as a change in line with other ways humans have tried to better ourselves over time or if, instead, it would be “crossing a line” we should not cross and meddling with nature.

Concern about the use of brain chip implants is particularly strong by this measure: 63% of Americans say that if implanting computer chips to speed up information processing becomes widespread, they would feel it was “meddling with nature.” Fewer (35%) take the position that this would be in line with ways humans have tried to better ourselves over the millennia.

Americans lean in the same direction in thinking about the potential widespread use of gene editing for babies to greatly reduce their risk for serious diseases: 52% say they would see this as crossing a line we should not cross; 46% say this would be no different than other ways humans have tried to better ourselves over time.

Views of robotic exoskeletons with a built-in AI system tilt in the opposite direction. A 62% majority of Americans say the widespread use of such robotic exoskeletons would be no different than other ways humans have tried to better ourselves over time.

Americans with higher levels of religious commitment are especially likely to see all three potential options to change human abilities as something that would be meddling with nature.

For instance, about eight-in-ten adults high in religious commitment (81%) say the widespread use of brain chip implants to improve cognitive processing of information would be meddling with nature and crossing a line we should not cross. Half of those low in religious commitment agree. (Levels of religious commitment are based on the importance or salience of religion in a person’s life and their frequency of prayer and attendance at religious services.)

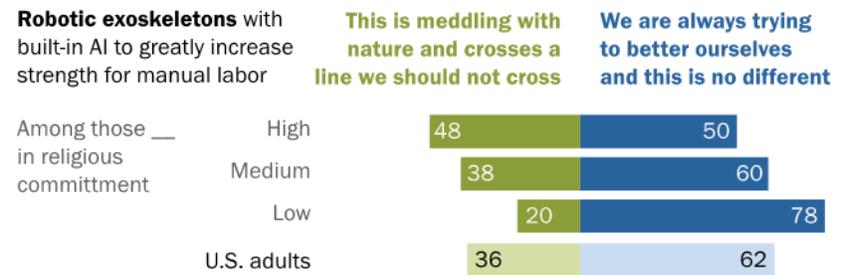
Similarly, those high in religious commitment are far more likely to see the potential use of gene editing for babies for enhancement purposes as something what would be meddling with nature and crossing a line we should not cross (72% vs. 26% who say it would not differ from other forms of self-improvement).

The [2016 Center survey](#) looking at potential enhancements from brain chip implants and gene editing also found wide differences in views about this issue across levels of religious commitment.

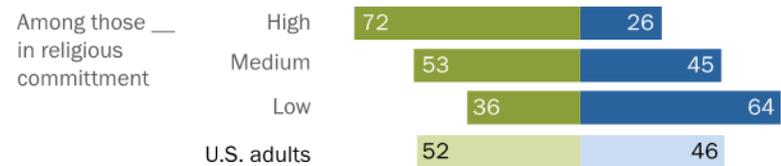
Religious differences arise in a range of views about these three potential enhancements in the new survey. For example, people high in religious commitment are far less likely to say they would personally want to use a robotic exoskeleton (36% say this, vs. 59% of those low in religious commitment).

## People high in religious commitment are most likely to express concern that certain physical and cognitive enhancements would be meddling with nature

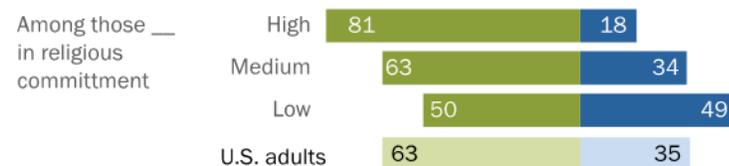
*% of U.S. adults who say if each of the following enhancements becomes widespread, they would feel ...*



**Gene editing for babies** to greatly reduce their risk of serious diseases or conditions



**Computer chip brain implants** to far more quickly/accurately process information



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

Source: Survey conducted Nov. 1-7, 2021.

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Across the six potential goals for human enhancement mentioned in the survey, people high in religious commitment are about 15 to 20 percentage points less inclined to say they would be very or somewhat excited about the prospect. See the [Appendix](#) for details.

## People would be more open to technological enhancements in human abilities if ways to limit scope, increase human agency were in place

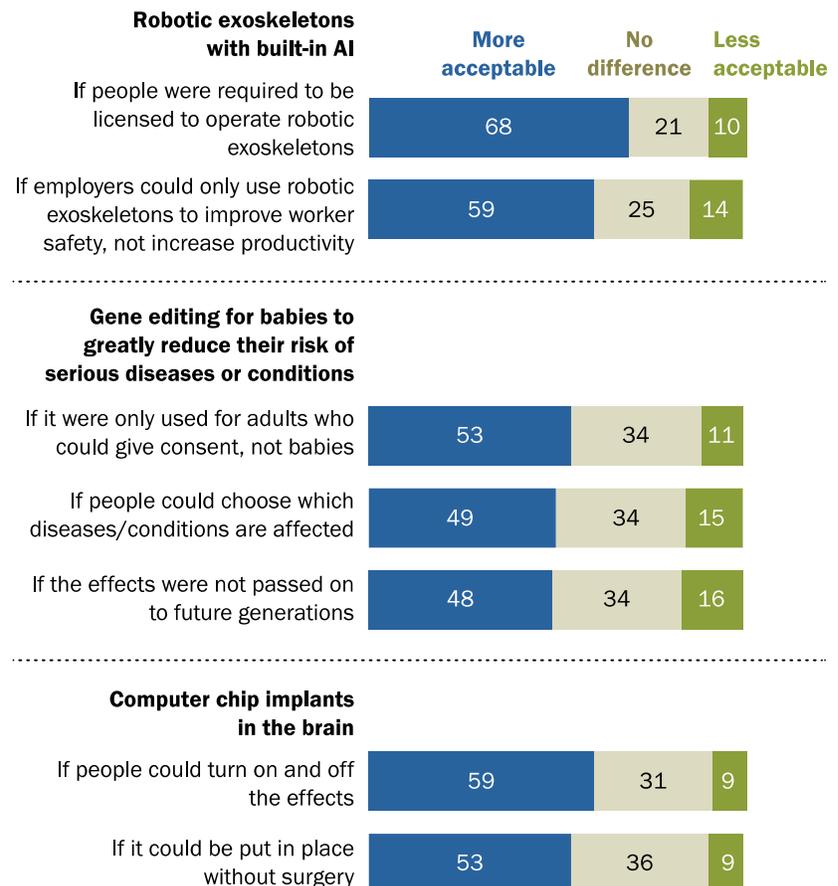
Even while Americans' views about three proposed avenues for human enhancement often strike a cautious note, majorities see promise for each if mitigating steps were in place that increased human agency over the nature of these changes.

One potential avenue for cognitive enhancement – brain chip implants – was met with a collective wariness. Yet, a majority of Americans say that brain chip implants would be more acceptable to them if people could turn on and off the effects (59%) and if implanting the devices did not require surgery (53%).

Similar patterns emerge as people think about the potential use of gene editing for babies. The need for such genetic modifications to be done on an embryo, and thus based on the consent of parents acting on behalf of a child, can raise additional ethical as well as legal concerns. Roughly half of U.S. adults say gene editing to prevent the risk of serious diseases or conditions would be more acceptable if it were used only for adults, who could give consent to the procedure (53%).

### Americans say they would be more accepting of several physical and cognitive enhancements if there were limits on how they would work

*% of U.S. adults who say the use of the following technologies would be \_\_\_ in each case*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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About half (49%) of the public says gene editing for babies that allowed people to choose which diseases or conditions are affected would be more acceptable. A similar share (48%) says such gene editing would be more acceptable if it would *not* be passed on to future generations.

Scientists who specialize in genome-editing technology [have long raised the alarm](#) about the potential uses of these technologies in ways that could change the human gene pool, known as germline editing. An alternative, of less concern to bioethicists, involves genetic modification only in somatic cells, that would not be passed on to future offspring.

On the idea of robotic exoskeletons – external devices that could be removed – the public is more accepting when given the option of having restrictions in place for how and when they could be used. For example, two-thirds (68%) of Americans say that robotic exoskeletons with built-in AI systems would be more acceptable if licensing for appropriate use of these devices were required. And 59% say that limits on how employers could use these devices for manual labor jobs, specifically if they were used to enhance worker safety rather than increase worker productivity, would make them more acceptable.

## Americans are open to each of three potentially enhancing techniques for uses focused on addressing disease or physical, cognitive limitations

People make clear distinctions among goals behind the possible uses of three proposed techniques to alter human abilities.

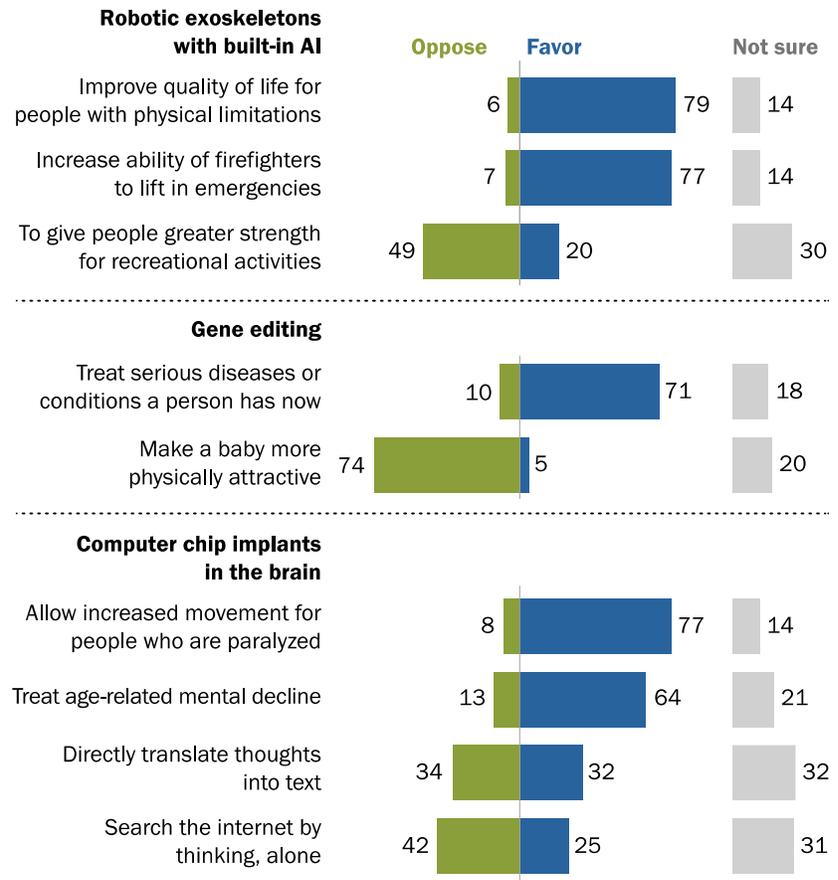
Asked to consider the potential use of robotic exoskeletons, genetic modifications, and brain chip implants for a range of purposes, majorities of U.S. adults embrace these techniques when they would be aimed at helping people with physical, health or cognitive limitations.

Consider the following:

- 79% favor the use of robotic exoskeletons with built-in AI systems to improve the quality of life for people with physical limitations.
- 77% favor the use of computer chip implants in the brain to allow increased movement for people who are paralyzed.
- 71% favor using gene editing in order to treat diseases or health conditions a person is currently experiencing.

### Majorities support use of three emerging techniques for enhancement if directed toward therapeutic goals

*% of U.S. adults who favor or oppose the use of each technology for the following purposes*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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But there are clear limits to public support around these techniques. About three-quarters of Americans (74%) oppose the potential use of gene editing to enhance a baby's physical

attractiveness. While many experts forecast a future where robotic exoskeletons are commonplace in people's everyday fitness routines, roughly half of the public (49%) opposes the idea of using a robotic exoskeleton to give people increased strength for recreational activities.

And the potential use of computer chip implants to “read people's minds” – allowing them to search the internet solely by thinking – elicits more opposition than support, with 31% uncertain of their views about this possibility.

## 6. Public cautious about enhancing cognitive function using computer chip implants in the brain

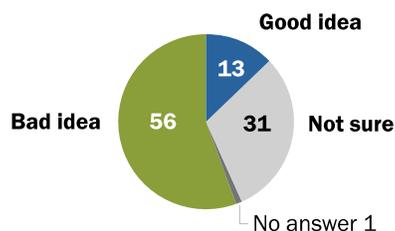
The idea of computer chip implants in the brain may seem futuristic to some, but this development could be widely available in the years to come. At this early stage of development, Americans are generally negative toward the idea of widespread use of computer chip implants in the brain to enhance cognitive function, and few say they would want this for themselves.

Devices that interface with the neural system are currently in use and development only for those with a therapeutic need. For instance, cochlear implants are used to help people with hearing difficulties. And some patients with Parkinson’s disease have a device implanted in their brain to send electrical pulses that control tremors and improve motor control.

Medical researchers and device developers aim to use brain chip implants to help people with paralysis. Researchers at Ohio State University and Battelle Memorial Institute have used [brain implants](#) to help restore hand movement and a sense of touch in patients with severe spinal cord injuries. And a brain implant was recently used to [translate the thoughts](#) of a patient with a severe spinal cord injury into text with a very high degree of accuracy.

### Majority of Americans say widespread use of brain chips to improve cognitive function would be bad for society

*% of U.S. adults who say the widespread use of computer chip implants in the brain to far more quickly and accurately process information would be a \_\_\_ for society*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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#### Here's how people were asked to think about brain chips:

“Computer chips are being developed which could be surgically implanted in a person’s brain. In the future, this could make it possible for people with the computer chip implants to far more quickly and accurately process information.”

One future use of brain chip implants could be to augment brain functioning for people even without therapeutic need. By 56% to 13%, far more U.S. adults say the widespread use of computer

chip implants in the brain to more quickly and accurately process information would be a bad idea than good idea for society; 31% say they are not sure if this would be a good or bad idea for society.

Americans express limited desire for a computer chip brain implant for themselves: 78% say they would *not* want a computer chip implant that would allow them to better process information if it were available to them. Just 20% say they would want this.

A [2016 Center survey](#) asked about the idea of using brain chip implants to enhance cognitive function using a similar though not identical description. Five years ago, most Americans were also largely wary of this possibility. Two-thirds thought they would *not* want a surgically implanted brain chip for a “much improved ability to concentrate and process information.” And more Americans said they were at least somewhat worried about this possibility than said they were enthusiastic about the idea.

Even so, the new survey finds six-in-ten U.S. adults think that if brain chip use became widespread, most people would feel pressure to get an implant. A smaller share (38%) thinks most people would not feel pressure to get this.

### Few Americans say they would want a brain chip for improved processing of information

*% of U.S. adults who say they definitely or probably \_\_\_ a computer chip implant in the brain to far more quickly and accurately process information*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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### Majority of Americans say there would be pressure to get a brain chip

*% of U.S. adults who say that if the use of computer chip implants in the brain to far more quickly and accurately process information becomes widespread, most people would ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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One factor in these negative reactions: Most Americans are skeptical that widespread use of brain chips would improve people's judgment and decision-making. Just 24% say the widespread use of brain chip implants to improve cognitive function would make people's decision-making better. A much larger share says it would either make people's judgment and decision-making worse (31%) or that it would be about the same as now (42%).

## Most Americans are skeptical brain chips would improve decision-making

*% of U.S. adults who say that if the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, it would make people's judgments and decision-making ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Negative views of using brain chip implants for enhancement are common across demographic groups

Limited enthusiasm for the widespread use of brain chip implants can be seen across demographic groups, with small shares saying this would be a good idea for society.

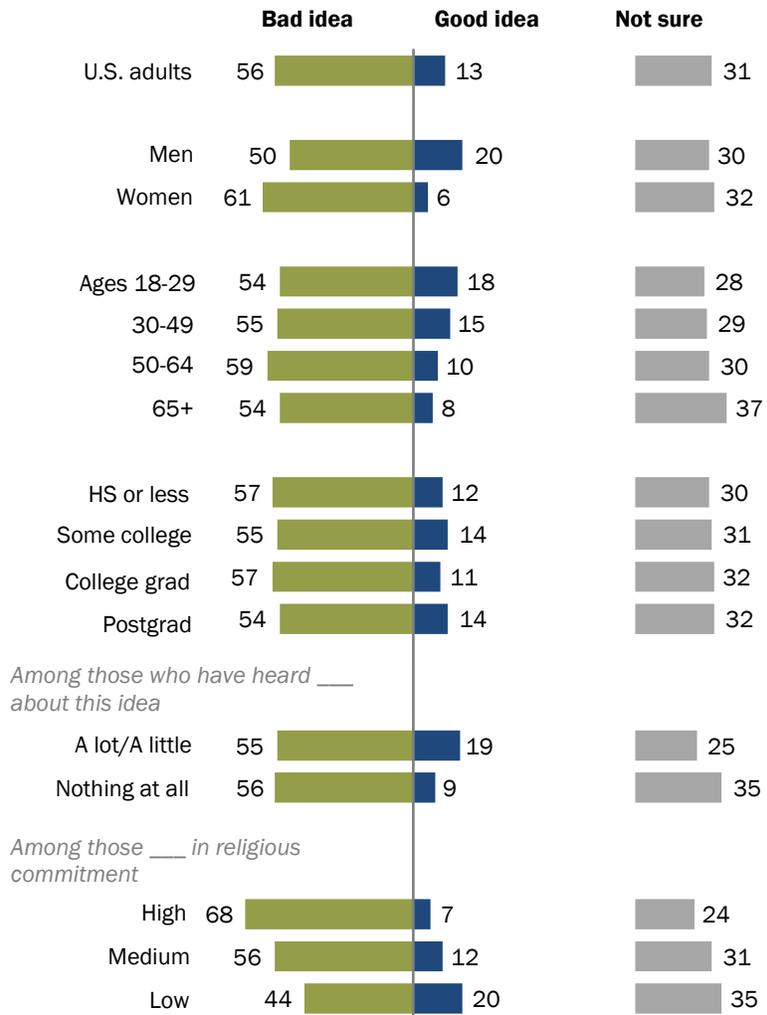
Men are somewhat more favorable about this idea than women. Among women, 61% say computer chip implants in the brain would be a bad idea for society, while just 6% say it would be a good idea. The balance of opinion tilts in the same direction among men, but by a somewhat narrower margin (50% see it as a bad idea vs. 20% good idea).

Just 5% of Americans say they have heard a lot and 32% a little about this idea. This group leans strongly to the viewpoint that this would be a bad rather than a good idea for society (55% vs. 19% saying good idea). Another quarter of this group say they are not sure.

Religion also plays a role in views about this idea. People with a high level of religious commitment (based on a three-item index of religious importance, frequency of religious service

### Women, highly religious Americans among most likely to view brain chip implants as a bad idea for society

*% of U.S. adults who say the widespread use of computer chip implants in the brain to far more quickly and accurately process information would be a \_\_\_ for society*



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

Source: Survey conducted Nov. 1-7, 2021.

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attendance and frequency of prayer) say widespread use of computer chip implants in the brain would be a bad idea for society by an overwhelming margin (68% to 7%). By comparison, 44% of those low in religious commitment say this would be a bad idea for society, while 20% say it would be a good idea and 35% say they're not sure.

Differences are also seen in the degree to which men and women, those more and less familiar with this idea and those with higher and lower levels of religious commitment think about whether this is something they would want. Still, no more than a third of Americans in any of these groups say they would want a brain chip implant for this purpose themselves if it were available. And the youngest and oldest adults are about equally likely to say they would want a brain chip implant after controlling for factors such as religious commitment, education and gender. (See the [Appendix](#) for more details.)

Similar patterns by gender, familiarity and religious commitment are also seen in views of the other two types of human enhancement in the survey: using [gene editing](#) for babies to enhance health and in the potential use of [robotic exoskeletons](#) with built-in artificial intelligence systems to enhance physical strength.

## Most Americans see use of brain chip implants to improve processing as meddling with nature and crossing a line

There is a [long history](#) of efforts to develop tools and techniques that would improve human abilities. When asked which statement better describes their views about the widespread use of brain chip implants to more quickly and accurately process information, 63% of Americans say this idea “is meddling with nature and crosses a line we should not cross.” Far fewer (35%) say that “as humans we are always trying to better ourselves and this is no different.”

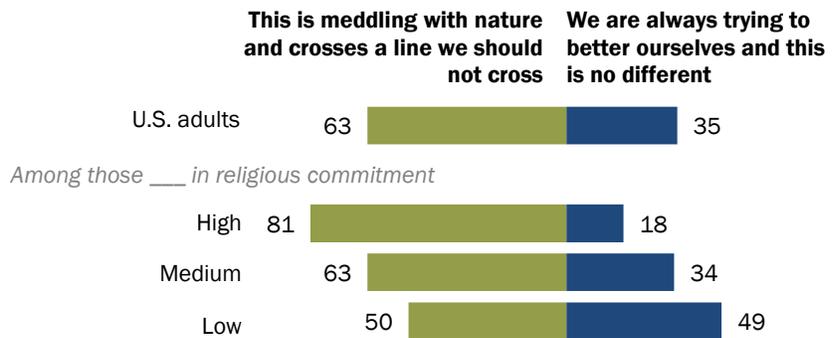
However, there are sizable differences in views on this

question by religious commitment and across religious groups. An overwhelming majority of highly religious Americans say the widespread use of computer chip implants is meddling with nature (81%). Those with low religious commitment are closely divided: Half say brain chips are meddling with nature, while 49% say brain chips for improved cognitive function are no different than other efforts to improve ourselves.

A large majority of White evangelical Protestants (79%) think the widespread use of computer chip implants would be meddling with nature and crossing a line we should not cross. By contrast, 61% of atheists and 55% of agnostics say the widespread use of computer chip implants would reflect, instead, that we are always trying to better ourselves and this idea is no different. (See the [Appendix](#) for more details.)

### 63% of U.S. adults see the potential use of brain chip implants as ‘meddling with nature’

*% of U.S. adults who say that if the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, they would feel that ...*



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

Source: Survey conducted Nov. 1-7, 2021.

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## Public anticipates negative impacts from widespread use of brain chips for enhancement and worries about economic inequality, cybersecurity

Asked to think about possible societal impacts from the widespread use of brain chips for improved cognitive function, the public sees both pros and cons. However, on balance, potential negative impacts resonate more strongly with the public than positive ones.

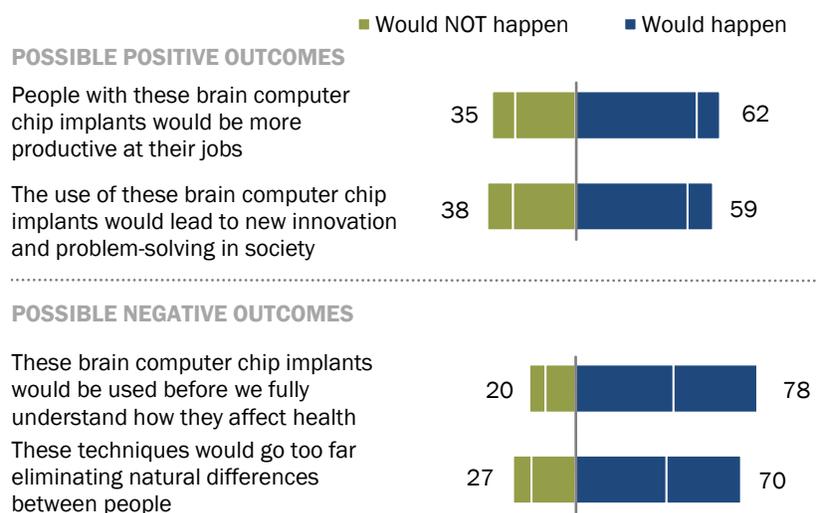
About eight-in-ten U.S. adults (78%) say computer chip implants in the brain would definitely or probably be used before we fully understand how they affect people's health; just 20% say this would definitely or probably not happen. The 2016 Center survey, using similar though not identical wording, found a similar share (74%) saying it was likely that implanted devices in the brain would be used before we fully understand the effects.

The current survey finds a large majority (70%) also views it as likely that the widespread use of computer chip implants in the brain to improve cognitive function would go too far in eliminating natural differences between people.

On the positive side, 62% think the widespread use of brain chips would definitely or probably make people more productive at their jobs, and 59% say they would likely lead to new innovation and problem-solving in society. Still, these majorities are smaller than the shares who see either negative impact as likely to happen, and few (about one-in-ten) say either of these positive impacts would *definitely* happen.

### Most Americans worry about unintended effects from widespread use of brain chip implants

*% of U.S. adults who say that if the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, each of the following definitely or probably ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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On balance, Americans expect that the widespread use of brain chips would have a negative impact on the issue of economic inequality. Overall, 57% say that the widespread use of computer chip implants in the brain to improve cognitive function would increase the gap between higher- and lower-income Americans, while just 10% think it would decrease the gap. Three-in-ten say the use of computer chip implants in the brain would not affect economic inequality much.

When asked to consider three potential problems with computer chip implants, majorities say hackers gaining access to people’s information, unwanted changes to the brain, and chip malfunctions are all issues that would happen at least some of the time.

Overall, 52% say hackers gaining access to people’s information would happen a lot of the time if chip implants in the brain were widely used; another 39% say this would occur some of the time. Comparable shares say unwanted changes to the brain would happen a lot (51%) or some (41%) of the time. A large majority also says computer chip malfunctions would happen at least some of the time, though fewer than half say this would happen a lot (37%). In all three instances, very small shares say these potential problems would happen rarely or never.

### A majority of Americans say brain chips would increase economic inequality

*% of U.S. adults who say that if the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, it would \_\_\_ (in) the gap between higher- and lower-income Americans*

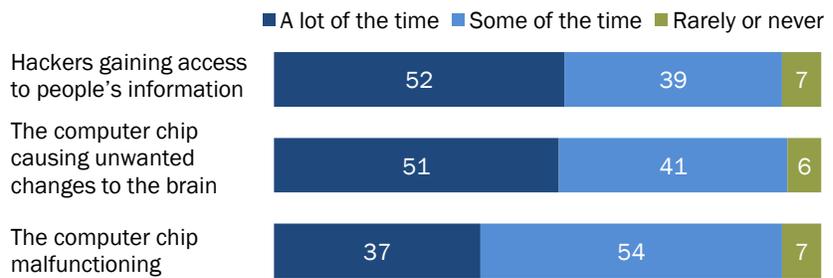


Note: Respondents who did not give an answer are not shown.  
Source: Survey conducted Nov. 1-7, 2021.  
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### About half of Americans say security failures and unwanted changes to brain would happen ‘a lot’ if brain chips were widely used

*% of U.S. adults who say that if the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, each of the following potential problems would happen ...*



Note: Respondents who did not give an answer are not shown.  
Source: Survey conducted Nov. 1-7, 2021.  
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## Most Americans back a higher standard to ensure safety of brain chip implants

Underscoring widely held concerns about the possible use of brain chip implants for improved cognitive function, most Americans (83%) think these implants should be tested using a higher standard than is used for medical devices, compared with just 13% who say existing standards for medical devices should be used to test brain chip implants.

When it comes to who should play a role setting standards for how computer chip implants in the brain are used, Americans place medical doctors and the people getting the chip implants at the top of the list.

About two-thirds (65%) of U.S. adults say the people getting these computer chip implants should play a major role setting the standards for how they are used; another 21% say they should play a minor role. Comparable shares say the medical doctors who implant the devices should play a major (64%) or minor (24%) role setting standards for their use.

Fewer than half of Americans think the companies that make the brain chips (46%) and federal government agencies (44%) should play a major role setting standards for how the chips are used – though majorities say both groups should play at least a minor role (81% and 72%, respectively).

### An overwhelming majority wants a higher standard to ensure the safety and effectiveness of brain chips

*% of U.S. adults who say that when it comes to ensuring safety and effectiveness, computer chip implants in the brain should be tested using ...*

- Existing standards for medical devices
- A higher standard than used for medical devices



Note: Respondents who did not give an answer are not shown.

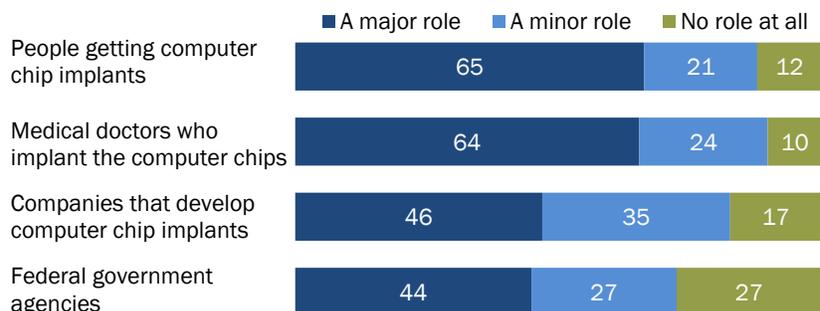
Source: Survey conducted Nov. 1-7, 2021.

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### Majority of Americans think medical doctors who implant the brain chips should play a major role in setting standards

*% of U.S. adults who say each of the following groups should have \_\_\_ in setting standards for how computer chip implants in the brain are used*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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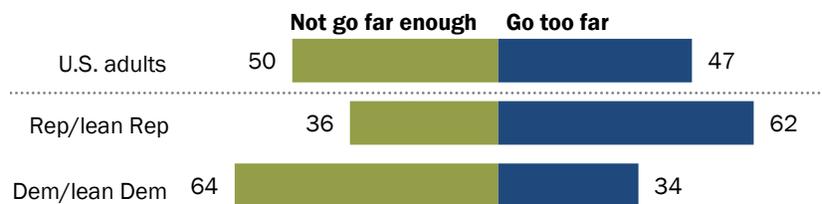
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When asked to consider government regulation and brain chip implants, Americans are roughly divided over whether they think government would go too far or not far enough. Half say that, if computer chip implants in the brain become widespread, their greater concern is that government would not go far enough regulating their use; about as many (47%) say their greater concern is that government would go too far in regulating the use of brain chip implants.

One example of potential regulatory measures: Some states across the country have preemptively passed laws [banning employers from requiring their employees to have microchips](#) or other implanted devices, citing privacy and other concerns.

### Americans are roughly divided over whether government would go too far or not far enough in regulating use of brain chips

*% of U.S. adults who say that if the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, their greater concern is that government will \_\_\_ regulating their use*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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A majority of Democrats and Democratic-leaning independents (64%) say their greater concern would be government regulations on brain chips not going far enough. By contrast, 62% Republicans and Republican leaners say their greater concern would be government going too far in regulating their use.

While Americans see a number of potential downsides to the widespread use of computer chip implants for enhancement, majorities see conditions that could make the widespread use of brain chip implants more acceptable.

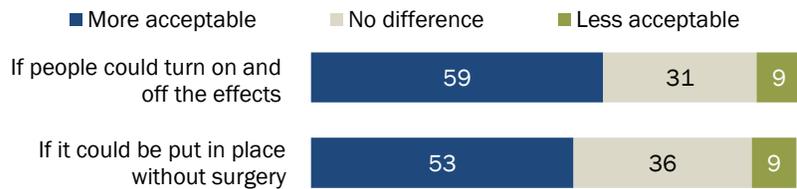
About six-in-ten U.S. adults (59%) say the widespread use of brain chips for improved information processing would be more acceptable if people could turn on and off the

effects of the computer chip implant; 31% say this would make no difference in their view, and just 9% say it would make their use less acceptable to them.

Similarly, 53% say the use of brain chips would be more acceptable to them if they could be put in place without surgery, while 36% say this would make no difference in their view.

### Americans more open to brain chip implants for cognitive enhancement if effects could be turned off, implants could be put in place without surgery

*% of U.S. adults who say each of the following would make the use of computer chip implants in the brain ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Large majorities of Americans support the use of brain chips for therapeutic purposes

Brain chip implants are currently in use and development for a variety of purposes, apart from their potential use to enhance how people process information. The survey finds broad support for the use of brain chip implants for therapeutic applications.

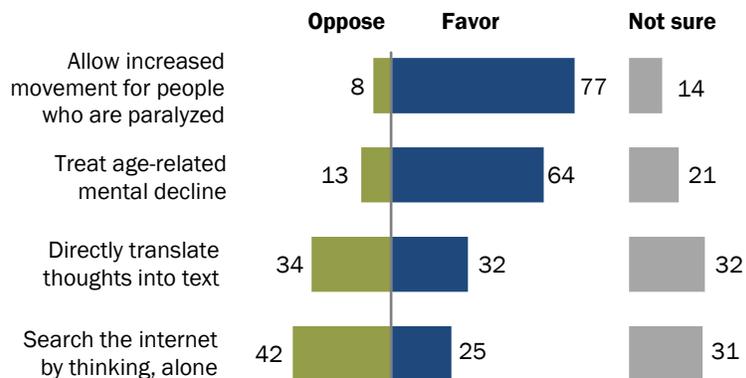
A large share of Americans (77%) say they would favor the use of computer implants in the brain to allow increased movement for people who are paralyzed. Just 8% would oppose this use, while 14% say they aren't sure.

A majority (64%) would also support the use of brain chip implants to treat age-related decline in mental abilities.

Americans are far less supportive of other uses of these devices, where there is no clear therapeutic benefit. About as many would favor as oppose using computer chip implants in the brain to translate thoughts into text (32% favor, 34% oppose), while 32% say they aren't sure how they feel about this. And a larger share say they would oppose (42%) than favor (25%) using computer chip implants to make it possible for thoughts in the brain to search content on the internet without typing; 31% say they aren't sure of their views about this possibility.

### Majorities favor using brain chips to help people who are paralyzed, treat age-related mental decline

*% of U.S. adults who say they would \_\_\_ the use of computer chip implants in the brain for the following purposes*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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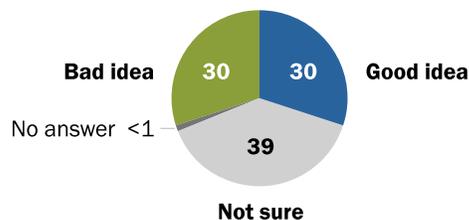
## 7. Americans are closely divided over editing a baby's genes to reduce serious health risk

Americans strongly support using gene editing techniques for people's therapeutic needs. But, when it comes to their potential use to enhance human health over the course of a lifetime by reducing a baby's risk of getting serious diseases or conditions, as many Americans think this would be a bad idea for society as say it would be a good idea. The public is also closely divided over whether they would want this for their own baby. As with previous Pew Research Center surveys on this topic, women and more religious Americans are less accepting of gene editing for this purpose.

Scientific advances in the use of [CRISPR technology](#) are expanding the possibilities for using gene editing. These techniques are currently in development for therapeutic needs. Clinical trial data suggests that gene therapy can be effective in treating some heritable [blood disorders](#) such as sickle cell anemia. Other trials have shown promise for treatment of [life-threatening rare diseases](#).

### Public divided over societal impact of using gene editing for babies to reduce risk of disease

*% of U.S. adults who say the widespread use of gene editing to greatly reduce a baby's risk of developing serious diseases or conditions would be a \_\_\_ for society*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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#### Here's how people were asked to think about gene editing:

"New ways to modify a person's genes are being developed that could make it possible to change the DNA of embryos before a baby is born in order to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime."

There are a large number of potential applications of gene editing techniques for humans.<sup>2</sup> One includes the possibility of using gene editing to prevent, or greatly lower the probability, of

<sup>2</sup> See National Academies of Sciences. 2020. "[Heritable Human Genome Editing](#)" for a review of potential applications and cautions about making heritable changes to the human genome.

developing serious disease. If such applications become widespread it would potentially change the trajectory of human health, greatly reducing the prevalence of serious disease.

The current survey asked respondents to consider one possible use of gene editing techniques: changing the DNA of embryos before a baby is born in order to greatly reduce the baby's risk of developing serious diseases or health conditions over their lifetime.

Among U.S. adults, equal shares (30% each) say the widespread use of gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime would be a good idea or bad idea for society. About four-in-ten (39%) are not sure how they feel about using gene editing for this purpose.

Americans are about evenly divided over whether they would want to use gene editing in this way for their own baby, if it were available to them. Overall, 48% say they would definitely or probably want this for their own baby; a similar share (49%) say they would not.

Parents of a minor-age child are a bit more hesitant: 42% say they would want this kind of gene editing for their own baby, while 55% say they would not. (See details in [Appendix](#).)

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### Americans divided over whether they would want gene editing to reduce risk of disease for their own baby

*% of U.S. adults who say they definitely or probably \_\_\_ gene editing to greatly reduce their baby's risk of developing serious diseases or conditions*



*% of U.S. adults who say most parents would \_\_\_ for their baby*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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Although Americans are closely divided over whether they themselves would want gene editing to reduce the risk of disease for their own baby, a majority thinks that most parents would feel pressure to get this type of gene editing. Nearly three-quarters (73%) think most parents would feel pressure to get gene editing to reduce their baby's risk of developing disease if its use becomes widespread. Far fewer (25%) think most parents would not feel pressure to use gene editing for their baby.

A [2016 Center survey](#) also focused on the idea of using gene editing to enhance health by greatly reducing a baby's chance of developing serious diseases over their lifetime. Americans were also closely divided over whether or not they would want this kind of gene editing for their baby (48% would and 50% would not). However, the current survey and [past Center surveys](#) on American's views of gene editing in babies have found large differences in views depending on the intended purpose of the genetic modification.

### **Concern about potential widespread use of gene editing to reduce a baby's health risk is stronger among those with high religious commitment**

One of the largest gaps in views of gene editing to reduce a baby's risk of developing serious disease is between those with higher and lower levels of religious commitment. Those with higher levels of religious commitment (a three-item index based on the importance of religion in their life and their frequency of religious service attendance and prayer) are much more likely to call the widespread use of gene editing in this way a bad idea than a good idea for society (46% to 14%). By contrast, those with low levels of religious commitment are about twice as likely to say it's a good idea for society than to say it's a bad idea (43% to 20%). Between 36% and 41% of those across levels of religious commitment say they aren't sure about their views.

On balance, men are more likely to call the use of gene editing to reduce the risk of disease in babies a good (36%) rather than a bad idea (29%). Women tilt in the other direction, with more saying the widespread use of gene editing for this purpose would be a bad idea than a good one (32% to 24%).

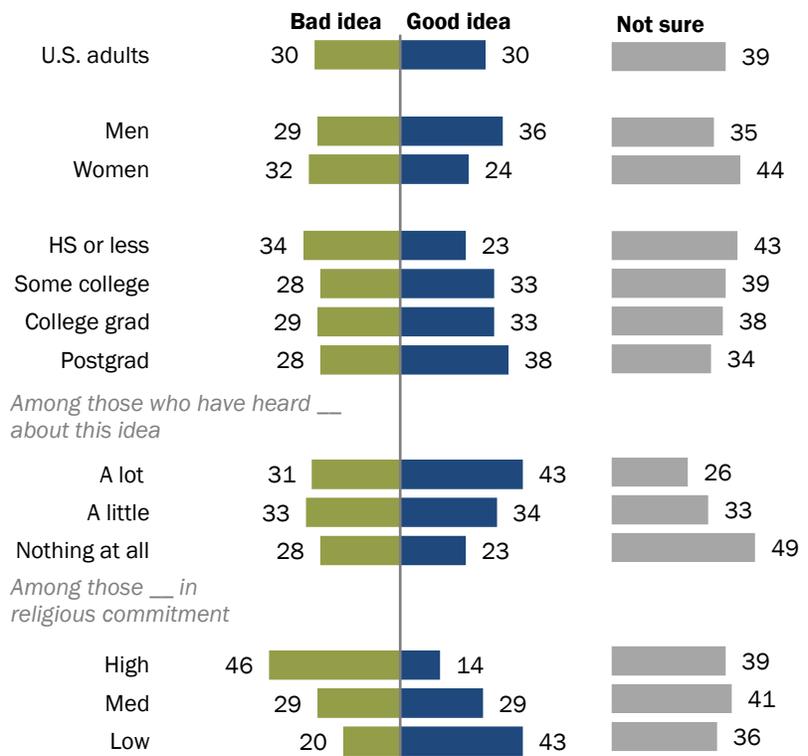
Among those with at least some college experience, views are slightly more positive than negative about the use of this technology. People with a high school diploma or less education are more negative than positive about the implications for society from the widespread use of gene editing in this way.

Just 8% of U.S. adults say they have heard or read a lot about using gene editing to greatly reduce a baby’s risk of developing serious diseases or conditions over their lifetime, while 47% say they have heard a little and 44% say they have heard nothing at all about this.

People more familiar with the concept of gene editing for babies to reduce the risk of serious diseases or health conditions during their lifetime are more likely to say it is a good idea than bad idea for society (43% to 31%), while about a quarter say they’re not sure (26%). Among those who hadn’t heard about this idea prior to the survey, 28% think the use of gene editing in babies would be a bad idea for society, compared with 23% who think it would be a good idea; nearly half of this group (49%) say they aren’t sure.

**Highly religious adults more likely to see gene editing to reduce a baby’s risk of developing disease as a bad idea than good idea for society**

*% of U.S. adults who say the widespread use of gene editing to greatly reduce a baby’s risk of developing serious diseases or conditions would be a \_\_\_ for society*



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

Source: Survey conducted Nov. 1-7, 2021.

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## Americans foresee both positive and negative implications from widespread use of gene editing to enhance human health

While gene editing techniques hold the promise of reducing the risk of serious disease over a person’s lifetime, the public is not entirely convinced that this would lead to a higher quality of life for people.

Overall, 39% of U.S. adults think the widespread use of gene editing to greatly reduce a baby’s risk of developing serious diseases or health conditions over their lifetime would lead to a better quality of life for people. However, 40% say quality of life for people would be about the same as now if this technology were widely used, and 18% say it would be worse.

Further, about half of Americans (52%) say that “this idea is meddling with nature and crosses a line we should not cross.” By contrast, 46% say their views are better described by the statement “as humans, we are always trying to better ourselves and this idea is no different.”

A majority of those high in religious commitment (72%) consider this use of gene editing to be inappropriate,

### Public divided over whether gene editing to reduce a baby’s risk of developing serious diseases or conditions would improve people’s quality of life

*% of U.S. adults who say that if the use of gene editing to greatly reduce a baby’s risk of developing serious diseases or conditions becomes widespread, people’s quality of life would be ...*



Note: Respondents who did not give an answer are not shown.

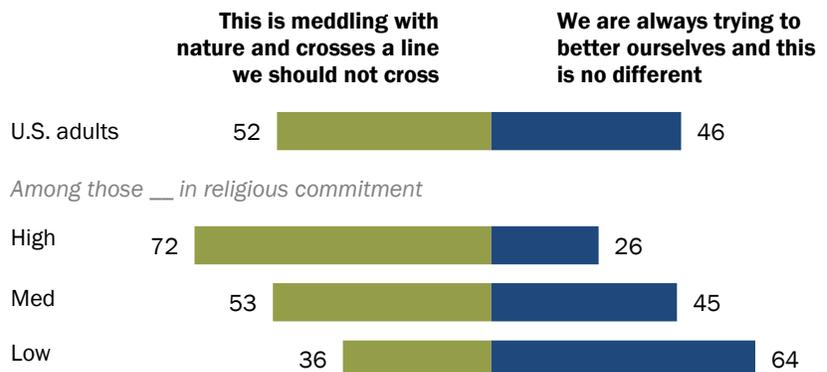
Source: Survey conducted Nov. 1-7, 2021.

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### Majority of highly religious adults see gene editing to reduce a baby’s risk of developing disease as meddling with nature

*% of U.S. adults who say that if the use of gene editing to greatly reduce a baby’s risk of developing serious diseases or conditions becomes widespread, they would feel that ...*



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

Source: Survey conducted Nov. 1-7, 2021.

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crossing a line we should not cross. By contrast, a majority of adults with low levels of religious commitment (64%) take the opposing view and describe this use of gene editing as no different than other efforts to better ourselves.

Asked to think about a future where gene editing to reduce the risk of babies developing serious diseases or health conditions is widespread, the public sees both positive and negative impacts as likely to happen. But one negative outcome is seen as particularly likely: the use of these techniques in ways that are morally unacceptable.

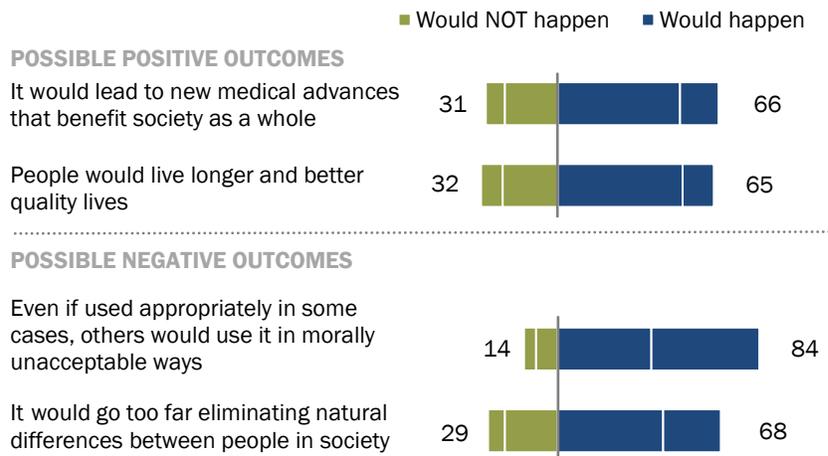
Overall, 84% think that even if gene editing is used appropriately in some cases, others would definitely or probably use these techniques in ways that are morally unacceptable.

Nearly seven-in-ten (68%) say these gene editing techniques would definitely or probably go too far eliminating natural differences between people in society.

At the same time, 66% say the development of these techniques would definitely or probably pave the way for new medical advances that benefit society as a whole, and 65% say these techniques would likely help people live longer and better-quality lives.

**Large majority thinks using gene editing to reduce disease risk in babies would lead to some morally unacceptable uses**

*% of U.S. adults who say that if the use of gene editing to greatly reduce a baby's risk of developing serious diseases or conditions becomes widespread, each of the following definitely or probably ...*



Note: Respondents who did not give an answer are not shown.  
 Source: Survey conducted Nov. 1-7, 2021.  
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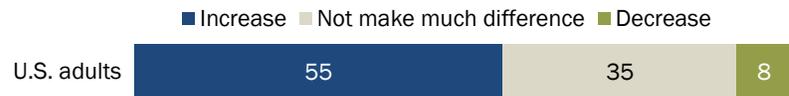
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In thinking about access to these techniques, 55% of U.S. adults say that if the use of gene editing to reduce a baby's risk of developing a serious disease during their lifetime becomes widespread, the gap between higher- and lower-income Americans would increase. About a third (35%) say the widespread use of this technology would not make much difference in the gap between higher- and lower-income Americans; 8% say it would decrease this gap.

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### 55% of U.S. adults say widespread use of gene editing to reduce disease risk in babies would lead to more income inequality

*% of U.S. adults who say that if use of gene editing to greatly reduce a baby's risk of developing serious diseases or conditions becomes widespread, it would \_\_\_ (in) the gap between higher- and lower-income Americans*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Majority backs higher standard for testing use of gene editing in babies, major role for medical scientists in setting standards

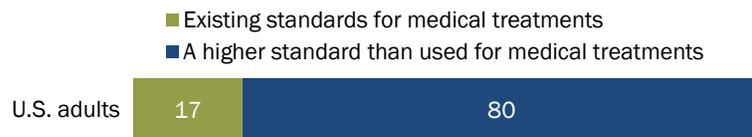
In line with concerns about the possible misuse of gene editing, a large majority (80%) of Americans say that gene editing techniques to greatly reduce a baby's risk of serious diseases or conditions should be tested using a higher standard than those used for other medical treatments to ensure their safety and effectiveness. Only 17% say gene editing should be tested using existing standards for medical treatments.

When asked who should be responsible for setting standards regarding the use of gene editing, two-thirds of Americans (67%) believe that medical scientists should play a major role, while another 21% say they should play a minor role.

Over half (55%) say the people who get these gene modifications should play a major role in setting the standards for how they are used; 29% think they should play a minor role.

### Large majority says gene editing techniques should be tested using higher standards than other treatments

*% of U.S. adults who say that when it comes to ensuring safety and effectiveness, gene editing to greatly reduce a baby's risk of developing serious diseases or conditions should be tested using ...*



Note: Respondents who did not give an answer are not shown.

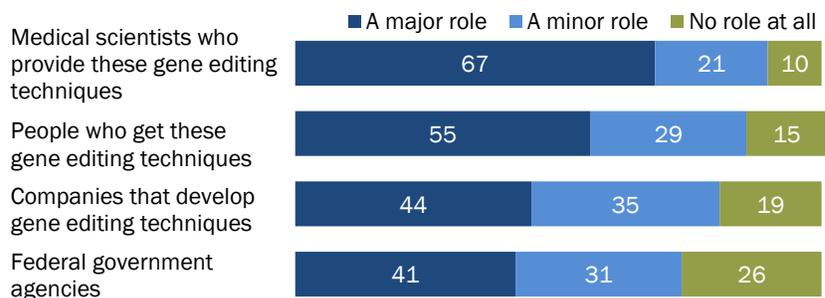
Source: Survey conducted Nov. 1-7, 2021.

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### Most U.S. adults say medical scientists should play a major role setting standards for gene editing

*% of U.S. adults who say each of the following groups should have \_\_\_ in setting standards for how gene editing is used*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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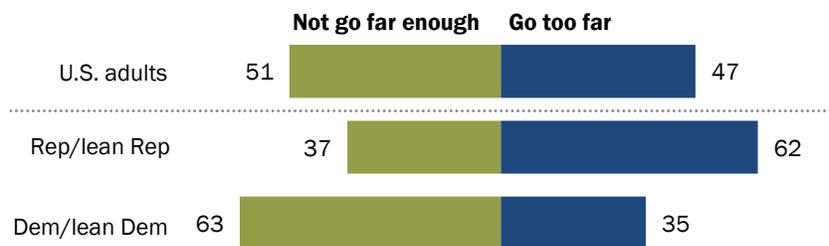
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Fewer than half say the companies that develop gene editing techniques (44%) and federal government agencies (41%) should have major roles in setting standards. However, majorities of Americans say both of these groups should play at least a minor role in setting standards for how gene editing techniques are used.

Americans are closely divided when it comes to their greater concern about government regulation in this area. In all, 51% say that if this use of gene editing becomes widespread, their greater concern is government will not go far enough regulating its use. Nearly as many (47%) take the opposite view and say their greater concern is that government regulation will go too far.

### Public roughly divided over bigger concern regarding government regulation of gene editing techniques

*% of U.S. adults who say that if the use of gene editing to greatly reduce a baby's risk of developing serious diseases or conditions becomes widespread, their greater concern is government will \_\_\_ regulating its use*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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### Democrats and Republicans

differ widely on this question, consistent with their broader views on government regulation. A majority of Republicans and Republican-leaning independents (62%) say that if gene editing to reduce a baby's risk of developing a serious disease or condition becomes widespread, their greater concern is that government will go too far in regulating the use of this technology. Among Democrats and Democratic leaners, 63% say their greater concern is that government regulation will not go far enough.

## Consent, control and heritability matter in thinking about the potential use of gene editing to reduce the risk of developing disease

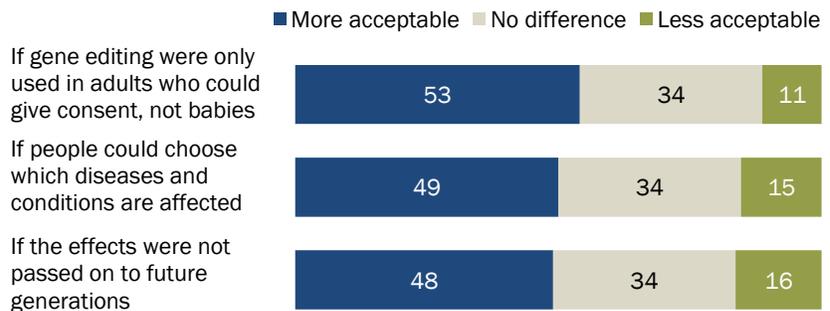
Overall, 53% of U.S. adults say the use of gene editing would be more acceptable to them if it were only used in adults who could consent to the procedure, rather than for babies; 34% say this wouldn't make a difference in their view and 11% say it would make the use of gene editing less acceptable to them.

About half or more of both those who say they would and would not want to use gene editing for their own baby say the idea of adult consent for this use of gene editing would make it more acceptable to them.

Roughly half (49%) of Americans also say the use of gene editing to reduce disease risk would be more acceptable to them if people could choose which diseases and conditions are affected. A similar share, 48%, say it would be more acceptable to them if the effects were limited to the person receiving the treatment and not passed on to future generations, a key concern among genetic experts when it comes to the societal and ethical implications of gene editing in babies.

### About half of U.S. adults say gene editing would be more acceptable under certain scenarios

*% of U.S. adults who say each of the following would make the use of gene editing to greatly reduce a baby's risk of developing serious diseases or conditions ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## About seven-in-ten Americans favor the use of gene editing to treat serious diseases

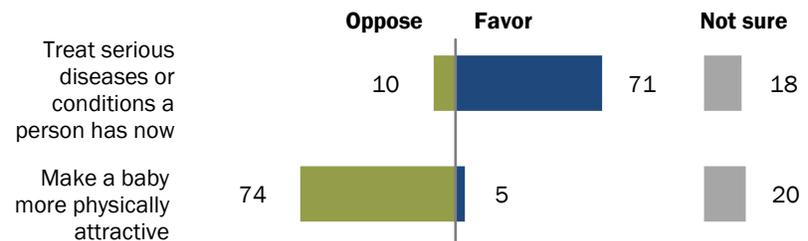
When asked to consider some other possible uses for gene editing (beyond use on babies to prevent the future risk of disease) the public is broadly supportive of using gene editing to treat conditions a person already has, but they are broadly opposed to using it to make a baby more attractive.

About seven-in-ten Americans (71%) say they would favor the use of gene editing to treat serious diseases or health conditions that a person *currently* has. Just 10% say they would oppose gene therapy, and 18% say they're not sure.

**Gene therapy** aims to treat disease by correcting an underlying genetic problem. It is in use or in an experimental development phase for a range of diseases including immune deficiencies and cancer.

### Majorities favor use of gene editing to treat diseases, oppose its use to enhance a baby's attractiveness

*% of U.S. adults who say they would \_\_\_ the use of gene editing for the following purposes*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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A 57% majority of those with high levels of religious commitment on a three-item index favor the use of gene editing to treat a current disease or health condition, as do large majorities of those with medium (71%) and low (83%) levels of religious commitment.

By contrast, a large majority (74%) in the U.S. say they would oppose using gene editing to change a baby's physical characteristics to make them more attractive. Only 5% would favor this (20% say they're not sure).

These findings are broadly in line with a [2019-2020 Center survey](#) which found majorities in the U.S. and many other places surveyed thought the use of gene editing in babies to make a baby more intelligent would be taking technology too far but that gene editing for treating a baby's serious disease or health condition would be an appropriate use of the technology.

## 8. Mixed views about a future with widespread use of robotic exoskeletons to increase strength for manual labor jobs

Robotic exoskeletons are an emerging technology now being developed with the potential to augment human strength. Some are in development for [use in manual labor jobs](#) to give workers increased strength for lifting heavy objects. More [complex exoskeletons](#) are sometimes called a “wearable robot,” because they include a built-in artificial intelligence (AI) computer system which uses sensor data to help guide its use.

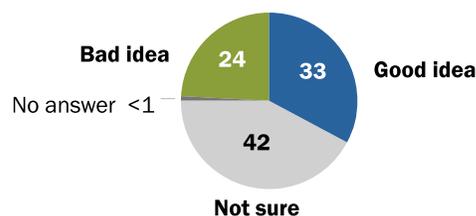
Americans report a mix of views about the potential for widespread use of robotic exoskeletons with built-in AI to give workers in manual jobs increased strength. While a majority sees this idea as being in line with long-standing efforts to better ourselves as humans, a slightly larger share of the public say they would hesitate to use such a device than say they would want to do so.

As Americans think about the possible widespread use of robotic exoskeletons with built-in AI systems for workers in manual jobs, 33% say this would be a good thing for society, a smaller share (24%) say it would be a bad thing, and nearly double that share (42%) say they are not sure what the impact would be for society.

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### A third of Americans say widespread use of exoskeletons is a good idea for society

*% of U.S. adults who say widespread use of exoskeletons with built-in AI to greatly increase strength for manual labor would be a \_\_\_ for society*



#### Here's how people were asked to think about robotic exoskeletons:

“Robotic exoskeletons are being developed that could make it possible to greatly increase a person’s strength and allow them to lift heavy objects when wearing the device. These devices could include an artificial intelligence computer system to help guide the device. They are expected to be used by workers doing manual labor jobs, such as manufacturing or construction.”

Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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If given the chance, a narrow majority of Americans (54%) say they, personally, would *not* want to use a robotic exoskeleton for manual labor tasks; 45% say they definitely or probably would like to use one.

### About two-thirds of Americans are skeptical robotic exoskeletons would improve manual labor conditions

Exoskeletons are being used and developed for a [variety of purposes](#). These external devices that combine human and machine movement can be designed as a whole body suit, as portrayed in the Iron Man movies, or as devices to fit specific areas such as the lower body, the hand or the head, neck and shoulders. Some are aimed at therapeutic roles to help people with [spinal cord injury](#) regain use of their limbs, for example. Others are being developed for [military applications](#), or as in this example to support [industrial work](#). In the future, experts believe their use could extend to the general population for use in [exercise](#) or fitness activities.

In thinking about the potential widespread use of robotic exoskeletons with a built-in AI system for use in manual labor jobs, many Americans are skeptical that such devices would improve conditions for workers. About a third (32%) say that the widespread use of robotic exoskeletons in manual labor jobs would make conditions for workers better than they are now, while about as many (31%) say they would make conditions worse; 36% say that, if exoskeletons were in widespread use, working conditions would be the same as they are today.

### A small majority of Americans say they would not want to use a robotic exoskeleton

*% of U.S. adults who say that they definitely or probably \_\_\_ to use an exoskeleton with built-in AI to greatly increase strength for manual labor*



Note: Respondents who did not give an answer are not shown.

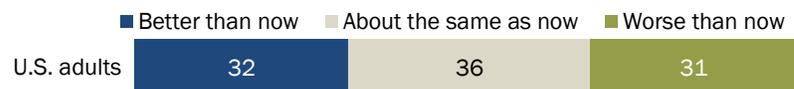
Source: Survey conducted Nov. 1-7, 2021.

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### A majority of Americans are not convinced robotic exoskeletons would improve conditions for workers

*% of U.S. adults who say that if the use of robotic exoskeletons to greatly increase strength for manual labor becomes widespread, conditions for workers would be ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

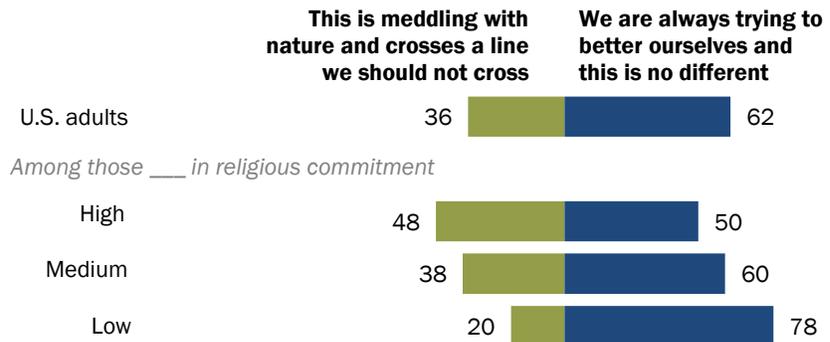
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Less than half the public raises ethical concerns about this idea. When asked which statement better describes their views about the possible widespread use of robotic exoskeletons for manual labor jobs, 62% express alignment with the view that “as humans we are always trying to better ourselves and this idea is no different.” A smaller share (36%) takes the opposing view that “this idea is meddling with nature and crosses a line we should not cross.”

## About six-in-ten Americans see robotic exoskeletons as part of ongoing efforts to better ourselves

*% of U.S. adults who say that if use of robotic exoskeletons to greatly increase strength for manual labor becomes widespread, they would feel that ...*



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

Source: Survey conducted Nov. 1-7, 2021.

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These findings stand in contrast to public views about other forms of human enhancement considered in the Center survey. For example, a 63% majority of Americans say that the potential widespread use of [brain chip implants](#) to improve cognitive functioning would be crossing a line that we should not cross. And Americans are closely divided over whether the use of [gene editing](#) to greatly reduce a baby’s risk of developing serious diseases or conditions over their lifetime would be crossing a line (52%) or in keeping with ways that humans have tried to better ourselves over time (46%).

As with those other potential avenues to human enhancement, however, people’s level of religious commitment are correlated with their views about this. (Religious commitment is based on a three-item index reflecting the salience of religion in a respondent’s life, their frequency of religious service attendance and their frequency of prayer.) Among those with high religious commitment, 48% say the widespread use of robotic exoskeletons with built-in AI for manual labor jobs would be meddling with nature and crosses a line, while 50% say it’s no different than other efforts at improvement. By contrast, majorities of those with medium (60%) or low (78%) levels of religious commitment say the use of robotic exoskeletons to greatly increase strength for manual labor jobs is no different than other human efforts to better ourselves.

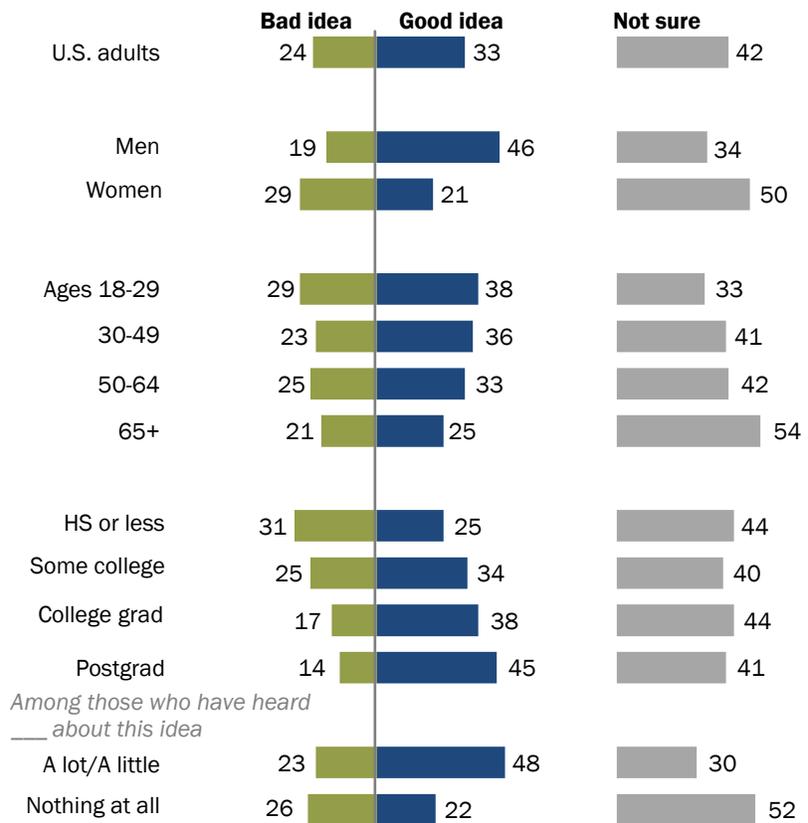
## Men, those familiar with robotic exoskeletons are more inclined to say the widespread use of exoskeletons would be a good idea for society

Public awareness of robotic exoskeletons is limited as of now. Only 6% of Americans say they have heard a lot about robotic exoskeletons with built-in artificial intelligence, while 37% have heard a little and 57% say they have heard nothing at all.

Those who are more familiar with the idea of robotic exoskeletons with built-in AI systems are more positive about their use. People who have heard at least a little about these devices are more likely to think their widespread use would be a good idea for society (48%) than a bad one (23%). By contrast, those who had not heard at all about this idea are closely divided between whether the widespread use of robotic exoskeletons in this way would be a good (22%) or bad (26%) thing. The remainder (52%) are undecided about this.

### Views about the use of exoskeletons for workers tilt positive among men, those more familiar with idea

*% of U.S. adults who say widespread use of exoskeletons with built-in AI to greatly increase strength for manual labor would be a \_\_\_ for society*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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Men are more than twice as likely to say that the widespread use of exoskeletons for manual labor would be a good idea for society (46%) as to say it is a bad idea (19%). By contrast, just 21% of women say this would be a good idea for society, while 29% call it a bad idea.

Those with higher levels of education are more embracing than those with less education of a future with widespread use of robotic exoskeletons with built-in AI for manual labor jobs. Among those with a postgraduate degree, significantly larger shares say the use of exoskeletons in manual labor jobs would be a good idea than bad idea for society (45% vs. 14%), and the same is true among those with a four-year college degree (38% vs. 17%). The balance of opinion is more narrowly divided among those with some college education (34% good idea, 25% bad idea). And among those with a high school diploma or less education, more say that exoskeletons are a *bad* idea (31%) than good idea (25%) for society.

There are only modest difference by age when it comes to views about this. People ages 65 and older are less likely to take a position on whether the widespread use of exoskeletons with built-in AI for manual labor jobs would be good or bad thing for society; those who do are closely divided on this issue. The balance of opinion tilts more positive among adults under age 30 (38% say this would be a good idea and 29% say it would be a bad idea).

Similar differences are seen in levels of personal interest about using an exoskeleton. Those most familiar with this idea and men overall are among the most enthusiastic about using such a device themselves. Those with high school or less education are less inclined than those with a college degree or more education to want to use such a device themselves. (See the [Appendix](#) for more details.)

## Americans anticipate a mix of positive and negative effects, if robotic exoskeletons with built-in AI become widely used in manual labor

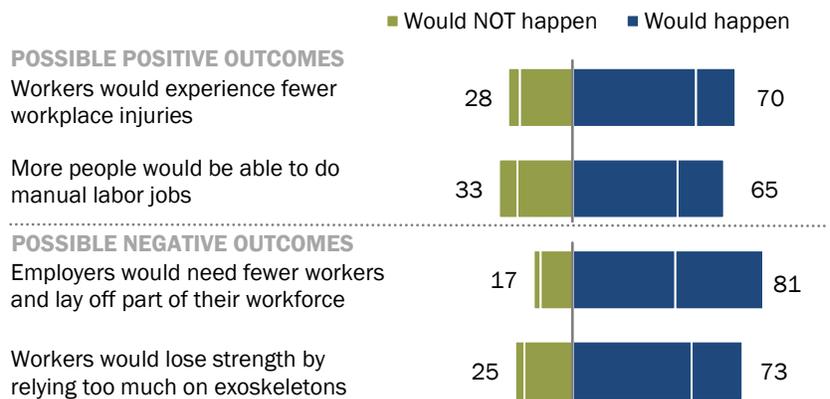
Asked to consider a future where robotic exoskeletons were widely used in manual labor, Americans anticipate both positive and negative impacts for workers.

Two potential downsides resonate broadly with the public: 81% say employers would definitely or probably need fewer workers and lay off part of their workforce if robotic exoskeletons were widely used. Concerns also exist about the physical effects on workers: 73% think that workers would probably or definitely lose strength from relying too much on the exoskeletons.

However, the public also sees the potential for robotic exoskeletons to yield benefits for workers. Seven-in-ten say workers would probably or definitely experience fewer workplace injuries, and 65% say exoskeletons would make it possible for more people to be able to do manual labor jobs.

### Majorities expect that the use of robotic exoskeletons would reduce worker injuries, lead to layoffs

*% of U.S. adults who say that if the use of robotic exoskeletons to greatly increase strength for manual labor becomes widespread, each of the following definitely or probably ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Americans want high standards, worker input for regulating exoskeleton use

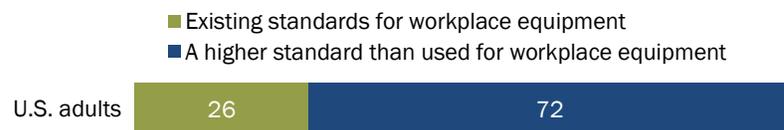
**Industry experts** anticipate continued refinements in the design, use and demand for robotic exoskeletons in the coming decades. At this early stage, a large majority of Americans stress the importance of a rigorous review of their safety and effectiveness: 72% say robotic exoskeletons should be tested using a higher standard than used for other workplace equipment. Far fewer (26%) say that existing standards are sufficient for testing robotic exoskeletons.

When it comes to who should play a part setting regulatory standards for the use robotic exoskeletons, the public ranks input from workers at the top of the list. Two-thirds of U.S. adults (67%) say the workers who would be using exoskeletons should play a major role setting standards for how they are used; another 22% say workers should play a minor role.

A smaller majority (55%) says the companies that develop the robotic exoskeletons should play a major role in setting standards for how they are used, and 49% say the same about employers. (Large majorities say both should play at least a minor role in setting standards.)

### Majority of Americans say robotic exoskeletons should be tested using higher standard than other equipment

*% of U.S. adults who say that when it comes to ensuring safety and effectiveness, robotic exoskeletons for manual labor should be tested using ...*



Note: Respondents who did not give an answer are not shown.

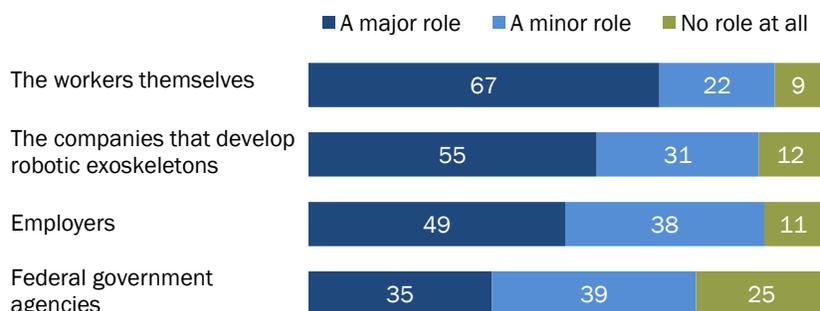
Source: Survey conducted Nov. 1-7, 2021.

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### Two-thirds of Americans say workers should play a major role in setting standards for exoskeleton use

*% of U.S. adults who say each of the following groups should have \_\_\_ in setting standards for how robotic exoskeletons are used for manual labor*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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About a third of the public (35%) says federal government agencies should have a major role in setting regulatory standards, while 39% say it should have a minor role.

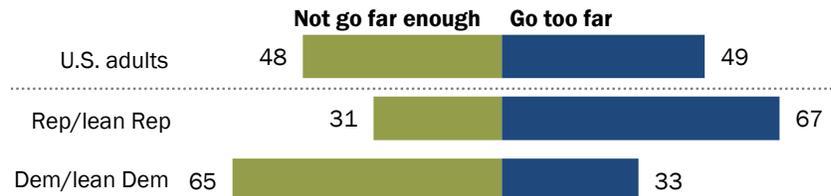
There are generally modest or no differences between party groups in these views, although Democrats and independents who lean to the Democratic Party are more inclined than their Republican counterparts to say federal government agencies should have a major role in setting standards (46% vs. 23%).

Americans are closely divided over their greater concern about government involvement in regulating the use of robotic exoskeletons for manual labor. About half (49%) say their greater concern is that government will go too far in regulating their use, while 48% say they are more concerned that government regulation will not go far enough.

A majority of Republicans (67%) say their greater concern is that government will go too far regulating the use of robotic exoskeletons for manual labor. A majority of Democrats express the opposite view: 65% say they are more concerned that government will not go far enough regulating the use of robotic exoskeletons.

### Americans divided over their greater concern about government regulation of robotic exoskeletons

*% of U.S. adults who say that if the use of robotic exoskeletons to greatly increase strength for manual labor becomes widespread, their greater concern is that the government will \_\_\_ regulating their use*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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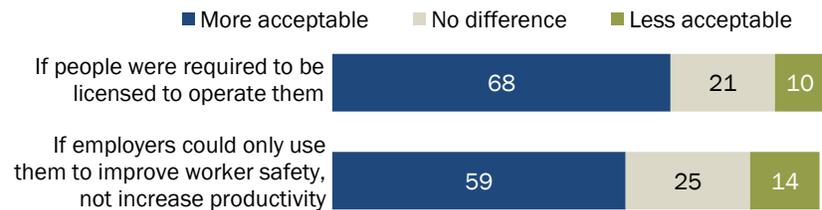
## Americans more open to use of robotic exoskeletons for manual labor if licenses are required, focus is on worker safety

While Americans are roughly divided over whether the use of robotic exoskeletons for manual labor would be a good or bad idea for society, many see conditions that would make their use more acceptable.

About seven-in-ten (68%) say they would find the use of robotic exoskeletons with built-in artificial intelligence computer systems for manual labor jobs more acceptable if people were required to be licensed to operate them. A majority (59%) also says they would find the use of such exoskeletons more acceptable if employers could only use them to improve worker safety, rather than to increase productivity.

### Public says requiring licenses, focus on worker safety would make robotic exoskeleton use more acceptable

*% of U.S. adults who say each of the following would make the use of robotic exoskeletons for manual labor ...*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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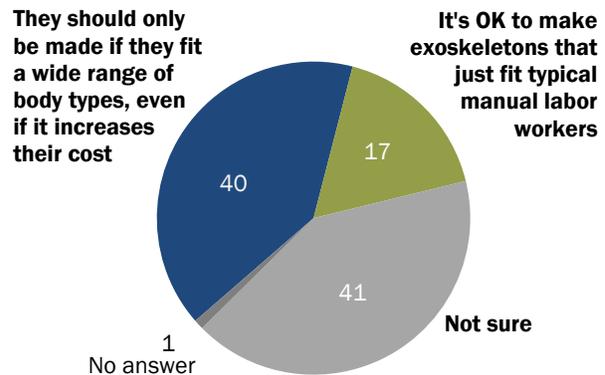
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Robotic exoskeletons raise a number of [new questions](#) for society. Among these: Should such devices be designed for a wider range of body types than most of those currently employed in manual labor jobs? The trade-offs to doing so would likely be costs and time to develop effective devices in this way.

As of now, the public leans toward the idea that robotic exoskeletons should be made for a wide range of body types, rather than typical worker body types, even if that impacts cost. Overall, 40% say robotic exoskeletons should only be made if they fit a wide range of worker body types, even if this increases their cost. A smaller share (17%) says it's OK to make robotic exoskeletons that just fit the typical body types of manual labor workers in order to lower their cost, even if they won't work for many other people. About four-in-ten (41%) say they aren't sure about their views on this question.

### More say exoskeletons should be produced for range of body types, rather than typical ones, even if costs increase

*% of U.S. adults who say that, thinking about the manufacturing of robotic exoskeletons ...*



Note: Figures may not add up to 100% due to rounding.

Source: Survey conducted Nov. 1-7, 2021.

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## Some potential uses of robotic exoskeletons garner wide public support

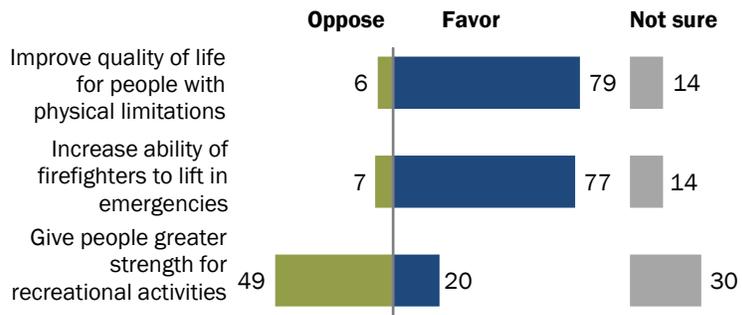
Use in manual labor jobs is just one of many possible applications of robotic exoskeleton technology. Some exoskeletons in use today are aimed at assisting people with physical disabilities or limitations resulting from disease or injury. Others could be used to augment the strength and endurance of first responders. And some experts anticipate the use of exoskeletons for wider use, such as allowing people to run or climb faster.

Large majorities of Americans say they would favor the use of robotic exoskeletons with built-in artificial intelligence computer systems to improve the quality of life for people with physical limitations (79%). About as many (77%) also say they would favor their use to increase the ability of firefighters to lift in emergency situations.

By contrast, more say they would oppose (49%) than favor (20%) the use of robotic exoskeletons to give people greater strength for recreational activities; 30% say they aren't sure how they feel about this.

### Majority favors use of exoskeletons to improve quality of life for people with physical limitations

*% of U.S. adults who say they would \_\_\_ the use of robotic exoskeletons with built-in AI for the following purposes*



Note: Respondents who did not give an answer are not shown.

Source: Survey conducted Nov. 1-7, 2021.

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## Methodology

### The American Trends Panel survey methodology

#### Overview

The American Trends Panel (ATP), created by Pew Research Center, is a nationally representative panel of randomly selected U.S. adults. Panelists participate via self-administered web surveys. Panelists who do not have internet access at home are provided with a tablet and wireless internet connection. Interviews are conducted in both English and Spanish. The panel is being managed by Ipsos.

Data in this report is drawn from the panel wave conducted from Nov. 1 to Nov. 7, 2021. A total of 10,260 panelists responded out of 11,492 who were sampled, for a response rate of 89%. The cumulative response rate accounting for nonresponse to the recruitment surveys and attrition is 3%. The break-off rate among panelists who logged on to the survey and completed at least one item is 1%. The margin of sampling error for the full sample of 10,260 respondents is plus or minus 1.6 percentage points.

#### Panel recruitment

The ATP was created in 2014, with the first cohort of panelists invited to join the panel at the end of a large, national, landline and cellphone random-digit-dial survey that was conducted in both English and Spanish. Two additional recruitments were conducted using the same method in 2015 and 2017, respectively. Across these three surveys, a total of 19,718 adults were invited to join the ATP, of whom 9,942 (50%) agreed to participate.

In August 2018, the ATP switched from telephone to

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#### American Trends Panel recruitment surveys

Recruitment dates	Mode	Invited	Joined	Active panelists remaining
Jan. 23 to March 16, 2014	Landline/ cell RDD	9,809	5,338	1,603
Aug. 27 to Oct. 4, 2015	Landline/ cell RDD	6,004	2,976	939
April 25 to June 4, 2017	Landline/ cell RDD	3,905	1,628	470
Aug. 8 to Oct. 31, 2018	ABS	9,396	8,778	4,432
Aug. 19 to Nov. 30, 2019	ABS	5,900	4,720	1,625
June 1 to July 19, 2020; Feb. 10 to March 31, 2021	ABS	3,197	2,812	1,698
May 29 to July 7, 2021	ABS	1,085	947	725
	<b>Total</b>	<b>39,296</b>	<b>27,199</b>	<b>11,492</b>

Note: Approximately once per year, panelists who have not participated in multiple consecutive waves or who did not complete an annual profiling survey are removed from the panel. Panelists also become inactive if they ask to be removed from the panel. The 2021 recruitment survey was ongoing at the time this survey was conducted. The counts reflect completed recruitment interviews up through July 7, 2021.

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address-based recruitment. Invitations were sent to a stratified, random sample of households selected from the U.S. Postal Service's Delivery Sequence File. Sampled households receive mailings asking a randomly selected adult to complete a survey online. A question at the end of the survey asks if the respondent is willing to join the ATP. Starting in 2020 another stage was added to the recruitment. Households that do not respond to the online survey are sent a paper version of the questionnaire, \$5 and a postage-paid return envelope. A subset of the adults returning the paper version of the survey are invited to join the ATP. This subset of adults receive a follow-up mailing with a \$10 pre-incentive and invitation to join the ATP.

Across the four address-based recruitments, a total of 19,578 adults were invited to join the ATP, of whom 17,257 agreed to join the panel and completed an initial profile survey. In each household, the adult with the next birthday was asked to go online to complete a survey, at the end of which they were invited to join the panel. Of the 27,199 individuals who have ever joined the ATP, 11,492 remained active panelists and continued to receive survey invitations at the time this survey was conducted.

The U.S. Postal Service's Delivery Sequence File has been estimated to cover as much as 98% of the population, although some studies suggest that the coverage could be in the low 90% range.<sup>3</sup> The American Trends Panel never uses breakout routers or chains that direct respondents to additional surveys.

### **Sample design**

The overall target population for this survey was non-institutionalized persons ages 18 and older, living in the U.S., including Alaska and Hawaii.

### **Questionnaire development and testing**

The questionnaire was developed by Pew Research Center in consultation with Ipsos. The web program was rigorously tested on both PC and mobile devices by the Ipsos project management team and Pew Research Center researchers. The Ipsos project management team also populated test data that was analyzed in SPSS to ensure the logic and randomizations were working as intended before launching the survey.

### **Incentives**

All respondents were offered a post-paid incentive for their participation. Respondents could choose to receive the post-paid incentive in the form of a check or a gift code to Amazon.com or

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<sup>3</sup> AAPOR Task Force on Address-based Sampling. 2016. "[AAPOR Report: Address-based Sampling.](#)"

could choose to decline the incentive. Incentive amounts ranged from \$5 to \$20 depending on whether the respondent belongs to a part of the population that is harder or easier to reach. Differential incentive amounts were designed to increase panel survey participation among groups that traditionally have low survey response propensities.

### Data collection protocol

The data collection field period for this survey was Nov. 1 to Nov. 7, 2021. Postcard notifications were mailed to all ATP panelists with a known residential address on Nov. 1.

Invitations were sent out in two separate launches: Soft Launch and Full Launch. Sixty panelists were included in the soft launch, which began with an initial invitation sent on Nov. 1, 2021. The ATP panelists chosen for the initial soft launch were known responders who had completed previous ATP surveys within one day of receiving their invitation. All remaining English- and Spanish-speaking panelists were included in the full launch and were sent an invitation on Nov. 2.

All panelists with an email address received an email invitation and up to two email reminders if they did not respond to the survey. All ATP panelists that consented to SMS messages received an SMS invitation and up to two SMS reminders.

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#### Invitation and reminder dates

	Soft Launch	Full Launch
Initial invitation	Nov. 1, 2021	Nov. 2, 2021
First reminder	Nov. 4, 2021	Nov. 4, 2021
Final reminder	Nov. 6, 2021	Nov. 6, 2021

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### Data quality checks

To ensure high-quality data, the Center's researchers performed data quality checks to identify any respondents showing clear patterns of satisficing. This includes checking for very high rates of leaving questions blank, as well as always selecting the first or last answer presented. As a result of this checking, 19 ATP respondents were removed from the survey dataset prior to weighting and analysis.

## Weighting

The ATP data is weighted in a multistep process that accounts for multiple stages of sampling and nonresponse that occur at different points in the survey process. First, each panelist begins with a base weight that reflects their probability of selection for their initial recruitment survey. The base weights for panelists recruited in different years are scaled to be proportionate to the effective sample size for all active panelists in their cohort and then calibrated to align with the population benchmarks in the accompanying table to

correct for nonresponse to recruitment surveys and panel attrition. If only a subsample of panelists was invited to participate in the wave, this weight is adjusted to account for any differential probabilities of selection.

Among the panelists who completed the survey, this weight is then calibrated again to align with the population benchmarks identified in the accompanying table and trimmed at the 1st and 99th percentiles to reduce the loss in precision stemming from variance in the weights. Sampling errors and tests of statistical significance take into account the effect of weighting.

Some of the population benchmarks used for weighting come from surveys conducted prior to the coronavirus outbreak that began in February 2020. However, the weighting variables for panelists recruited in 2021 were measured at the time they were recruited to the panel. Likewise, the profile variables for existing panelists were updated from panel surveys conducted in July or August 2021.

This does not pose a problem for most of the variables used in the weighting, which are quite stable at both the population and individual levels. However, volunteerism may have changed over the intervening period in ways that made their 2021 measurements incompatible with the

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## Weighting dimensions

Variable	Benchmark source
Age x Gender	2019 American Community Survey (ACS)
Education x Gender	
Education x Age	
Race/Ethnicity x Education	
Born inside vs. outside the U.S. among Hispanics and Asian Americans	
Years lived in the U.S.	
Census region x Metro/Non-metro	2020 CPS March Supplement
Volunteerism	2019 CPS Volunteering & Civic Life Supplement
Voter registration	2018 CPS Voting and Registration Supplement
Party affiliation	2021 National Public Opinion Reference Survey (NPORS)
Frequency of internet use	
Religious affiliation	

Note: Estimates from the ACS are based on non-institutionalized adults. Voter registration is calculated using procedures from Hur, Achen (2013) and rescaled to include the total U.S. adult population.

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available (pre-pandemic) benchmarks. To address this, volunteerism is weighted using the profile variables that were measured in 2020. For all other weighting dimensions, the more recent panelist measurements from 2021 are used.

For panelists recruited in 2021, plausible values were imputed using the 2020 volunteerism values from existing panelists with similar characteristics. This ensures that any patterns of change that were observed in the existing panelists were also reflected in the new recruits when the weighting was performed.

The following table shows the unweighted sample sizes and the error attributable to sampling that would be expected at the 95% level of confidence for different groups in the survey.

<b>Group</b>	<b>Unweighted sample size</b>	<b>Weighted percentage</b>	<b>Plus or minus ...</b>
Total sample	10,260		1.6 percentage points
Half sample	At least 5,107		2.3 percentage points
Men	4,549		2.5 percentage points
<i>Half sample</i>	At least 2,270		3.6 percentage points
Women	5,628		2.0 percentage points
<i>Half sample</i>	At least 2,788		2.9 percentage points
White, non-Hispanic	7,163		1.8 percentage points
<i>Half sample</i>	At least 3,562		2.6 percentage points
Black, non-Hispanic	809		5.1 percentage points
<i>Half sample</i>	At least 402		7.2 percentage points
Hispanic	1,458		5.0 percentage points
<i>Half sample</i>	At least 724		7.1 percentage points
Asian, non-Hispanic	356		8.0 percentage points
Ages 18-29	895		5.0 percentage points
<i>Half sample</i>	At least 438		7.2 percentage points
30-49	3,328		2.7 percentage points
<i>Half sample</i>	At least 1,642		3.8 percentage points
50-64	2,953		2.8 percentage points
<i>Half sample</i>	At least 1,444		4.0 percentage points
65+	3,048		2.6 percentage points
<i>Half sample</i>	At least 1,521		3.7 percentage points

*(table continued below)*

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(sample sizes and margins of error, continued)

<b>Group</b>	<b>Unweighted sample size</b>	<b>Weighted percentage</b>	<b>Plus or minus ...</b>
HS or less	1,746		3.3 percentage points
<i>Half sample</i>	At least 869		4.7 percentage points
Some college	3,259		2.7 percentage points
<i>Half sample</i>	At least 1,619		3.9 percentage points
College grad	2,824		2.6 percentage points
<i>Half sample</i>	At least 1,381		3.7 percentage points
Postgrad	2,399		2.6 percentage points
<i>Half sample</i>	At least 1,177		3.9 percentage points
Rep/lean Rep	4,869	42	2.3 percentage points
<i>Half sample</i>	At least 2,424		3.3 percentage points
Dem/lean Dem	5,142	51	2.2 percentage points
<i>Half sample</i>	At least 2,553		3.2 percentage points
High religious commitment	2,158		3.2 percentage points
<i>Half sample</i>	At least 1,076		4.6 percentage points
Medium religious commitment	5,554		2.2 percentage points
<i>Half sample</i>	At least 2,765		3.1 percentage points
Low religious commitment	2,472		3.3 percentage points
<i>Half sample</i>	At least 1,229		4.7 percentage points
<i>Among Form 2 respondents only (human enhancement applications)</i>			
Protestant	2,116		3.3 percentage points
White, evangelical	851		5.0 percentage points
White, not evangelical	671		6.1 percentage points
Black Protestant	291		8.3 percentage points
Catholic	1,116		4.8 percentage points
White	704		5.2 percentage points
Unaffiliated	1,383		4.3 percentage points
Atheist	285		9.7 percentage points
Agnostic	302		9.5 percentage points
Nothing in particular	796		5.6 percentage points
Parent of a child under the age of 18	1,421		4.1 percentage points
Not a parent of a child under the age of 18	3,668		2.6 percentage points

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Sample sizes and sampling errors for other subgroups are available upon request. In addition to sampling error, one should bear in mind that question wording and practical difficulties in conducting surveys can introduce error or bias into the findings of opinion polls.

### **A note about the Asian sample**

This survey includes a total sample size of 356 Asian Americans. The sample includes English-speaking Asian Americans only and, therefore, may not be representative of the overall Asian American population. Despite this limitation, it is important to report the views of Asian Americans on the topics in this study. As always, Asian Americans' responses are incorporated into the general population figures throughout this report. Because of the relatively small sample size and a reduction in precision due to weighting, we are not able to analyze Asian American respondents by demographic categories, such as gender, age or education, nor are we able to report overall findings for Asian adults within each of the individual survey forms. For more, see ["Polling methods are changing, but reporting the views of Asian Americans remains a challenge."](#)

**Dispositions and response rates**

<b>Final dispositions</b>	<b>AAPOR code</b>	<b>Total</b>
Completed interview	1.1	10,260
Logged onto survey; broke off	2.12	112
Logged onto survey; did not complete any items	2.1121	193
Never logged on (implicit refusal)	2.11	906
Survey completed after close of the field period	2.27	2
Completed interview but was removed for data quality		19
Screened out		0
<b>Total panelists in the survey</b>		<b>11,492</b>
Completed interviews	I	10,260
Partial interviews	P	0
Refusals	R	1,230
Non-contact	NC	2
Other	O	0
Unknown household	UH	0
Unknown other	UO	0
Not eligible	NE	0
<b>Total</b>		<b>11,492</b>
AAPOR RR1 = $I / (I+P+R+NC+O+UH+UO)$		89%

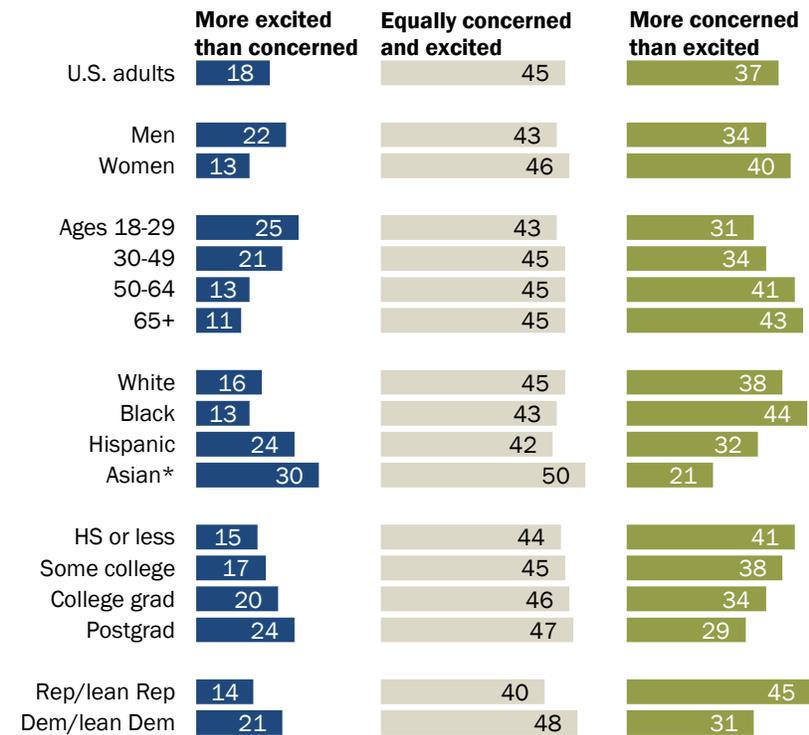
<b>Cumulative response rate</b>	<b>Total</b>
Weighted response rate to recruitment surveys	12%
% of recruitment survey respondents who agreed to join the panel, among those invited	69%
% of those agreeing to join who were active panelists at start of Wave 99	42%
Response rate to Wave 99 survey	89%
<b>Cumulative response rate</b>	<b>3%</b>

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## Appendix

### Public opinion tilts more toward concern than excitement about the increased use of AI in daily life; nearly half feel both equally

*% of U.S. adults who say that overall, the increased use of artificial intelligence computer programs in daily life makes them feel ...*



\*Asian adults were interviewed in English only.

Note: Respondents who did not give an answer are not shown. White, Black and Asian adults include those who report being only one race and are not Hispanic. Hispanics are of any race.

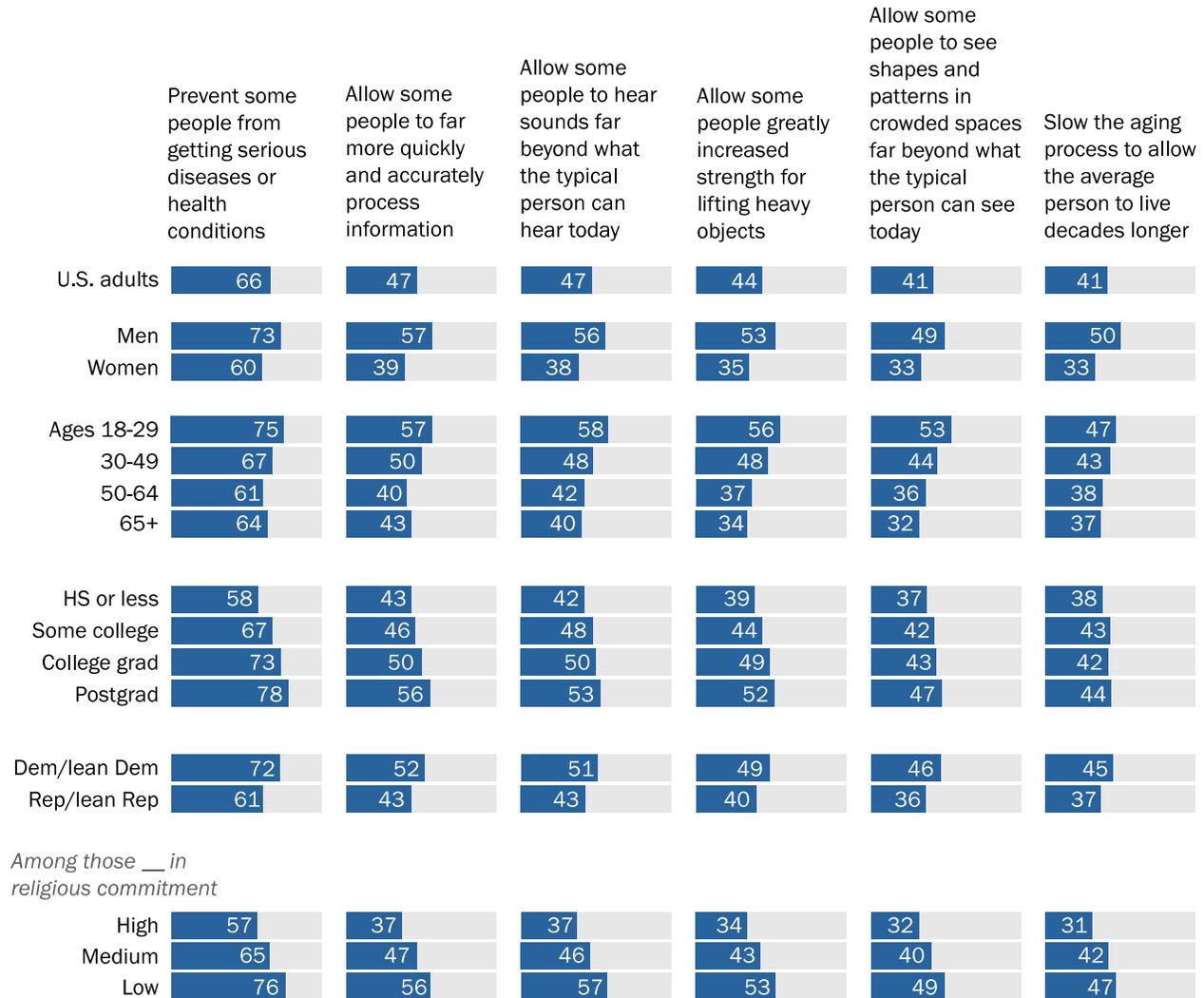
Source: Survey conducted Nov. 1-7, 2021.

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## Men, more religious Americans and those with higher levels of education express more excitement about these human enhancement possibilities

% of U.S. adults who say they would feel very or somewhat excited about these potential new techniques that could change human abilities in the following ways



Note: Respondents who gave other responses or who did not give an answer are not shown. See Methodology for details on the religious commitment index.

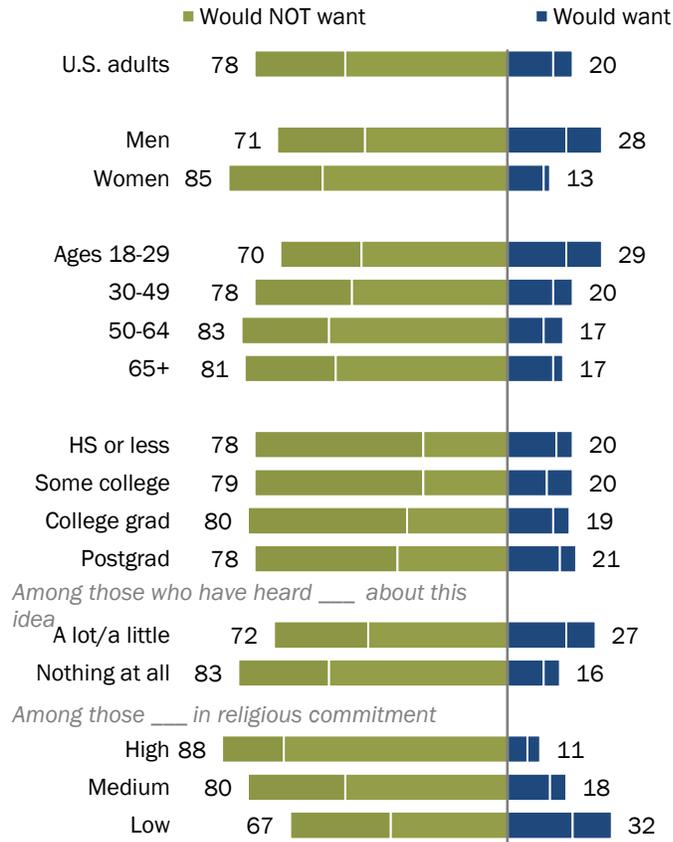
Source: Survey conducted Nov. 1-7, 2021.

“AI and Human Enhancement: Americans’ Openness Is Tempered by a Range of Concerns”

PEW RESEARCH CENTER

## Women are more likely than men to say they would not want a computer chip implant in the brain

% of U.S. adults who say they definitely or probably \_\_\_ to get a computer chip implant in the brain, allowing them to far more quickly and accurately process information



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

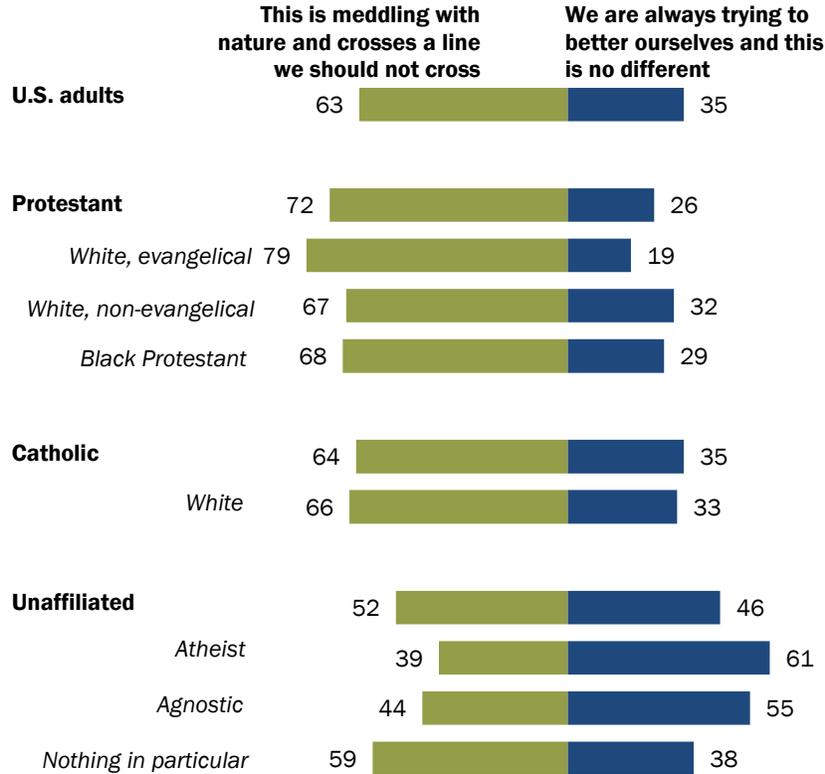
Source: Survey conducted Nov. 1-7, 2021.

“AI and Human Enhancement: Americans’ Openness Is Tempered by a Range of Concerns”

PEW RESEARCH CENTER

**About eight-in-ten White evangelical Protestants think this use of brain chips would be meddling with nature**

*% of U.S. adults who say if the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, they would feel that ...*



Note: Respondents who did not give an answer are not shown.

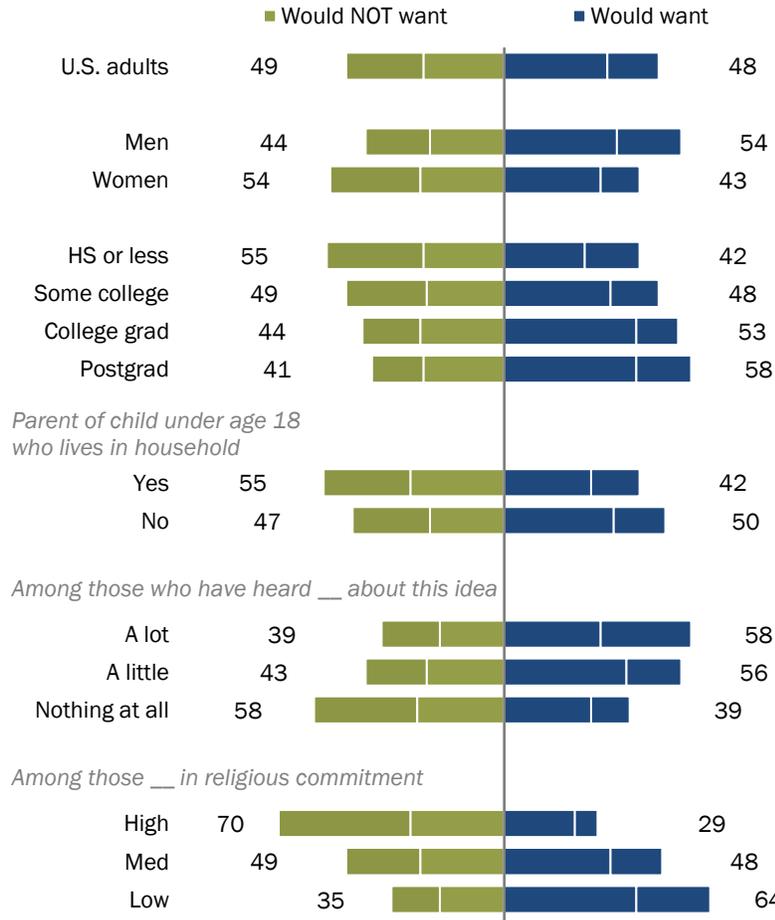
Source: Survey conducted Nov. 1-7, 2021.

"AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns"

PEW RESEARCH CENTER

## Americans' interest in gene editing to reduce risk of disease for their own baby varies by gender, education

% of U.S. adults who say they definitely or probably \_\_\_ gene editing to greatly reduce their baby's risk of developing serious diseases or conditions



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

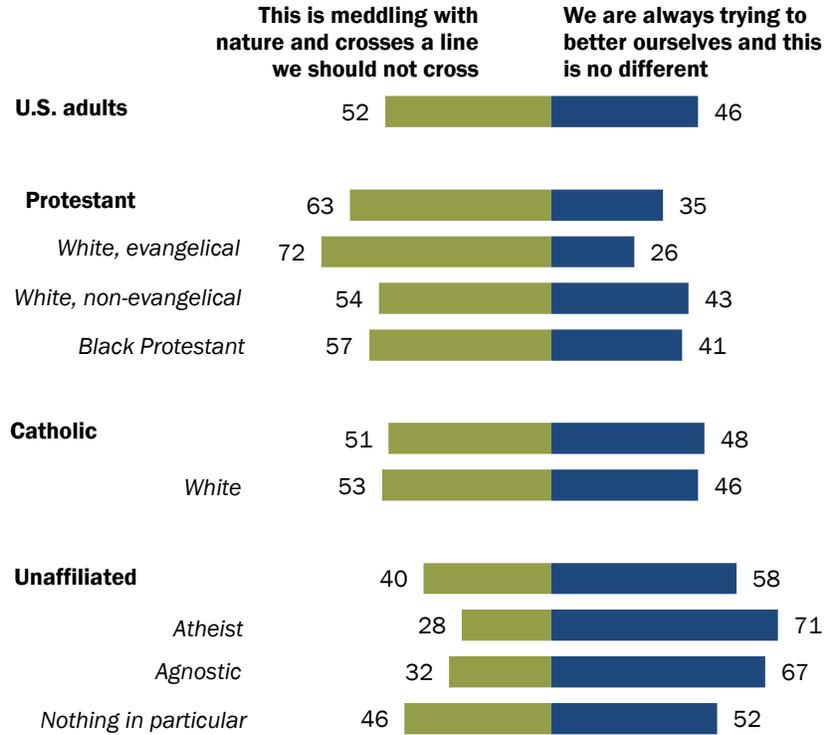
Source: Survey conducted Nov. 1-7, 2021.

"AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns"

PEW RESEARCH CENTER

## 72% of White evangelical Protestants see gene editing to reduce baby’s risk of developing disease as meddling with nature

*% of U.S. adults who say that if the use of gene editing to greatly reduce a baby’s risk of developing serious diseases or conditions becomes widespread, they would feel that ...*



Note: Respondents who did not give an answer are not shown.

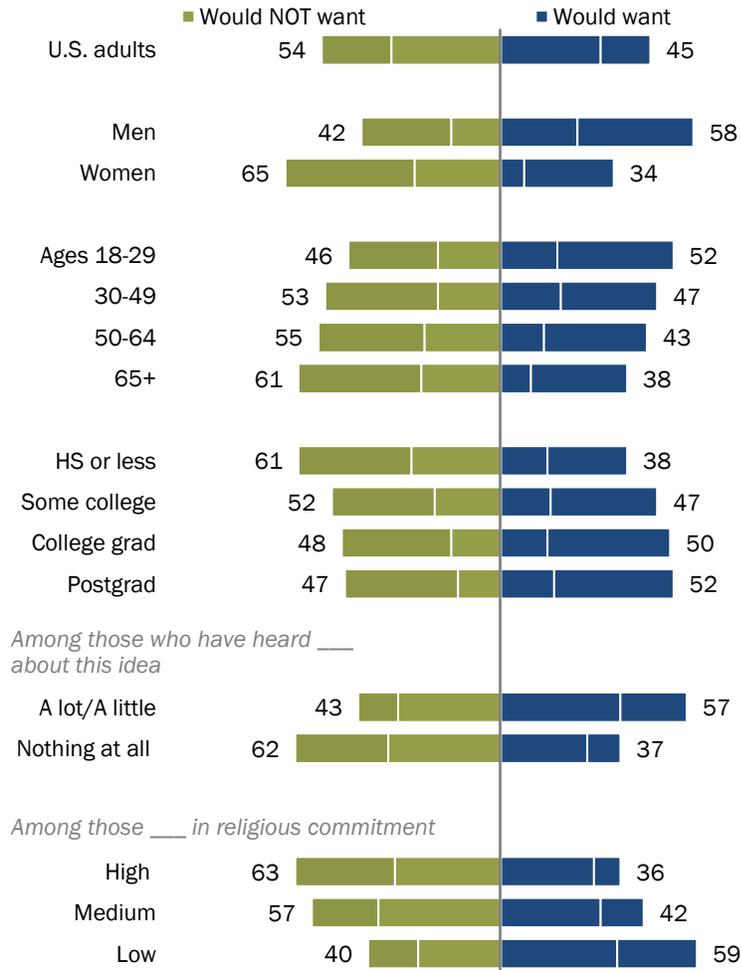
Source: Survey conducted Nov. 1-7, 2021.

“AI and Human Enhancement: Americans’ Openness Is Tempered by a Range of Concerns”

PEW RESEARCH CENTER

## Men are more likely than women to say they would want to use a robotic exoskeleton with built-in AI

% of U.S. adults who say that they definitely or probably \_\_\_ to use an exoskeleton with built-in AI to greatly increase strength for manual labor



Note: Respondents who did not give an answer are not shown. See Methodology for details on the religious commitment index.

Source: Survey conducted Nov. 1-7, 2021.

"AI and Human Enhancement: Americans' Openness Is Tempered by a Range of Concerns"

PEW RESEARCH CENTER

## Topline

**2021 PEW RESEARCH CENTER'S AMERICAN TRENDS PANEL  
WAVE 99 – INTERNET & SCIENCE  
TOPLINE  
NOVEMBER 1-7, 2021  
N=10,260**

**NOTE: ALL NUMBERS ARE PERCENTAGES UNLESS OTHERWISE NOTED. THE PERCENTAGES LESS THAN 0.5% ARE REPLACED BY AN ASTERISK (\*). ROWS/COLUMNS MAY NOT TOTAL 100% DUE TO ROUNDING.**

U.S. adults	<b>Sample size</b> 10,260	<b>Margin of error at 95% confidence level</b> +/- 1.6 percentage points
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**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

TECH1 Overall, would you say technology has had a mostly positive effect on our society or a mostly negative effect on our society?

<u>Nov 1-7, 2021</u>		<u>Mar 2-28, 2016</u>
48	Mostly positive	52
11	Mostly negative	8
41	Equal positive and negative effects	38
*	No answer	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

SCI1 Overall, would you say science has had a mostly positive effect on our society or a mostly negative effect on our society?

<u>Nov 1-7, 2021</u>		<u>Feb 16-21, 2021</u>	<u>Jan 7-21, 2019</u>	<u>Mar 2-28, 2016</u>
65	Mostly positive	67	73	67
7	Mostly negative	6	3	4
28	Equal positive and negative effects	27	23	27
*	No answer	1	*	2

**ASK ALL:**

CNCEXC Artificial intelligence computer programs are designed to learn tasks that humans typically do, for instance recognizing speech or pictures. Overall, would you say the increased use of artificial intelligence computer programs in daily life makes you feel...  
**[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

<u>Nov 1-7, 2021</u>	
18	More excited than concerned
37	More concerned than excited
45	Equally concerned and excited
*	No answer

**ASK IF MORE EXCITED ABOUT AI [CNCEXC=1]:**

EXCITEOE What is the main reason you are more excited than concerned about the increased use of artificial intelligence computer programs in daily life? [OPEN-END RESPONSE, CODED ANSWERS SHOWN BELOW]

Nov 1-7, 2021

31	Makes life, society better
13	Saves time, more efficient
10	Inevitable progress, is the future
7	Handles mundane, tedious tasks
6	Helps with work/labor
6	AI is interesting, exciting
6	Helps humans with difficult/dangerous tasks
4	More accurate than humans
4	Helps those who are elderly/have a disability
2	Personal anecdotes
2	Other people's fears are based on sci-fi, not reality
7	Other
22	No answer

**ASK IF MORE CONCERNED ABOUT AI [CNCEXC=2]:**

CONCERNOE What is the main reason you are more concerned than excited about the increased use of artificial intelligence computer programs in daily life? [OPEN-END RESPONSE, CODED ANSWERS SHOWN BELOW]

Nov 1-7, 2021

19	Loss of human jobs
16	Surveillance, hacking, digital privacy
12	Lack of human connection, qualities
8	AI will get too powerful, outsmarting people
8	People misusing AI
7	People becoming too reliant on AI/tech
6	AI fails, makes mistakes
3	Concerns about govt./tech companies using AI
3	Don't trust AI or people wielding it
2	Unforeseen consequences/effects
2	Loss of freedom
2	Human bias coded into AI
2	Lack of oversight and regulation
7	Other
20	No answer

**ASK ALL:**

ALGFAIR Do you think it is possible or not possible for people to design artificial intelligence computer programs that can consistently make fair decisions in complex situations?

Nov 1-7, 2021

30	Possible
28	Not possible
41	Not sure
1	No answer

**ASK ALL:**

DISCRIM1

Thinking about the people who design artificial intelligence computer programs, how well do you think they take into account the experiences and views of each of the following?

**[RANDOMIZE a-d AND e-f IN BLOCKS; RANDOMIZE ORDER OF BLOCKS; SHOW BLOCKS ON SEPARATE PAGES]**

		<u>Very well</u>	<u>Somewhat well</u>	<u>Not too well</u>	<u>Not at all well</u>	<u>Not sure</u>	<u>No answer</u>
a.	White adults Nov 1-7, 2021	23	25	8	5	39	1
b.	Black adults Nov 1-7, 2021	7	18	20	12	42	1
c.	Hispanic adults Nov 1-7, 2021	6	17	23	10	43	1
d.	Asian adults Nov 1-7, 2021	10	23	15	8	43	1
e.	Men Nov 1-7, 2021	23	28	7	4	37	1
f.	Women Nov 1-7, 2021	9	27	18	7	38	1

**ASK ALL:**

POSNEGAI

How excited or concerned would you be if artificial intelligence computer programs could do each of the following? **[RANDOMIZE ITEMS]**

		<u>Very excited</u>	<u>Somewhat excited</u>	<u>Equal excitement and concern</u>	<u>Somewhat concerned</u>	<u>Very concerned</u>	<u>No answer</u>
a.	Know people's thoughts and behaviors						
	Nov 1-7, 2021	3	6	16	23	52	*
b.	Perform household chores						
	Nov 1-7, 2021	26	31	24	12	7	1
c.	Make important life decisions for people						
	Nov 1-7, 2021	4	6	16	23	52	*
d.	Diagnose medical problems						
	Nov 1-7, 2021	20	20	24	16	19	*
e.	Perform repetitive workplace tasks						
	Nov 1-7, 2021	20	27	27	16	10	1
f.	Handle customer service calls						
	Nov 1-7, 2021	9	18	26	28	19	1

**ASK ALL:**

POSNEGHE How excited or concerned would you be about potential new techniques that could change human abilities in the following ways? **[RANDOMIZE ITEMS]**

		<u>Very excited</u>	<u>Somewhat excited</u>	<u>Equal excitement and concern</u>	<u>Somewhat concerned</u>	<u>Very concerned</u>	<u>No answer</u>
a.	Slow the aging process to allow the average person to live decades longer Nov 1-7, 2021	22	19	30	16	13	1
b.	Allow some people to far more quickly and accurately process information Nov 1-7, 2021	21	26	30	13	10	1
c.	Prevent some people from getting serious diseases or health conditions Nov 1-7, 2021	41	26	22	6	5	1
d.	Allow some people greatly increased strength for lifting heavy objects Nov 1-7, 2021	19	25	28	16	11	1
e.	Allow some people to see shapes and patterns in crowded spaces far beyond what the typical person can see today Nov 1-7, 2021	16	25	31	16	11	1
f.	Allow some people to hear sounds far beyond what the typical person can hear today Nov 1-7, 2021	20	27	29	14	10	*

**[PROGRAMMING NOTE: ASK BLOCKS 1-3 IF FORM 1; RANDOMIZE ORDER OF BLOCKS]****BLOCK 1****ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALGVIG Computer programs can be trained to review large amounts of information and learn to identify patterns. These programs, called algorithms, are widely used by social media companies to find false information about important topics that appears on their sites.

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG1 How much have you heard or read about computer programs used by social media companies to find false information on their sites?

Nov 1-7, 2021

24	A lot
51	A little
24	Nothing at all
*	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG2 Do you think widespread use of computer programs by social media companies to find false information on their sites has been a...

Nov 1-7, 2021

38	Good idea for society
31	Bad idea for society
30	Not sure
*	No answer

**ASK FORM 1 INTERNET USERS ONLY [XFORM=1 AND XTABLET=2] [N=5,057]:**

SMALG3 Have you ever seen information on social media sites that has been flagged or labeled as false?

Nov 1-7, 2021

63	Yes, I have
22	No, I have not
13	I don't use social media sites
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG3GP Have you ever seen information on social media sites that has been flagged or labeled as false?

Nov 1-7, 2021

61	Yes, I have
22	No, I have not
13	I don't use social media sites
1	No answer
4	Does not use internet

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG4 Do you think widespread use of computer programs by social media companies to find false information is making the following happen on their sites? **[RANDOMIZE ITEMS]**

		<u>Definitely happening</u>	<u>Probably happening</u>	<u>Probably NOT happening</u>	<u>Definitely NOT happening</u>	<u>No answer</u>
a.	News and information are being wrongly removed Nov 1-7, 2021	29	39	24	6	2
b.	Political viewpoints are being censored Nov 1-7, 2021	36	34	21	8	1
c.	It is getting easier to find trustworthy information Nov 1-7, 2021	10	30	36	23	2
d.	It is allowing people to have more meaningful conversations Nov 1-7, 2021	7	28	40	23	2

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG5 How much control do you think users have over the things they see on social media sites?

Nov 1-7, 2021

10	A lot of control
48	A little control
33	No control
8	Not sure
*	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG6 Which comes closer to your view, even if neither is exactly right?

When using computer programs to find false information on their sites, social media companies should give priority to... **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

28	Quick decisions, even if some accurate information gets mistakenly removed
69	Accurate decisions, even if some false information stays up on sites for a longer period of time
3	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG7 How much confidence do you have that social media companies will use computer programs appropriately to determine which information on their sites is false?

Nov 1-7, 2021

3	A great deal of confidence
24	A fair amount of confidence
43	Not too much confidence
30	No confidence at all
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG8 As the use of computer programs by social media companies to find false information on their sites has become widespread, which is your greater concern? **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

44	Government will <u>go too far</u> regulating their use
53	Government will <u>not go far enough</u> regulating their use
3	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG9 How much of a role do you think each of the following groups should play in setting standards for how social media companies use computer programs to find false information on their sites? **[RANDOMIZE ITEMS]**

		<u>A major role</u>	<u>A minor role</u>	<u>No role at all</u>	<u>No answer</u>
a.	Federal government agencies				
	Nov 1-7, 2021	40	39	19	1
b.	The social media companies that develop these computer programs				
	Nov 1-7, 2021	51	35	13	1
c.	Social media users				
	Nov 1-7, 2021	46	38	14	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG10 When creating computer programs to find false information, how important do you think it is for social media companies to include people of different... **[RANDOMIZE ITEMS]**

		<u>Extremely important</u>	<u>Very important</u>	<u>Somewhat important</u>	<u>A little important</u>	<u>Not at all important</u>	<u>No answer</u>
a.	Genders						
	Nov 1-7, 2021	39	24	18	5	13	2
b.	Racial and ethnic groups						
	Nov 1-7, 2021	42	25	17	3	11	1
c.	Political viewpoints						
	Nov 1-7, 2021	37	27	18	5	10	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG11 Do you think the decisions made by social media companies about what information is false should be... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTIONS 3 AND 4 ALWAYS LAST]**

Nov 1-7, 2021

21	Mostly made by people
6	Mostly made by computer programs
57	A mix of both people and computer programs
14	Not sure
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG12 When it comes to finding false information on their sites, do you think computer programs used by social media companies do... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTIONS 3 AND 4 ALWAYS LAST]**

Nov 1-7, 2021

19	A better job than humans
22	A worse job than humans
25	About the same job as humans
32	Not sure
2	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

SMALG13 Computer programs like the ones used by social media companies to find false information could be used for a number of purposes. Would you favor or oppose the use of computer programs to make final decisions about each of the following? **[RANDOMIZE ITEMS]**

	<u>Favor</u>	<u>Oppose</u>	<u>Not sure</u>	<u>No answer</u>
a. Which people should be approved for mortgages Nov 1-7, 2021	21	56	22	1
b. Which patients should get a medical treatment Nov 1-7, 2021	12	70	17	*
c. Which job applicants should move on to a next round of interviews Nov 1-7, 2021	18	60	21	1
d. Which people should be good candidates for parole Nov 1-7, 2021	13	64	23	1

**[PROGRAMMING NOTE: ASK BLOCKS 1-3 IF FORM 1; RANDOMIZE ORDER OF BLOCKS]****BLOCK 2****ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACERECVIG Facial recognition technology can identify someone by scanning their face in photos, videos or in real time. This technology could be used by police to look for people who may have committed a crime or monitor crowds in public spaces.

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC1 How much have you heard or read about facial recognition technology by police?

Nov 1-7, 2021

21	A lot
58	A little
20	Nothing at all
*	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC2 Do you think the widespread use of facial recognition technology by police would be a...

Nov 1-7, 2021

46	Good idea for society
27	Bad idea for society
27	Not sure
*	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC3 If the use of facial recognition technology by police becomes widespread, do you think each of the following would happen? The police would... **[RANDOMIZE ITEMS]**

		Definitely would <u>happen</u>	Probably would <u>happen</u>	Probably would NOT <u>happen</u>	Definitely would NOT <u>happen</u>	<u>No answer</u>
a.	Make more false arrests Nov 1-7, 2021	16	38	40	5	2
b.	Solve crimes more quickly and efficiently Nov 1-7, 2021	18	55	21	4	1
c.	Use the technology to monitor Black and Hispanic neighborhoods much more often than other neighborhoods Nov 1-7, 2021	26	40	24	8	2
d.	Find more missing persons Nov 1-7, 2021	21	57	18	2	1
e.	Be able to track everyone's location at all times Nov 1-7, 2021	27	42	24	6	1
f.	Be better able to keep crowds under control Nov 1-7, 2021	12	37	43	7	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC4 Do you think the widespread use of facial recognition technology by police will make policing... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

34	More fair
25	Less fair
40	Not make much difference
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC5 If the use of facial recognition technology by police becomes widespread, do you think crime would... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

8	Increase in the U.S.
33	Decrease in the U.S.
57	Stay about the same
3	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC6 How much of a role do you think each of the following groups should have in setting standards for how facial recognition technology is used by police? **[RANDOMIZE ITEMS]**

	<u>A major role</u>	<u>A minor role</u>	<u>No role at all</u>	<u>No answer</u>
a. Federal government agencies Nov 1-7, 2021	49	36	14	1
b. Companies that develop facial recognition technology Nov 1-7, 2021	41	38	20	1
c. Ordinary people Nov 1-7, 2021	40	38	21	1
d. Police departments that use facial recognition technology Nov 1-7, 2021	51	37	11	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC7 If the use of facial recognition technology by police becomes widespread, which is your greater concern? **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

47	Government will <u>go too far</u> regulating its use
51	Government will <u>not go far enough</u> regulating its use
2	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC8 Would the use of facial recognition technology by police be more acceptable, less acceptable or would it make no difference if... **[RANDOMIZE ITEMS]**

	<u>More acceptable</u>	<u>Less acceptable</u>	<u>No difference</u>	<u>No answer</u>
a. People without criminal records could opt-out of facial recognition databases Nov 1-7, 2021	45	26	28	2
b. People were notified of the public events and public spaces that were scanned for facial images Nov 1-7, 2021	53	18	28	2
c. Police officers were trained in how facial recognition systems can make errors in identifying people before they use it Nov 1-7, 2021	64	11	23	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC9 Which of the following statements best describes your views, even if neither is exactly right? **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

60	People should assume they are being monitored when they are in public spaces
39	People should have a right to privacy when they are in public spaces
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC10 If a facial recognition program said that someone was involved in a crime, should that be good enough evidence for police to arrest them, even if there was a small chance the program was wrong?

Nov 1-7, 2021

27	Yes
70	No
2	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC11 Would you consider each of the following uses of facial recognition technology by police to be acceptable or not acceptable? Scanning people ... **[RANDOMIZE ITEMS]**

	<u>Acceptable</u>	<u>Not acceptable</u>	<u>No answer</u>
a. At public protests Nov 1-7, 2021	61	38	1
b. As they enter large events like concerts to see who is in the crowd Nov 1-7, 2021	63	36	1
c. As they walk down the street Nov 1-7, 2021	31	68	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

FACEREC12 Facial recognition technology could be used for a number of purposes. Would you favor or oppose the use of facial recognition technology for each of the following purposes? **[RANDOMIZE ITEMS]**

	<u>Favor</u>	<u>Oppose</u>	<u>Not sure</u>	<u>No answer</u>
a. Companies automatically tracking the attendance of their employees Nov 1-7, 2021	30	48	22	1
b. Social media sites automatically identifying people in photos Nov 1-7, 2021	19	57	23	1
c. Retail stores enhancing credit card payment security by confirming account holders at checkout Nov 1-7, 2021	53	26	21	1
d. Apartment buildings tracking who enters or leaves their buildings Nov 1-7, 2021	51	30	18	1

**[PROGRAMMING NOTE: ASK BLOCKS 1-3 IF FORM 1; RANDOMIZE ORDER OF BLOCKS]**

**BLOCK 3****ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCCARSVIG Driverless passenger vehicles, sometimes called self-driving cars, are equipped with software allowing them to operate with computer assistance. In the future, driverless passenger vehicles are expected to be able to operate entirely on their own without a human driver.

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS1 How much have you heard or read about driverless passenger vehicles?

Nov 1-7, 2021

26	A lot
62	A little
12	Nothing at all
*	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS2 Do you think widespread use of driverless passenger vehicles would be a...

Nov 1-7, 2021

26	Good idea for society
44	Bad idea for society
29	Not sure
*	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS3 Would you personally want to ride in a driverless passenger vehicle, if you had the opportunity?

Nov 1-7, 2021

14	Definitely want
23	Probably want
32	Probably NOT want
30	Definitely NOT want
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS4 If the use of driverless passenger vehicles becomes widespread, do you think each of the following would happen? **[RANDOMIZE ITEMS]**

	Definitely would <u>happen</u>	Probably would <u>happen</u>	Probably would NOT <u>happen</u>	Definitely would NOT <u>happen</u>	<u>No answer</u>
a. Older adults and people with disabilities will be able to live more independently Nov 1-7, 2021	22	49	23	5	1
b. Many people who make their living by driving others or delivering things with passenger vehicles would lose their jobs Nov 1-7, 2021	37	46	13	3	*
c. Getting from place to place would be less stressful Nov 1-7, 2021	16	40	33	10	1
d. The computer systems in driverless passenger vehicles would be easily hacked in ways that put safety at risk Nov 1-7, 2021	25	51	20	3	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS5 If the use of driverless passenger vehicles becomes widespread, do you think that would... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST; USE SAME ORDER FOR DCARS6]**

Nov 1-7, 2021

46	Increase the gap between higher and lower-income Americans
8	Decrease the gap between higher and lower-income Americans
46	Not make much difference
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS6 If the use of driverless passenger vehicles becomes widespread, do you think that would... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST; USE SAME ORDER FOR DCARS5]**

Nov 1-7, 2021

27	Increase the number of people killed or injured in traffic accidents
39	Decrease the number of people killed or injured in traffic accidents
31	Not make much difference
3	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS7 In the case of an unavoidable accident, should the computer systems guiding driverless vehicles be designed to prioritize the safety of... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

40	The vehicle's passengers
18	Those outside of the vehicle
41	Not sure
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS8 How much of a role do you think each of the following groups should have in setting standards for how driverless passenger vehicles are used? **[RANDOMIZE ITEMS]**

	<u>A major role</u>	<u>A minor role</u>	<u>No role at all</u>	<u>No answer</u>
a. Federal government agencies Nov 1-7, 2021	53	32	14	1
b. The companies that develop driverless passenger vehicles Nov 1-7, 2021	62	29	8	1
c. The people who use driverless passenger vehicles Nov 1-7, 2021	54	33	12	1
d. The dealerships that sell driverless passenger vehicles Nov 1-7, 2021	25	37	36	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS9 If the use of driverless passenger vehicles becomes widespread, which is your greater concern? **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

43	Government will <u>go too far</u> regulating their use
55	Government will <u>not go far enough</u> regulating their use
3	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS10 Which statement comes closer to your view when it comes to ensuring the safety and effectiveness of driverless passenger vehicles? **[RANDOMIZE RESPONSE OPTIONS]**

Driverless passenger vehicles should be tested using...

Nov 1-7, 2021

11	Existing standards used for regular passenger vehicles
87	A higher standard than used for regular passenger vehicle
1	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS11 Would the use of driverless passenger vehicles be more acceptable, less acceptable or would it make no difference in each of the following circumstances? **[RANDOMIZE ITEMS]**

	<u>More acceptable</u>	<u>Less acceptable</u>	<u>No difference</u>	<u>No answer</u>
a. They were required to travel in dedicated lanes Nov 1-7, 2021	67	10	22	1
b. They were required to be labeled as driverless in order to be easily identified Nov 1-7, 2021	70	7	22	1
c. If regular reports about the number of accidents caused by them were required Nov 1-7, 2021	71	10	18	1
d. If someone in the vehicle was required to have a driver's license Nov 1-7, 2021	57	9	33	1

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS12 If the use of driverless passenger vehicles became widespread, how comfortable would you feel sharing the road with them?

Nov 1-7, 2021

7	Extremely comfortable
14	Very comfortable
34	Somewhat comfortable
27	Not too comfortable
18	Not comfortable at all
*	No answer

**ASK FORM 1 ONLY [XFORM=1] [N=5,153]:**

DCARS13 The technology used to operate driverless passenger vehicles could be used for a number of purposes. Would you favor or oppose the use of this technology in each of the following purposes? **[RANDOMIZE ITEMS]**

	<u>Favor</u>	<u>Oppose</u>	<u>Not sure</u>	<u>No answer</u>
a. Taxis and ride-sharing vehicles Nov 1-7, 2021	41	34	25	*
b. 18-wheeler trucks Nov 1-7, 2021	20	59	20	*
c. Buses for public transportation Nov 1-7, 2021	34	43	22	1
d. Delivery vehicles Nov 1-7, 2021	42	34	23	*

**[PROGRAMMING NOTE: ASK BLOCKS 4-6 IF FORM 2; RANDOMIZE ORDER OF BLOCKS]****BLOCK 4****ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

CHIPVIG Computer chips are being developed which could be surgically implanted in a person's brain. In the future, this could make it possible for people with the computer chip implants to far more quickly and accurately process information.

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP1 How much have you heard or read about computer chip implants in the brain that could make it possible for people to far more quickly and accurately process information?

Nov 1-7, 2021

5	A lot
32	A little
62	Nothing at all
*	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP2 Do you think widespread use of computer chip implants in the brain allowing people to far more quickly and accurately process information would be a...

Nov 1-7, 2021

13	Good idea for society
56	Bad idea for society
31	Not sure
1	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP3 Would you personally want a computer chip implant in the brain, allowing you to far more quickly and accurately process information, if you had the opportunity?

Nov 1-7, 2021

6	Definitely want
14	Probably want
28	Probably NOT want
50	Definitely NOT want
1	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP4 If the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, do you think each of the following would happen? **[RANDOMIZE ITEMS]**

	Definitely would <u>happen</u>	Probably would <u>happen</u>	Probably would NOT <u>happen</u>	Definitely would NOT <u>happen</u>	No <u>answer</u>
a. People who have these computer chip implants in the brain would be more productive at their jobs Nov 1-7, 2021	10	52	26	10	3
b. These computer chip implants in the brain would be used before we fully understand how they affect people's health Nov 1-7, 2021	36	42	13	7	2
c. The use of these computer chip implants in the brain would lead to new innovation and problem solving in society Nov 1-7, 2021	11	48	27	11	3
d. These techniques would go too far eliminating natural differences between people in society Nov 1-7, 2021	32	39	19	8	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP5 If the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, which statement better describes how you would feel about this development? **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

35	As humans, we are always trying to better ourselves and this idea is no different
63	This idea is meddling with nature and crosses a line we should not cross
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP6 If the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, do you think most people would...

Nov 1-7, 2021

60	Feel pressure to get this
38	Not feel pressure to get this
2	No answer

**[RANDOMIZE ORDER OF BCHIP7 AND BCHIP8]****ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP7 If the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, do you think people's judgments and decision-making would be... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

24	Better than now
31	Worse than now
42	About the same as now
3	No answer

**[RANDOMIZE ORDER OF BCHIP7 AND BCHIP8]****ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP8 If the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, do you think it would... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

57	Increase the gap between higher and lower-income Americans
10	Decrease the gap between higher and lower-income Americans
30	Not make much difference
3	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP9 If the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, how often do you think each of these potential problems would happen? **[RANDOMIZE ITEMS]**

	<u>A lot of the time</u>	<u>Some of the time</u>	<u>Rarely or never</u>	<u>No answer</u>
a. The computer chip implant would malfunction Nov 1-7, 2021	37	54	7	2
b. Hackers would gain access to people's computer chip information without consent Nov 1-7, 2021	52	39	7	1
c. The computer chip implant would cause unwanted changes to the way the brain functions Nov 1-7, 2021	51	41	6	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP10 How much of a role do you think each of the following groups should have in setting standards for how computer chip implants in the brain are used? **[RANDOMIZE ITEMS]**

	<u>A major role</u>	<u>A minor role</u>	<u>No role at all</u>	<u>No answer</u>
a. Federal government agencies Nov 1-7, 2021	44	27	27	2
b. The companies that develop these computer chip implants Nov 1-7, 2021	46	35	17	2
c. The people getting these computer chip implants Nov 1-7, 2021	65	21	12	2
d. The medical doctors who implant the computer chips in the brain Nov 1-7, 2021	64	24	10	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP11 If the use of computer chip implants in the brain becomes widespread, allowing people to far more quickly and accurately process information, which is your greater concern?  
**[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

47	Government will <u>go too far</u> regulating their use
50	Government will <u>not go far enough</u> regulating their use
3	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP12 Which statement comes closer to your view when it comes to ensuring the safety and effectiveness of computer chip implants in the brain?

Implanted computer chips in the brain should be tested using... **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

13	Existing standards used for medical devices
83	A higher standard than used for medical devices
3	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP13 Would the use of computer chip implants in the brain be more acceptable, less acceptable or would it make no difference in each of the following circumstances?  
**[RANDOMIZE ITEMS]**

	<u>More acceptable</u>	<u>Less acceptable</u>	<u>No difference</u>	<u>No answer</u>
a. If people could turn on and off the effects Nov 1-7, 2021	59	9	31	2
b. If it could be put in place without surgery Nov 1-7, 2021	53	9	36	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

BCHIP14 Computer chip implants in the brain could be used for a number of purposes. Would you favor or oppose the use of computer chips implants in the brain for each of the following purposes? **[RANDOMIZE ITEMS]**

	<u>Favor</u>	<u>Oppose</u>	<u>Not sure</u>	<u>No answer</u>
a. To treat age-related decline in mental abilities Nov 1-7, 2021	64	13	21	1
b. To allow increased movement for people who are paralyzed Nov 1-7, 2021	77	8	14	1
c. To make it possible for thoughts in the brain to search content on the internet without typing Nov 1-7, 2021	25	42	31	1
d. To translate thoughts in the brain, without speaking, into text on a screen Nov 1-7, 2021	32	34	32	1

**[PROGRAMMING NOTE: ASK BLOCKS 4-6 IF FORM 2; RANDOMIZE ORDER OF BLOCKS]**

**BLOCK 5****ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEVIG New ways to modify a person's genes are being developed that could make it possible to change the DNA of embryos before a baby is born in order to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime.

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV1 How much have you heard or read about using gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime?

Nov 1-7, 2021

8	A lot
47	A little
44	Nothing at all
1	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV2 Do you think the widespread use of gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime would be a...

Nov 1-7, 2021

30	Good idea for society
30	Bad idea for society
39	Not sure
*	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV3 If gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime were available, is this something you would want?

Nov 1-7, 2021

16	Yes, I would definitely want this for my baby
32	Yes, I would probably want this for my baby
25	No, I would probably NOT want this for my baby
24	No, I would definitely NOT want this for my baby
3	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV4 If the use of gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime becomes widespread, do you think each of the following would happen? **[RANDOMIZE ITEMS]**

	Definitely would <u>happen</u>	Probably would <u>happen</u>	Probably would NOT <u>happen</u>	Definitely would NOT <u>happen</u>	No <u>answer</u>
a. Even if gene editing is used appropriately in some cases, others would use these techniques in ways that are morally unacceptable Nov 1-7, 2021	45	39	9	5	2
b. These gene editing techniques would help people live longer and better quality lives Nov 1-7, 2021	13	52	23	9	3
c. Development of these gene editing techniques would pave the way for new medical advances that benefit society as a whole Nov 1-7, 2021	16	51	22	8	3
d. These gene editing techniques would go too far eliminating natural differences between people in society Nov 1-7, 2021	24	44	22	7	3

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV5 If the use of gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime becomes widespread, which statement better describes how you would feel about this development? **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

46	As humans, we are always trying to better ourselves and this idea is no different.
52	This idea is meddling with nature and crosses a line we should not cross.
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV6 If the use of gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime becomes widespread, do you think most parents would...

Nov 1-7, 2021

73	Feel pressure to get this for their baby
25	Not feel pressure to get this for their baby
2	No answer

**RANDOMIZE ORDER OF GENEV7 AND GENEV8****ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV7 If the use of gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime becomes widespread, do you think people's quality of life would be... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

39	Better than now
18	Worse than now
40	About the same as now
3	No answer

**RANDOMIZE ORDER OF GENEV7 AND GENEV8****ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV8 If the use of gene editing to greatly reduce a baby's risk of developing serious diseases or health conditions over their lifetime becomes widespread, do you think it would... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

55	Increase the gap between higher and lower-income Americans
8	Decrease the gap between higher and lower-income Americans
35	Not make much difference
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV9 How much of a role do you think each of the following groups should have in setting standards for how gene editing techniques are used? **[RANDOMIZE ITEMS]**

	<u>A major role</u>	<u>A minor role</u>	<u>No role at all</u>	<u>No answer</u>
a. Federal government agencies Nov 1-7, 2021	41	31	26	2
b. The companies that develop these gene editing techniques Nov 1-7, 2021	44	35	19	2
c. People who get these gene editing techniques Nov 1-7, 2021	55	29	15	2
d. The medical scientists who provide these gene editing techniques Nov 1-7, 2021	67	21	10	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV10 If the use of gene editing to greatly reduce a baby's risk of serious diseases or health conditions over their lifetime becomes widespread, which is your greater concern?  
**[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

47	Government will <u>go too far</u> regulating their use
51	Government will <u>not go far enough</u> regulating their use
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV11 Which statement comes closer to your views when it comes to ensuring the safety and effectiveness of these gene editing techniques?

Gene editing to greatly reduce a baby's risk of serious diseases or health conditions over their lifetime should be tested using... **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

17	Existing standards used for medical treatments
80	A higher standard than used for medical treatments
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV12 Would the use of gene editing to greatly reduce a baby's risk of serious diseases or health conditions over their lifetime be more acceptable, less acceptable or would it make no difference in each of the following circumstances? **[RANDOMIZE ITEMS]**

	<u>More acceptable</u>	<u>Less acceptable</u>	<u>No difference</u>	<u>No answer</u>
a. If people could choose which diseases and conditions are affected Nov 1-7, 2021	49	15	34	2
b. If the effects were limited to that person and NOT passed on to future generations Nov 1-7, 2021	48	16	34	2
c. If gene editing were only used in adults who could consent to the procedure, rather than for babies Nov 1-7, 2021	53	11	34	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

GENEV13 Gene editing could be used for a number of purposes. Would you favor or oppose the use of gene editing for each of the following purposes? **[RANDOMIZE ITEMS]**

	<u>Favor</u>	<u>Oppose</u>	<u>Not sure</u>	<u>No answer</u>
a. To change a baby's physical characteristics to make them more attractive Nov 1-7, 2021	5	74	20	1
b. To treat serious diseases or health conditions that a person currently has Nov 1-7, 2021	71	10	18	1

**[PROGRAMMING NOTE: ASK BLOCKS 4-6 IF FORM 2; RANDOMIZE ORDER OF BLOCKS]****BLOCK 6****ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOVIG Robotic exoskeletons are being developed that could make it possible to greatly increase a person's strength and allow them to lift heavy objects when wearing the device. These devices could include an artificial intelligence computer system to help guide the device. They are expected to be used by workers doing manual labor jobs, such as manufacturing or construction.

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV1 How much have you heard or read about robotic exoskeletons with built-in artificial intelligence computer systems for manual labor?

Nov 1-7, 2021

6	A lot
37	A little
57	Nothing at all
*	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV2 Do you think widespread use of robotic exoskeletons would be a...

Nov 1-7, 2021

33	Good idea for society
24	Bad idea for society
42	Not sure
*	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV3 Would you personally want to use a robotic exoskeleton with a built-in artificial intelligence computer system for manual labor, if you had the opportunity?

Nov 1-7, 2021

15	Definitely want
30	Probably want
33	Probably NOT want
21	Definitely NOT want
1	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV4 If the use of robotic exoskeletons for manual labor becomes widespread, do you think each of the following would happen? **[RANDOMIZE ITEMS]**

	Definitely would <u>happen</u>	Probably would <u>happen</u>	Probably would NOT <u>happen</u>	Definitely would NOT <u>happen</u>	<u>No answer</u>
a. Employers would need fewer workers and lay off part of their work force Nov 1-7, 2021	38	44	14	3	2
b. Workers would experience fewer workplace injuries Nov 1-7, 2021	17	53	23	5	2
c. Workers would lose strength by relying too much on exoskeletons Nov 1-7, 2021	22	51	21	4	2
d. More people would be able to do manual labor jobs Nov 1-7, 2021	20	45	24	8	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV5 If the use of robotic exoskeletons for manual labor becomes widespread, which statement better describes how you would feel about this development **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

62	As humans, we are always trying to better ourselves and this idea is no different
36	This idea is meddling with nature and crosses a line we should not cross
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV6 If the use of robotic exoskeletons for manual labor becomes widespread, do you think conditions for workers would be... **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

32	Better than now
31	Worse than now
36	About the same as now
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV7 Thinking about the manufacturing of robotic exoskeletons, which of the following statements comes closest to your view, even if neither is exactly right? **[RANDOMIZE RESPONSE OPTIONS 1 AND 2, WITH OPTION 3 ALWAYS LAST]**

Nov 1-7, 2021

40	Robotic exoskeletons should only be made if they fit a wide range of worker body types, even if that increase their cost
17	It's okay to make robotic exoskeletons that just fit the typical body types of manual labor workers in order to lower their cost, even if they won't work for many other people
41	Not sure
1	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV8 How much of a role do you think each of the following groups should have in setting standards for how robotic exoskeletons for manual labor are used? **[RANDOMIZE ITEMS]**

	<u>A major role</u>	<u>A minor role</u>	<u>No role at all</u>	<u>No answer</u>
a. Federal government agencies Nov 1-7, 2021	35	39	25	2
b. The companies that develop robotic exoskeletons Nov 1-7, 2021	55	31	12	2
c. The workers themselves Nov 1-7, 2021	67	22	9	2
d. Employers Nov 1-7, 2021	49	38	11	2

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV9 If the use of robotic exoskeletons for manual labor becomes widespread, which is your greater concern? **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

49	Government will <u>go too far</u> regulating their use
48	Government will <u>not go far enough</u> regulating their use
3	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV10 Which statement comes closer to your view when it comes to ensuring the safety and effectiveness of robotic exoskeletons for manual labor?

Robotic exoskeletons should be tested using... **[RANDOMIZE RESPONSE OPTIONS]**

Nov 1-7, 2021

26	Existing standards used for workplace equipment
72	A higher standard than used for workplace equipment
2	No answer

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV11 Would the use of a robotic exoskeleton with a built-in artificial computer system for manual labor be more acceptable, less acceptable or would it make no difference in each of the following circumstances?

	<u>More acceptable</u>	<u>Less acceptable</u>	<u>No difference</u>	<u>No answer</u>
a. If employers could only use robotic exoskeletons to improve worker safety, rather than to increase their productivity Nov 1-7, 2021	59	14	25	2
b. If people were required to be licensed to operate robotic exoskeletons Nov 1-7, 2021	68	10	21	1

**ASK FORM 2 ONLY [XFORM=2] [N=5,107]:**

EXOV12 Robotic exoskeletons with built-in artificial intelligence computer systems could be used for a number of purposes. Would you favor or oppose the use of robotic exoskeletons for each of the following purposes? **[RANDOMIZE ITEMS]**

	<u>Favor</u>	<u>Oppose</u>	<u>Not sure</u>	<u>No answer</u>
a. To improve the quality of life for people with physical limitations Nov 1-7, 2021	79	6	14	1
b. To give people greater strength for recreational activities Nov 1-7, 2021	20	49	30	1
c. To increase the ability of firefighters to lift in emergency situations Nov 1-7, 2021	77	7	14	1

**ASK ALL:**

PARTY In politics today, do you consider yourself a:

**ASK IF INDEP/SOMETHING ELSE (PARTY=3,4) OR MISSING:**

PARTYLN As of today do you lean more to...<sup>4</sup>

<u>Republican</u>	<u>Democrat</u>	<u>Independent</u>	<u>Something else</u>	<u>No answer</u>	<u>Lean Rep</u>	<u>Lean Dem</u>
26	31	27	14	2	17	20

<sup>4</sup> PARTY and PARTYLN asked in a prior survey.