A JOURNAL BY SISSA MEDIALAB

ARTICLE

Who thinks we'll be uploading minds on terraformed planets? Science fiction, science news, and attitudes toward speculative technologies

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Abstract

Extending previous research on how science fiction viewing and science news use predict attitudes toward a range of *emerging* technologies, this study draws on theories of genre-specific cultivation and narrative transportation to analyze how media consumption predicts attitudes toward two *speculative* technologies: mind uploading and terraforming. Results from a survey of the U.S. public (N = 1,015) show that science fiction viewing was positively related to support for mind uploading, while science fiction transportation was positively related to support for terraforming, belief that people are likely to develop mind uploading, and belief that people are likely to develop terraforming. Transportation also mediated relationships between science fiction viewing and attitudes. In addition, science news use was positively related to support for each technology and belief that people are likely to develop each technology. These findings highlight the potential role of media factors in predicting attitudes about hypothetical technologies.

Keywords

Public perception of science and technology; Science and media

Received: 13th January 2025
Accepted: 17th May 2025
Published: 28th July 2025

1 ▪ Introduction

Since their inception, science fiction and science news have played important roles in shaping public images of new technologies. Over the decades, a range of media — including films, entertainment television programs, newspapers, and television news programs — have presented both optimistic and frightening portrayals of many different emerging technologies, from atomic power to the internet [Kirby, 2011; Nelkin & Lindee, 2010; Perkowitz, 2007]. Furthermore, research has found that consumption of these depictions can predict audience members' attitudes regarding new technologies [Nisbet et al., 2002]. For example, science fiction viewing predicts attitudes toward technologies such as artificial intelligence [Brewer et al., 2022; Nader et al., 2022], biotechnology [Nisbet & Goidel, 2007], gene editing [Eichmeier et al., 2023], and robotics [Young & Carpenter, 2018]. Similarly, science news consumption predicts attitudes toward technologies ranging from artificial intelligence [Brewer et al., 2022; Wen & Chen, 2024] to biotechnology [Besley & Shanahan, 2005] to nanotechnology [Ho et al., 2011].

To date, most of the research in this area has focused on *emerging* technologies — that is, technologies in their initial stages of development. However, entertainment and news media also provide an array of messages about *speculative*, or hypothetical, technologies. As Kirby [2009, p. 43] argues, such depictions can offer "prototypes that demonstrate to large public audiences a technology's need, benevolence and viability." Consequently, these media portrayals may help to promote funding and popular enthusiasm for speculative technologies — which, in some cases, can help turn them into realities [Kirby, 2009]. For example, depictions of virtual reality in the 1992 film *Lawnmower Man* and gesture-based interfaces in the 2002 film *Minority Report* contributed to the real-world development of these technologies [Kirby, 2009].

By contrast, other speculative technologies portrayed in the media remain purely hypothetical at present. Consider the cases of *mind uploading*, the emulation of a human consciousness in a digital computer [Cave, 2020; Laakasuo et al., 2018] and *terraforming*, the use of technology to make an otherwise uninhabitable planet habitable by humans [Beech, 2009; Kaku, 2018]. Both technologies currently lie well beyond the realm of feasibility, let alone emergent status. Nevertheless, entertainment and news media have devoted substantial attention to them. For example, audience members can find depictions of mind uploading [Graziano, 2019; Katz, 2018] and terraforming [Ball, 2019] in Hollywood science fiction blockbusters, science fiction television dramas, and stories from major news outlets. The same is true for a host of other as-yet speculative technologies, including antigravity, cloaking devices, cold fusion, de-extinction, interstellar travel, and simulated realities.

Despite the visibility of such technologies in the media and the potential for media prototypes to promote public support for them, research has paid relatively little attention to how media consumption may be linked to attitudes regarding speculative technologies. With this in mind, the present study extends research on media use and attitudes regarding emerging technologies to the more speculative domains of mind uploading and terraforming. Drawing on theories of genre-specific cultivation [Hawkins & Pingree, 1980; Lee & Niederdeppe, 2010; Potter & Chang, 1990] and narrative transportation [Bilandzic & Busselle, 2008; Green & Brock, 2000a, 2000b], it analyzes original data from an online survey of the United States public that measured support for both types of technology as well as beliefs about the likelihood of their future development. The study's findings highlight how multiple forms of media consumption can predict public opinion about speculative technologies.

2 ▪ Science fiction viewing, transportation, and technology attitudes

The role of science fiction viewing in predicting attitudes toward emerging technologies follows from the logic of cultivation theory [Brewer & Ley, 2021; Dawson et al., 2022; Eichmeier et al., 2023]. The original formulation of this theory [Gerbner & Gross, 1976; Shanahan & Morgan, 1999] emphasized how public perceptions of social reality — including perceptions of science and technology — can reflect dominant portrayals in the overarching media system, particularly entertainment television. For example, research drawing on a cultivation perspective has demonstrated that overall exposure to television — which tends to portray scientists as good but science as dangerous — can predict reservations about science and technology [Dudo et al., 2010; Gerbner et al., 1981] while also predicting belief in the promise of science and technology [Nisbet et al., 2002] and belief that scientists work for the good of humanity [Brewer & Ley, 2021].

Yet subsequent research has highlighted how differences across genres in media content can contribute to genre-specific patterns in the cultivation of beliefs and attitudes [Hawkins & Pingree, 1980; Potter & Chang, 1990; Lee & Niederdeppe, 2010]. Looking at science fiction viewing in particular, one study found that this form of viewing predicted reservations about developments in robotics [Young & Carpenter, 2018]. At the same time, other studies have found that science fiction consumption is associated with support for a range of emerging technologies, including therapeutic cloning [Nisbet & Goidel, 2007], artificial intelligence [Brewer et al., 2022], gene editing [Eichmeier et al., 2023], and robotic space probes [Bingaman et al., 2024]. The latter findings dovetail with Kirby's [2009, p. 66] argument that science fiction prototypes — even ambivalent or frightening ones — can "create public excitement about nascent technologies."

Just as emerging technologies have featured prominently in science fiction media, so, too, have speculative technologies. For example, the technology-themed anthology television program *Black Mirror* has presented both optimistic and pessimistic portrayals of mind uploading. In terms of the former, the episode "San Junipero" dramatizes the potential for the technology to give humans a form of digital immortality by depicting two dead lovers who reunite as virtual consciousnesses in a simulated reality. By contrast, other episodes of the program illustrate frightening applications of mind uploading technology: "White Christmas" features a man who keeps uploaded consciousnesses imprisoned as virtual servants, while "Black Museum" depicts an uploaded consciousness being repeatedly submitted to virtual electrocution.

Similarly, science fiction films and television programs have presented benign, ominous, and ambivalent portrayals of terraforming technology. For example, films and television programs in the *Star Trek* franchise depict a technology named Genesis that can rapidly transform lifeless words to living ones but can also destroy life on inhabited planets in the process of terraforming them. The technology first appears in the film *Star Trek: The Wrath of Khan*, which features two protagonists (Mr. Spock and Dr. McCoy) debating its implications. Taking a longer but similarly complex view, the television drama *The Expanse* depicts a centuries-spanning terraforming project on Mars that is still underway when the program's story begins and stalls as the plotline progresses.

Although science fiction had presented mixed portrayals of mind uploading and terraforming, even menacing depictions may provide viewers with vivid prototypes of the possibilities these technologies could offer. By way of precedent, the horror-themed portrayals of virtual reality in *Lawnmower Man* generated enthusiasm for its development [Kirby, 2009], and the cautionary tales of de-extinction in the *Jurassic World* franchise may have fostered support for proposed efforts at reviving species such as mammoths [Brewer & Ley, 2021].

Extending theoretical accounts regarding genre-specific cultivation of technology attitudes [Brewer & Ley, 2021; Eichmeier et al., 2023] and the role of prototypes in science fiction [Kirby, 2009], the present study tests the following hypothesis:

> H1: Science fiction viewing will be positively related to (A) support for mind uploading and terraforming and (B) belief that people are likely to develop these technologies.

In addition, this study examines the potential role of narrative transportation — that is, the mental process of becoming lost or absorbed in a story [Green & Brock, 2000a, 2000b] — in mediating any relationships between science fiction viewing and attitudes toward speculative technologies. Building on the theoretical premise that cognitive and emotional immersion in narratives can shape audience members' evaluations and beliefs [Green & Brock, 2000a], previous research has pointed to such transportation as a potential mechanism underlying genre-specific cultivation [Bilandzic & Busselle, 2008]. If stories are "the central communicative unit[s] in long-term cultivation effects," as Bilandzic and Busselle [2008, pp. 508–509] argue, then immersion in narratives may increase knowledge, foster interest, and facilitate information processing regarding topics portrayed in a specific genre such as science fiction. Transportation may also reduce counterarguing against messages embedded in narratives, thereby enhancing their persuasive effects [Green & Brock, 2002; Bilandzic & Busselle, 2008]. Moreover, transportation — and, thus, enjoyment [Green & Brock, 2000b] — induced by genre-specific viewing may motivate audience members to seek out similar content, thereby reinforcing relationships between genre-specific viewing and relevant attitudes [Bilandzic & Busselle, 2008].

In keeping with this theoretical model, Bilandzic and Busselle [2008] found that experimental participants with high levels of propensity toward transportation (*transportability*) were more like experience transportation in response to viewing content from specific genres of television, including science fiction. They also found that such transportation can — but does not always — predict genre-relevant attitudes. Subsequent research applying their framework has yielded further evidence that narrative transportation can mediate genre-specific cultivation [McKinley, 2013; McNallie, 2022].

Drawing on this same framework, scholars have suggested that narrative transportation may shape attitudes toward science and technology [Green & Appel, 2024; Kaplan & Dahlstrom, 2017; Merry & Payne, 2025]. More specifically, recent studies have argued that immersion in science fiction narratives may influence attitudes toward emerging technologies [Brewer & Ley, 2021; Brewer et al., 2022; Eichmeier et al., 2023]. Given that science fiction narratives frequently present new technologies, regular viewers of the genre may be particularly likely to develop schemas, or knowledge structures, that shape message processing and, ultimately, attitudes about such technologies; additionally, these viewers may be especially motivated to

seek out science fiction portrayals in the future [Bilandzic & Busselle, 2008]. Thus, the present study goes beyond examining the role of science fiction *viewing* to test whether science fiction *transportation* explains attitudes toward speculative technologies:

> H2: Science fiction transportation will be positively related to (A) support for mind uploading and terraforming and (B) belief that people are likely to develop these technologies.

Given the potential role of narrative transportation as a mechanism connecting genre-specific media consumption — including science fiction viewing — to attitudes [Bilandzic & Busselle, 2008; Brewer & Ley, 2021; Brewer et al., 2022; Eichmeier et al., 2023; Green & Appel, 2024; Kaplan & Dahlstrom, 2017], this study tests also whether any relationships between the former and the latter flow in part through science fiction transportation:

> H3: Science fiction transportation will mediate (A) the relationship between science fiction viewing and support for speculative technologies and (B) the relationship between science fiction viewing and belief that people are likely to develop these technologies.

3 ▪ Science news and technology attitudes

Just as science fiction can be conceptualized within the framework of genre-specific cultivation, so can science news. By way of precedent, previous research has identified television news viewing as a form of genre-specific media use that predicts attitudes about a variety of topics [Goidel et al., 2006; Lett et al., 2004]. Similarly, studies have highlighted local news as a specific genre that can cultivate attitudes [Gross & Aday, 2003; Lee & Niederdeppe, 2010; Niederdeppe et al., 2010; Romer et al., 2003]. More broadly, a meta-analysis of cultivation studies found that among forms of genre-specific media use, news consumption tended to yield relatively large effect sizes in predicting attitudes [Hermann et al., 2021].

The role of news use in cultivating attitudes extends to science and technology topics, as well [Mede, 2022]. As a case in point, Nisbet et al. [2002] found that news consumption predicted general reservations about science [see also Dudo et al., 2010] but also general faith in the promise of science. Additionally, studies have found that science news use can predict trust in scientists in general [Cacciatore et al., 2016] along with trust in scientists as sources of information about emerging technologies [Anderson et al., 2011]. Looking at attitudes toward particular emerging technologies, studies have shown that news use is linked to favorable views regarding biotechnology [Besley & Shanahan, 2005], stem cell research [Liu & Priest, 2009], nanotechnology [Lee & Scheufele, 2006; Ho et al., 2011], self-driving vehicles [Ho et al., 2020], artificial intelligence [Brewer et al., 2022], gene editing [Dawson et al., 2022; Eichmeier et al., 2023], and space probes and telescopes [Bingaman et al., 2024].

The same pattern could extend to the context of speculative technologies. In recent years, prominent news outlets — including leading newspapers and major broadcast television networks — have covered mind uploading as a potentially feasible tool of social and

scientific progress. For example, an April 8, 2022, CNBC story quoted Elon Musk (at the time, best known as a technology entrepreneur) as saying, "I think it is possible … we could download the things that we believe make ourselves so unique" [Sauer, 2022], and an October 2, 2024, *New York Time*s story about a project mapping fly neurons quoted one project leader as saying, "Mind uploading has been a science fiction, but now mind uploading — for a fly, at least — is becoming mainstream science" [Zimmer, 2024]. Similarly, leading newspapers and television news channels have covered speculative proposals for making Mars and perhaps other planets inhabitable by humans. As a case in point, a January 2, 2022, *New York Time*s story ran under the headline, "NASA's retiring top scientist says we can terraform Mars and maybe Venus, too" [O'Callaghan, 2022]. Two days later, CNN ran a story (with a chyron stating, "Top NASA scientist: 'Yes, we can terraform Mars,"') in which another NASA astrophysicist described an approach for making Mars habitable [CNN, 2022].

In light of such coverage — as well as previous findings that consumption of science and technology news coverage can cultivate support for emerging technologies [Besley & Shanahan, 2005; Bingaman et al., 2022; Brewer et al., 2022; Dawson et al., 2022; Lee & Scheufele, 2006] — the present study proposes the following hypothesis:

> H4: Science news use will be positively related to (A) support for mind uploading and terraforming and (B) belief that people are likely to develop these technologies.

4 ▪ Theoretical model

Figure 1 illustrates the model underlying the hypothesized relationships among science fiction viewing, science fiction transportation, science news use, and attitudes toward speculative technologies. This model includes the proposed direct relationship between science fiction viewing and attitudes (H1) and the proposed direct relationship between science fiction transportation and attitudes (H2), as well as an indirect relationship between science fiction viewing and attitudes through science fiction transportation (H3). In addition, the figure depicts the hypothesized direct relationship between science news use and attitudes toward speculative technologies (H4).

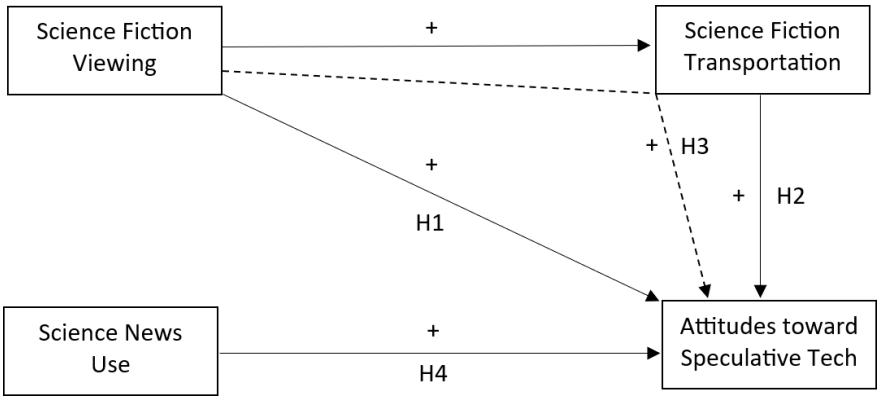

Figure 1. Model of media variables and attitudes toward speculative technologies.

5 ▪ Methods

The data for this study come from an online survey designed by the authors and fielded by the survey firm Qualtrics (https://www.qualtrics.com/) from 2 February to 18 February 2024. A national sample of adult United States residents (N = 1,015) was selected from Qualtrics panels based on population quotas for gender, age, race, education, income, and region. The study design was approved by the Institutional Review Board of the authors' institution. Key measures were as follows:

5.1 ▪ *Science fiction viewing*

Respondents were asked how often they watched "science fiction movies or television shows," with options ranging from nearly every day (coded as 3) to less than a few times a month (coded as 0) (M = 1.29; SD = 1.03).

5.2 ▪ *Science fiction transportation*

Given that narrative transportation includes both cognitive and affective components [Green & Brock, 2000a], respondents who reported watching science fiction at least a few times a month were asked how "mentally immersed" and "emotionally immersed" they felt while watching it, with options ranging from very (coded as 3) to not at all/did not watch (coded as 0). Responses to the two items were averaged to create an index (r = .89; M = 1.42; SD = 1.11).

5.3 ▪ *Science news use*

The survey included two items asking respondents how closely they followed "news about science" and "news about technology," with options ranging from very (coded as 3) to not at all (coded as 0). Responses were averaged to create an index (r = .67; M = 1.61; SD = 0.84).

5.4 ▪ *Attitudes toward speculative technologies*

Four questions measured attitudes toward the speculative technologies of interest. The first item asked respondents how much they supported or opposed "developing technology for uploading human minds to a computer system," (M = 1.72; SD = 1.37), with options ranging from strongly support (coded as 4) to strongly oppose (coded as 0). Another item asked respondents how likely they thought it was that people would develop such technology (M = 1.76; SD = 0.95), with options ranging from very likely (coded as 3) to very unlikely (coded as 0). Two more items asked respondents (using the same response options as before) how much they supported or opposed "developing technology for transforming the environments of other planets so that humans can live on them" (M = 2.28; SD = 1.26) and how likely they thought it was that people would develop this form of technology (M = 1.72; SD = 0.95). Question order was constant across all respondents, with the mind uploading questions first and the terraforming questions second.

5.5 ▪ *Control variables*

The survey also measured background variables that may influence support for new technologies [e.g., Besley & Shanahan, 2005; Brewer et al., 2022; Eichmeier et al., 2023; Ho

et al., 2011; Nisbet & Goidel, 2007] including overall viewing of television and movies (none = 0; 4 or more hours a day = 4; *M* = 2.71; *SD* = 1.20); political ideology (very liberal = 0; very conservative = 6; *M* = 3.24; *SD* = 1.73); importance of religion to the respondent (not at all = 0; very = 3; *M* = 1.87; *SD* = 1.13); self-identified gender (female = 54%; male = 45%; nonbinary < 1%); age (in years; *M* = 45.82; *SD* = 17.71); self-identification as Black (13%), Hispanic (19%), and Asian American (6%); education (no high school diploma = 0; postgraduate degree = 5; *M* = 2.66; *SD* = 1.45); and income (<$10K = 0; $\geq$ $150K = 11; *M* = 5.93; *SD* = 3.54). The inclusion of self-identified race and ethnicity was motivated by survey findings in the U.S. context of particularly high levels of distrust in science among Black respondents, reflecting a history of race-based exploitation and exclusion in scientific research [Corbie-Smith et al., 2002; Plutzer, 2013], along with recent findings of distinctly high distrust in science among Hispanic respondents [Funk et al., 2019].

6 ▪ Results

A series of mediation models tested the study's hypotheses about media factors and attitudes toward speculative technologies. These models allowed the key media variables — science fiction viewing, science fiction transportation, and science news use — to directly predict respondents' attitudes. The models also allowed for indirect relationships from science fiction viewing to attitudes through science fiction transportation. In addition, the models allowed the control variables to predict attitudes. The models were estimated using Model 4 in the PROCESS macro for SPSS [see Hayes, 2017].

Table 1 reports the zero-order correlations between the independent variables and each of the dependent variables. The correlations for the key independent variables followed the expected patterns: science fiction viewing, science fiction transportation, and science news use were all positively related to each dependent variable ($p < .01$ for each). By contrast, overall media viewing was not significantly correlated with any of the dependent variables. Self-identification as male was positively correlated with the attitude measures, while age was negatively related to them ($p < .05$ or better for each). The other background factors were inconsistently correlated with attitudes.

Turning to the results of the mediation models (Table 2), science fiction viewing directly predicted greater support for mind uploading (Figure 2; direct effect = .27; $p < .01$) but did not directly predict support for terraforming (Figure 3), belief that people are likely to develop technology for mind uploading (Figure 4), or belief that people are likely to develop technology for terraforming (Figure 5). At first glance, then, the results provided only partial support for H1A and no support for H1B (but see below).

Shifting from science fiction viewing to science fiction transportation, the analysis found no role of such transportation in predicting support for mind uploading. On the other hand, science fiction transportation predicted greater support for terraforming (direct effect = .20; $p < .01$), belief that people are likely to develop technology for mind uploading (direct effect = .09; $p < .05$), and belief that people are likely to develop technology for terraforming (direct effect = .16; $p < .01$). Thus, the results yielded partial support for H2A and consistent support for H2B.

In regard to mediation, the analysis found no indirect relationship between science fiction viewing and support for mind uploading through science fiction transportation (indirect

Table 1. Zero-order correlations between independent variables and attitudes toward speculative technologies.

	Support mind uploading	Support terraforming	Mind uploading likely	Terraforming likely
Sci-fi viewing	.39**	.30**	.17**	.25**
Sci-fi transportation	.37**	.37**	.23**	.33**
Science news use	.38**	.41**	.32**	.37**
Total media viewing	-.01	.03	.05	.02
Political ideology	.05	.06	.06	-.01
Religiosity	.04	-.01	.07*	.03
Self ID as male	.17**	.20**	.07*	.09**
Age (in years)	-.24**	-.15**	-.12*	-.18**
Self ID as Black	.01	-.07*	.01	-.03
Self ID as Hispanic	.03	.05	.05	.13**
Self ID as Asian	.07**	.001	.002	-.02
Education	-.003	.03	.04	.06
Income	-.07*	.07*	.03	.03

Note: N=1,000; *$p \leq .05$; **$p \leq .01$.

Table 2. Predicting support for speculative technologies and belief in their likely development.

	Support mind uploading	Support terraforming	Mind uploading likely	Terraforming likely
Sci-fi viewing	.27**(.06)	.02(.05)	-.04(.04)	-.03(.04)
Sci-fi transportation	.05(.06)	.20**(.06)	.09*(.04)	.16**(.04)
Science news use	.42**(.06)	.41**(.05)	.29**(.04)	.29**(.04)
Total media viewing	-.02(.03)	.003(.03)	.03(.03)	.002(.02)
Political ideology	.002(.02)	.02(.02)	.02(.02)	-.02(.02)
Religiosity	.02(.04)	-.02(.03)	.04(.03)	.02(.03)
Self ID as male	.26**(.08)	.26**(.07)	.02(.06)	.06(.06)
Age (in years)	-.01**(.002)	-.01**(.002)	-.004*(.002)	-.01**(.002)
Self ID as Black	-.08(.12)	-.22*(.11)	-.03(.09)	-.11(.09)
Self ID as Hispanic	-.09(.11)	.07(.10)	.04(.08)	.18*(.08)
Self ID as Asian	.45**(.17)	.16(.16)	.10(.13)	-.02(.12)
Education	.01(.03)	-.02(.03)	.004(.02)	.02(.02)
Income	-.03*(.01)	.02(.01)	.003(.01)	.003(.01)
Constant	1.17**(.19)	1.40**(.18)	1.19**(.14)	1.26**(.14)
R^2	.25	.23	.12	.18
N	1,000	1,000	1,000	1,000

Note: Table entries are coefficients in PROCESS mediation models, with standard errors in parentheses; *$p \leq .05$; **$p \leq .01$.

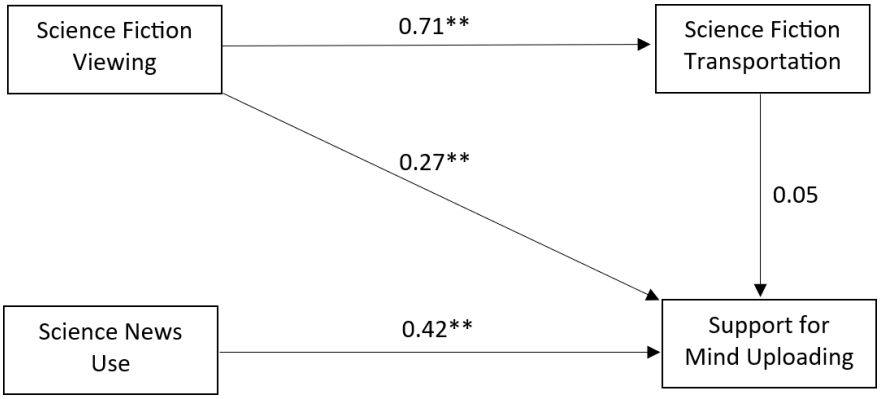

Figure 2. Media variables and support for mind uploading.

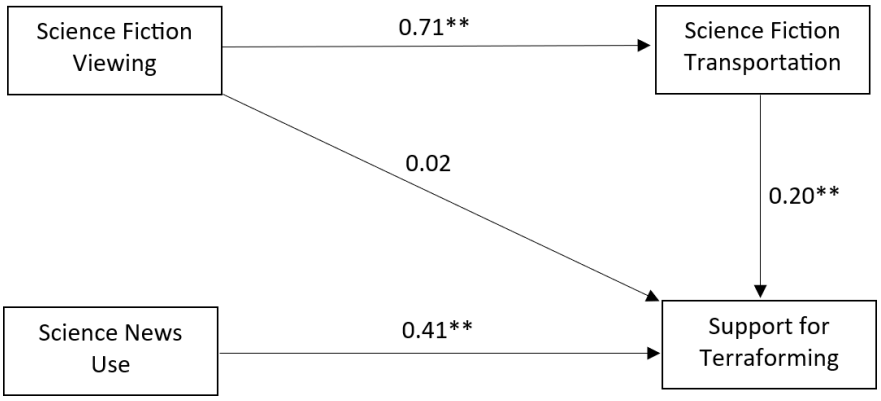

Figure 3. Media variables and support for terraforming.

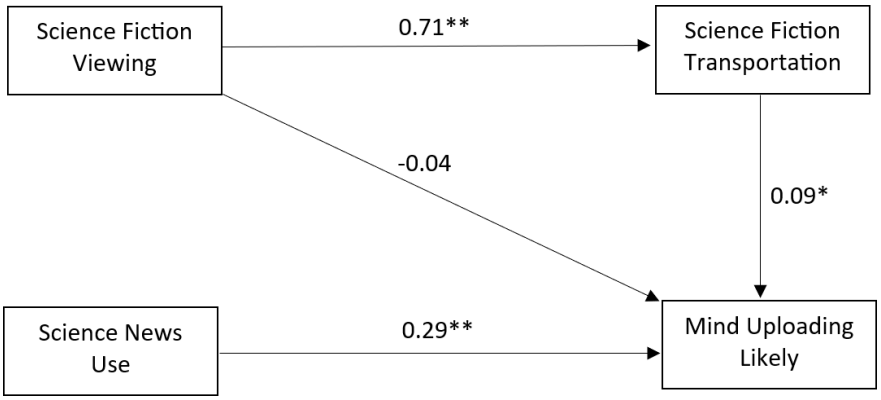

Figure 4. Media variables and belief that mind uploading is likely.

effect = .03, 95% CI [-.05, .12]). However, science fiction viewing was positively and indirectly related to support for terraforming through science fiction transportation (indirect effect = .15, 95% CI [.07, .22]). Similarly, science fiction transportation mediated positive relationships between science fiction viewing and belief that people are likely to develop technology for mind uploading (indirect effect = .06, 95% CI [.001, .13]) and terraforming (indirect effect = .11, 95% CI [.05, .17]). These results provided partial support for H3A and consistent support for H3B.

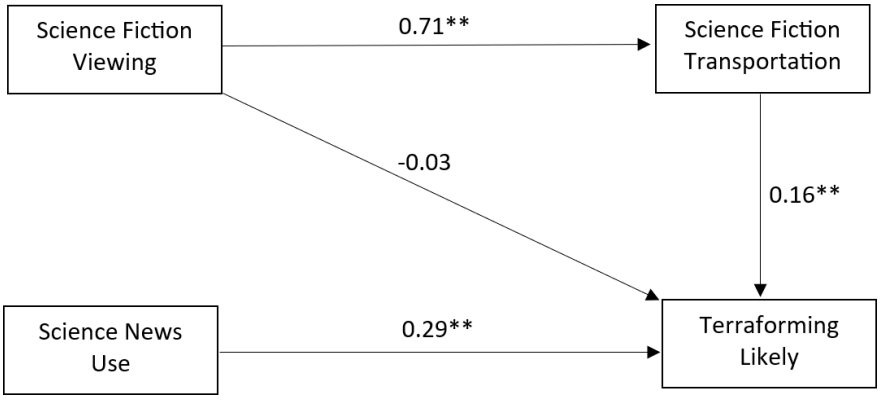

Figure 5. Media variables and belief that terraforming is likely.

Furthermore, an examination of the *total* relationships between science fiction viewing and attitudes (the direct relationships plus the indirect relationships through science fiction transportation) yielded additional support for H1A and H1B. These total relationships were positive and significant for three of the four dependent variables: support for mind uploading (total effect = .31; $p < .01$), support for terraforming (total effect = .16; $p < .01$), and belief that people are likely to develop technology for terraforming (total effect = .08; $p < .01$). The one exception to the pattern was the non-significant total relationship between science fiction viewing and belief that people are likely to develop technology for mind uploading.

The results yielded consistent evidence for both H4A and H4B. Science news use predicted greater support for mind uploading (direct effect = .42; $p < .01$) and terraforming (direct effect = .41; $p < .01$). Likewise, science news use predicted greater belief that people are likely to develop technologies for mind uploading (direct effect = .29; $p < .01$) and terraforming (direct effect = .29; $p < .01$).

Turning to background variables, neither political ideology nor religiosity predicted attitudes about either technology. Male respondents were particularly likely to support technologies for mind uploading and terraforming ($p < .01$ for each) but no more likely to believe in their likely development. Meanwhile, age in years was negatively related to each dependent variable ($p < .05$ or better for each). Race and ethnicity were not consistently related to attitudes. Greater income predicted less support for mind uploading ($p < .05$) but did not predict the other dependent variables. No other significant relationships emerged between the background variables and attitudes.

7 ▪ Discussion

The results of this study provide evidence that both science fiction viewing and science news use can play roles in predicting attitudes toward two speculative technologies: mind uploading and terraforming. As such, the findings reinforce and extend previous research demonstrating that these forms of media use predict attitudes toward emerging technologies [Besley & Shanahan, 2005; Brewer et al., 2022; Dawson et al., 2022; Eichmeier et al., 2023; Ho et al., 2011; Nisbet & Goidel, 2007; Wen & Chen, 2024; Young & Carpenter, 2018].

Reflecting the logic of genre-specific cultivation in general [Hawkins & Pingree, 1980; Lee & Niederdeppe, 2010; Potter & Chang, 1990], science fiction-based cultivation in particular [Brewer & Ley, 2021; Eichmeier et al., 2023], and the role of prototypes in fictional media portrayals [Kirby, 2009], watching science fiction was linked to support for both forms of speculative technology examined and — in, the case of terraforming, perceptions of prospects for future development. Consistent with accounts of narrative immersion [Green & Brock, 2000a] and genre-specific cultivation [Bilandzic & Busselle, 2008] in the context of science fiction and public attitudes [Brewer & Ley, 2021; Brewer et al., 2022; Eichmeier et al., 2023; Green & Appel, 2024; Kaplan & Dahlstrom, 2017], science fiction transportation predicted support for terraforming and belief that people will develop both mind uploading and terraforming technologies. Moreover, the findings suggest that science fiction transportation may serve as a mechanism linking science fiction consumption to viewers' attitudes — a pattern that bolsters arguments for the mediating role of immersion in science fiction [Bilandzic & Busselle, 2008].

Consistent with previous accounts of genre-specific cultivation through news consumption [Goidel et al., 2006; Gross & Aday, 2003; Hermann et al., 2021; Lee & Niederdeppe, 2010; Lett et al., 2004; Niederdeppe et al., 2010; Romer et al., 2003], including news-based cultivation of science and technology attitudes [Mede, 2022; Nisbet et al., 2002], the study's results also demonstrate that science news use can predict attitudes about speculative technologies such as mind uploading and terraforming. In particular, the results here suggest that science news consumption goes hand in hand not only with favorable views of emerging technologies, as previous research has shown [Besley & Shanahan, 2005; Bingaman et al., 2022; Brewer et al., 2022; Dawson et al., 2022; Lee & Scheufele, 2006], but also with favorable views of as-yet hypothetical technologies.

Having identified these broad patterns, it is important to note that differences emerged across types of media consumption and types of speculative technologies. In terms of media genres, science fiction viewing directly predicted only one of the four dependent variables (support for mind uploading) whereas science news use predicted all four. This contrast reflects the role of science fiction transportation, which mediated indirect relationships between science fiction viewing and three of the four dependent variables (support for terraforming and perceptions of each technology as likely). One possibility here is that immersion plays a greater role in genre-specific cultivation for fictional media than for nonfiction media. However, previous studies have found little evidence that the labeling of fact versus fiction matters for narrative transportation [Green & Brock, 2000a; Green & Appel, 2024]. Moreover, the present study did not capture narrative transportation in response to science news. Thus, future research could compare the roles of science fiction and science news in more depth.

Looking across the two topics, the results suggest differences in how media factors predicted attitudes about mind uploading versus terraforming: in particular, science fiction viewing was *directly* related to support for the former but *indirectly* related to support for the latter through transportation. In part, this contrast could reflect the nature of the technologies in question. For example, mind uploading [Laakasuo et al., 2018] and terraforming [Schwartz, 2013] may each raise distinctive sets of ethical concerns.

In weighing this study's conclusions, it is also important to consider several potential limitations of its design. First and foremost, its use of cross-sectional data precludes strong

causal inferences from the results. The relationships observed here could reflect the influence of media use and immersion on attitudes toward speculative technology, the influence of the latter on the former, or both. It may seem implausible that many members of the public would hold attitudes toward mind uploading or terraforming strong enough to shape their media habits; however, future experimental studies could not only provide stronger evidence of media effects on attitudes toward both technologies but also compare the effects of different portrayals on such attitudes. For example, such research could test the relative effects of benign versus menacing science fiction portrayals [Perkowitz, 2007] or of "social progress" versus "Pandora's box" framing in news coverage [Cobb, 2005; Druckman & Bolsen, 2011; Entman, 1993; Gamson & Modigliani, 1989; Nisbet & Mooney, 2007]. By the same logic, randomizing the presentation order for different technologies could capture potential order effects on participants' attitudes.

Looking deeper, both experiments and survey-based studies could explore other potential psychological mechanisms underlying the relationships observed here. As a case in point, the perceived realism of science fiction portrayals [Kirby, 2003] could mediate relationships between science fiction viewing and attitudes toward speculative technologies, just as with emerging technologies [Bingaman et al., 2022, 2024; Eichmeier et al., 2023]. Similarly, future research could explore what factors moderate genre-specific cultivation of attitudes toward speculative technologies [Eichmeier et al., 2023]. Furthermore, content analysis research could provide systematic portraits of how both science fiction media and science news depict mind uploading and terraforming.

Another limitation of the present study is its focus on only two speculative technologies (mind uploading and terraforming), one population (the U.S. public), and two aspects of public opinion (support and belief in the likelihood of future development). Thus, future research could build on the study's design by extending its approach to other speculative technologies and other publics along with other attitudes, beliefs, and behavioral intentions. For example, research could examine the role of media factors in predicting attitudes toward such hypothetical technologies as cold fusion, interstellar travel, and simulated realities.

Keeping these limitations in mind, the study's results highlight the potential roles of science fiction viewing, science fiction transportation, and science news use in explaining public attitudes toward speculative technologies. Humans may be unlikely to upload their minds on a terraformed Mars anytime soon, but they *are* likely to encounter a host of messages about hypothetical technologies — both implausible ones and more feasible ones. Accordingly, understanding audience members' responses to these messages may help to illuminate public understandings of future technological developments. By the same token, the results of this study suggest that efforts to shape depictions of speculative technologies in science fiction and science news may carry implications for public enthusiasm and optimism about such technologies.

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How to cite

Brewer, P. R. and Cuddy, L. (2025). 'Who thinks we'll be uploading minds on terraformed planets? Science fiction, science news, and attitudes toward speculative technologies'. *JCOM* 24(04), A03. https://doi.org/10.22323/JCOM.1499.

ISSN 1824-2049. Published by SISSA Medialab. jcom.sissa.it