International Journal of Gender, Science and Technology
http://genderandset.open.ac.uk

Social Media and STEM Stereotypes: Effects of Seeing Women Scientists with and without Visible Disabilities

Paul R. Brewer and Barbara L. Ley

University of Delaware, USA

ABSTRACT
As the popularity of social media platforms has grown, STEM professionals have increasingly used them to communicate with broader audiences. The present study builds on the stereotype content model and gender schema theory by testing how exposure to an Instagram image of a woman scientist with a visible disability or an Instagram image of a women scientist without a visible disability shapes stereotypes of scientists. The study also investigates how patterns of social media use predict these stereotypes. The analyses draw on an experiment embedded in a national online survey (N = 1,050). The results indicate that seeing an image of a woman scientist with a visible disability led respondents to perceive scientists as warmer but not as more competent. Similarly, seeing an image of a woman scientist without a visible disability fostered perceptions of scientists as warmer but not as more competent. The results also reveal that overall Instagram use predicted more favorable perceptions of scientists. The findings extend theoretical accounts regarding stereotypes of scientists while also carrying implications for the use of Instagram and other social media platforms to promote positive perceptions of STEM professionals and counter barriers confronting women, including women with disabilities, in STEM professions.

KEYWORDS
Social media; Instagram; gender stereotypes; disability; perceptions of scientists

Social Media and STEM Stereotypes: Effects of Seeing Women Scientists with and without Visible Disabilities

As social media use has increased, research into its effects on public perceptions of science, technology, engineering, and mathematics (STEM) professionals has also expanded. For example, studies have shown that overall social media use is associated with greater trust in scientists (Huber et al., 2019) and that exposure to specific messages on social media platforms such as Facebook and YouTube can influence attitudes toward scientists (Brewer & Ley, 2017, 2021). Such perceptions, in turn, can shape interest in STEM education and careers (Blickenstaff, 2005; Gokhale et al., 2015; Steinke et al., 2006, 2009; Wyer, 2003).

In addition, social media messages may carry implications for *who* pursues STEM professions. Long-standing social, cultural, and institutional barriers based on gender (Hill et al., 2010), race and ethnicity (Malcolm et al., 1976; Ong et al., 2011), disability status (Booksh & Madsen, 2018; Sarju, 2021; Yerbury & Yerbury, 2021), and other social identities have contributed to ongoing patterns of exclusion and underrepresentation in STEM education and careers. In the United States, for example, women made up only 34% of the STEM workforce in 2019—an increase of 2% from 2010 (National Science Board, 2022). Furthermore, the logic of "double binds" highlights how women of color (Malcolm et al., 1976; Ong et al., 2011) and women with disabilities (Grant & Zwier, 2011; Naples et al., 2019) may face compounding barriers in STEM education and workplaces.[1] Messages on social media platforms can reinforce such barriers by replicating historical disparities in representation (Welbourne & Grant, 2016; Brewer & Ley, 2021) or, alternatively, counter stereotypes of STEM professionals and raise awareness of inequities in STEM professions (Brewer & Ley, 2017).

As a social media platform that is both broadly used and especially popular among women (Pew Research Center, 2024), Instagram could play an important role in shaping perceptions of STEM professionals. As of 2023, 47% of the US public—including 54% of US women—reported using the site (Gottfried, 2024). Moreover, Instagram prominently features science-themed content (Jarreau et al., 2019b; Phillips et al., 2022; Su et al., 2021). As of 2024, National Geographic was the 14th most followed account on the site, and NASA (the National Aeronautics and Space Administration) ranked 40th (Not Common, 2024). Looking beyond institutional actors, thousands of STEM professionals have launched their own Instagram accounts. These include many accounts run by individual women, such as Samantha "Science Sam" Yammine (who had more than 150,000 followers as of 2024); they also include accounts highlighting diverse women in science, such as Women Doing Science (almost 100,000 followers).

Some observers have criticized the idea of using Instagram to promote a more positive and inclusive image of STEM, arguing that such an approach takes "time away from research," may emphasize a "narrow representation of femininity," and cannot substitute for addressing structural barriers through "policy changes at institutional and governmental levels" (Wright, 2018). However, other observers have argued that the platform provides a potential tool for fostering greater trust in STEM professionals and addressing disparities in STEM (Phillips et al., 2022; Yammine et al., 2018). Investigating the site's potential as a platform for challenging stereotypes of scientists, one recent study tested how exposure to Instagram images influenced perceptions of scientists (Jarreau et al., 2019a). Drawing on the *stereotype content model* (Fiske et al., 2002), which highlights warmth and competence as two key dimensions of stereotyping, the study showed that seeing Instagram selfies of scientists—particularly women scientists—increased perceptions of scientists as trustworthy while decreasing stereotypes of them as being male (Jarreau et al., 2019a).

The present study revisits this line of inquiry while incorporating an intersectional perspective on gender and disability status. Research on intersectionality highlights how individuals with multiple marginalized identities revolving around gender, race, and other social attributes face intersecting and mutually amplifying barriers of discrimination (Crenshaw, 1989). Given that women with disabilities face intersecting barriers based on sexism and ableism (Grant & Zwier, 2011; Naples et al., 2019), the present study considers whether audience members respond differently to seeing an Instagram image of a woman scientist with a visible disability or an Instagram image of a woman scientist without a visible disability. Reflecting the image-driven nature of Instagram, the study focuses on visible disability as a first step toward a broader understanding of social media representations of women STEM professionals with disabilities (while bearing in mind that not all disabilities are visible and that not all disabled people choose to self-identify publicly as disabled or are in socially supported positions to do so).

To these ends, the present study builds on the stereotype content model (Fiske et al., 2002; Jarreau et al., 2019a) in examining how both exposure to specific social media images of women scientists and patterns of social media use may be linked to perceptions of scientists as warm and competent. The study also draws on *gender schema theory* (Bem, 1993; Campbell, Shirley, & Candy, 2004), which highlights how people form schemas, or mental frameworks, about gender early in life as well as how media messages can influence schemas about gender and science and how such schemas, in turn, can shape self-images as scientists and aspirations regarding science (Steinke, 2017; Steinke & Duncan, 2023; Steinke & Long, 1996; Steinke & Tavarez, 2017). The analyses use data from a national survey in which respondents were randomly assigned to see an Instagram image of a woman scientist with a visible disability, an Instagram image of a woman scientist with no visible disability, or no image. To provide a broader look at what factors predict perceptions of scientists, this survey also captured respondents' media habits, including social media use (Brewer & Ley, 2021; Dudo et al., 2011; Huber et al., 2019; Jarreau et al., 2019a), as well as their political and religious values (Funk et al., 2020; Krause, 2023; Nisbet et al., 2002). The findings extend theoretical accounts of stereotypes in the context of STEM professions along with intersectional perspectives on gender, disability, and barriers to such professions. The findings also carry implications for the practice of using social media platforms such as Instagram to counter stereotypes of STEM professionals.

STEREOTYPES OF SCIENTISTS, MEDIA MESSAGES, AND MEDIA EFFECTS
Faced with the challenge of forming evaluations in a complex and cognitively demanding social environment, people often base their judgments on stereotypes, or "pictures in [their] heads" of groups (Lippmann, 1922, p.1). The stereotype content model identifies two dimensions of stereotypes as particularly important for social judgments: perceptions of traits related to warmth such as friendliness and sociability, and perceptions of traits related to competence such as intelligence and skill (Fiske, 2018; Fiske et al., 2002). In terms of the model's key dimensions, members of the US public perceive scientists as relatively competent but less warm (Fiske & Dupree, 2014; Jarreau et al., 2019a). Consistent with this pattern, US residents tend to see scientists as trustworthy and dedicated people working for the good of humanity but also as peculiar and socially distant (Besley et al., 2021; Brewer & Ley, 2021). The former stereotypes may promote trust in scientific research along with interest in STEM professions (Huber et al., 2019), but the latter stereotypes could discourage pursuit of STEM education and careers (Blickenstaff, 2005; Gokhale et al., 2015; Steinke et al., 2006, 2009; Wyer, 2003).

In addition to stereotyping scientists' traits, people hold stereotypes about who can be a scientist. In particular, members of the US public have historically tended to stereotype scientists as men (Chambers, 1983; Miller et al., 2018), a pattern reflecting broader gender schemas typically formed in childhood (Bem, 1993; Campbell, Shirley, & Candy, 2004). These stereotypes can act as barriers to participation in STEM by women (Cheryan et al., 2013; Steinke, 1997), discouraging them from developing wishful identification with scientists (Long et al., 2010) and possible selves as scientists (Steinke et al., 2009) while also underpinning individual and institutional gender-based discrimination. Furthermore, members of the US public tend to perceive women as warmer but less competent than men (Eagly et al., 2020; Fiske, 2018). Thus, stereotypes of scientists as colder but more competent and stereotypes of women as warmer but less competent may interact to produce gendered patterns in beliefs that reinforce long-standing social and institutional barriers to participation in STEM professions (Jarreau et al., 2019a).

Similarly, members of the public tend to associate disabled people with warmth but not competence (Coleman et al., 2015)—a pattern that can amplify other social and institutional barriers disabled people face in STEM education and occupations (Booksh & Madsen, 2018). Furthermore, stereotypes of social groups can intersect in reinforcing ways. For example, women with disabilities may confront particularly negative evaluations of their competence (Coleman et al., 2015) that contribute to the "double discrimination" against them (Lloyd, 1992, p.212).

Given that many members of public have little direct social contact with the STEM community (Steinke et al., 2007, 2009), they may rely on media messages in forming their schemas regarding STEM professionals (Steinke, 2017; Steinke & Duncan, 2023; Steinke & Long, 1996). In some cases, such messages can reinforce dominant stereotypes of scientists. For example, Hollywood films and prime-time television shows have often portrayed scientists as capable and dedicated but also as strange and solitary (Brewer & Ley, 2021; Dudo et al., 2011; Gerbner, 1987).

Similarly, meme-based internet GIFs tend to portray scientists as competent but cold (Fujiwara et al., 2022). In addition, traditional media such as films (Cave et al., 2023; Steinke & Tavarez, 2017; Weingart et al., 2003) and television programs (Aladé et al., 2021; Dudo et al., 2011; Geena Davis Institute, 2018, 2024) and social media such as Twitter, now rebranded as X (Ke et al., 2017), and YouTube (Welbourne & Grant, 2016; Brewer & Ley, 2021) have tended to underrepresent women as scientists. Meanwhile, popular media have seldom depicted disabled scientists, with some notable exceptions invoking villainous deviance through tropes such as the stereotypical "mad scientist" (Brewer & Ley, 2021; Weingart et al., 2003). Such media depictions, in turn, can influence audience members' perceptions of scientists and attitudes toward science through cultivation effects reflecting long-term exposure to dominant portrayals (Dudo et al., 2011; Gerbner, 1987; O'Keeffe, 2013) as well as through single exposures to specific messages (Bond, 2016; Brewer & Ley, 2021; Steinke et al., 2007).

At the same time, members of the public may encounter media messages that challenge stereotypes of STEM professionals. Looking at traditional media, both Hollywood movies (Jackson, 2011; Simis et al., 2015; Steinke, 1999) and entertainment television programs (Geena Davis Institute, 2019; O'Keeffe, 2013) have featured counter-stereotypical portrayals of women scientists. Likewise, some movies and television shows have depicted disabled scientists as helpful assistants or sympathetic antagonists, though disabled scientist protagonists remain rare among Hollywood heroes (Brewer & Ley, 2021). Over the past decade and a half, scientists and science communicators have also used social media platforms to challenge stereotypes of science and build support for a more inclusive vision of science. In the early 2010s, the Tumblr site This Is What a Scientist Looks Like posted images of diverse scientists to counter the stereotype of a "white man in a white lab coat" (DiChristina, 2012), and YouTube science channel host Emily Graslie posted a widely viewed video discussing the sexist comments she had received from viewers (*The Brain Scoop*, 2013). Similarly, numerous women scientists used the Twitter hashtag #distractinglysexy to challenge sexist comments made by a prominent biochemist in 2015 (Chappell, 2015). By countering stereotypes, challenging sexism, and presenting images of diverse role models in science, such messages can reshape perceptions of scientists and attitudes toward science (Geena Davis Institute, 2019; O'Keeffe, 2013; Steinke et al., 2022). For example, exposure to Graslie's YouTube video increased awareness of sexism in science while fostering more positive perceptions of scientists (Brewer & Ley, 2017).

In exploring the effects of social media messages and social media use on stereotypes of STEM professionals, it is important to consider each platform's specific affordances (Treem & Leonardi, 2013), that is, "things that it allows and makes easy versus things that are not possible or difficult" (Tufekci, 2014, pp.506-507). The architecture and features of a particular platform can facilitate certain types of uses over others: for example, the design of Facebook encourages private communication by mutual consent with "friends" whereas the design of Twitter (X) encourages more public-facing communication to "followers" (Gerbaudo, 2012; Tufekci, 2017). Such affordances can also carry implications for audience engagement with and responses to science (Hendriks et al., 2020): as a case in point, Facebook's affordances facilitated the rapid mobilization of scientists and activist groups in cities around world to participate in the 2017 March for Science (Ley & Brewer, 2018). Of particular relevance for the present study, Instagram's design encourages the sharing of images, including self-portraits or "selfies" (Butkowski et al., 2020). Building on the platform's affordances, women scientists have created individual accounts (Yammine et al., 2018) and organizational accounts such as Women Doing Science (Phillips et al., 2022) that challenge stereotypes of science by sharing images of diverse scientists.

To test the effects of such images, one recent study drew on a survey experiment in which respondents were randomly assigned to view different images (Jarreau et al., 2019a). Some respondents saw Instagram selfies of scientists, while others saw images of lab equipment or no image. The researchers found that seeing images of scientists—particularly women scientists—increased perceptions of scientists as warm but did not increase perceptions of them as competent. Respondents who saw selfies of women scientists were also less likely to perceive science as a stereotypically male activity. Moreover, the survey found a relationship between overall Instagram use and perceiving scientists as warm but no relationship between Instagram use and perceiving scientists as competent.

These results highlight the potential role of social media platforms in shaping stereotypes of scientists while also raising new questions about such platforms' effects. For example, how will members of the public respond to social media images of women scientists with visible disabilities? Though members of this group may not be as prominent on social media as women scientists without visible disabilities, a number of women with disabilities working in science have used social media platforms, including Instagram, to communicate with broader audiences and challenge ableism in science (e.g., @disabledSTEM, @cortdoesscience, and @oisforoviraptor). Thus far, however, research has paid relatively little attention to the impact of such communication.

RESEARCH QUESTIONS AND HYPOTHESES

Building on previous research into how social media messages can shape stereotypes of scientists (Brewer & Ley, 2017, 2021; Jarreau et al., 2019a), the present study begins by revisiting whether exposure to Instagram images of women scientists can influence such stereotypes. Specifically, it focuses on the two key dimensions of the stereotype content model: warmth and competence. Previous findings suggest a positive effect on perceptions of warmth (Jarreau et al., 2019a). On the other hand, it is less clear whether exposure to social media images of women scientists will influence perceptions of scientists as competent (Jarreau et al., 2019a), particularly given enduring stereotypes of women as warmer but less competent (Eagly et al., 2020; Fiske, 2018). With this in mind, the study tests the following hypotheses:

> H1A: Seeing an Instagram image of a woman scientist will increase perceptions of scientists as warm.

H1B: Seeing an Instagram image of a woman scientist will increase perceptions of scientists as competent.

Drawing on an intersectional approach that addresses compounding gender-based stereotypes and ability-based stereotypes (Lloyd, 1992; Naples et al., 2019), the present study also asks the following questions:

RQ1A: Will seeing an Instagram image of a woman scientist with a visible disability and seeing an Instagram image of a woman scientist without a visible disability yield different effects on perceptions of scientists as warm?

RQ1B: Will seeing an Instagram image of a woman scientist with a visible disability and seeing an Instagram image of a woman scientist without a visible disability yield different effects on perceptions of scientists as competent?

Given the potentially reinforcing stereotypes of women and disabled people as warmer but less competent (Coleman et al., 2015), one possibility is that exposure to an image of a woman scientist with a visible disability will lead audience members to perceive scientists as warmer but also as less competent, relative to no exposure or exposure to an image of a woman scientist with no visible disability. However, previous research has not compared the effects of such images.

In addition to testing the effects of exposure to specific social media images, the present study examines the potential roles of broader patterns in social media use, particularly Instagram use, in predicting stereotypes of scientists. Building on findings that overall social media use is associated with greater trust in scientists (Huber et al., 2019) and that Instagram use is associated with perceptions of scientists as warm (Jarreau et al., 2019a), this study hypothesizes the following:

H2A: Instagram use will be positively related to perceiving scientists as warm.

H2B: Instagram use will be positively related to perceiving scientists as competent.

Researchers have identified multiple mechanisms that could underlie such relationships, including the effects of social recommendations and personal contact through social media (Huber et al., 2019) along with social learning from media models (O'Keeffe, 2013; Steinke & Long, 1996). Moreover, parasocial identification with scientists in the media reflecting perceived vicarious relationships with these figures may shape broader perceptions of scientists and, thus, wishful identification with and possible selves as scientists (O'Keeffe, 2013; Steinke et al., 2012).

Though the present study focuses on Instagram use, it also considers other forms of media use that may predict perceptions of scientists. Research drawing on cultivation theory (Gerbner & Gross, 1976) suggests that exposure to dominant portrayals of science in television can cultivate perceptions of scientists (Dudo et al., 2011; Gerbner, 1987); in particular, recent research suggests that overall television viewing is linked to perceiving scientists as good (Brewer & Ley, 2021). Similarly, research taking a genre-specific approach to cultivation has shown that science fiction viewing (Brewer & Ley, 2021) and news use (Dudo et al., 2011; Nisbet et al., 2002) can shape attitudes about science and scientists. The role of news use can also differ across outlets: in the case of US news media, for instance, use of the relatively conservative and science-skeptical Fox News cable channel and use of its more centrist or liberal-leaning television news counterparts can be related to perceptions of scientists in contrasting ways (Hmielowski et al., 2014; Krause, 2023). Furthermore, use of other social media platforms with differing affordances may predict perceptions of science and scientists (Huber et al., 2019). For example, one study found that exposure to a YouTube video challenging sexism in science led to more favorable attitudes toward science (Brewer & Ley, 2017), while another study found that Facebook posts featuring humorous messages about science fostered more favorable perceptions of scientists (Brewer & Ley, 2021).

The present study considers the potential role of audience members' values, as well. Members of the public often base their beliefs about science on ideological orientations and religious worldviews (Funk et al., 2020; Nisbet et al., 2002); thus, these values may also shape perceptions of scientists. Looking at the US public, one recent study found that both conservatism and religiosity were negatively related to perceptions of scientists as warm (Krause, 2023).

METHODS

The data for this study came from a national online survey of US residents. The survey was designed by the authors and conducted by Qualtrics on April 6-13, 2021. The 1,050 respondents were sampled from Qualtrics panels, with quotas to match population values on gender, race, education, income, and region of the country. Of the respondents, 51% self-identified as women, and 47% self-identified as men; 1% self-identified as non-binary or a third gender. In terms of race and ethnicity, 17% self-identified as Black, 23% as Hispanic, and 10% as Asian American. The mean age in years was 45.99 (SD = 20.10). Highest level of formal education completed was captured on a six-category scale (coded to range from 0 to 5): no high school diploma (5%), high school graduate (25%), some college (23%), 2-year college degree (12%), 4-year college degree (23%), or postgraduate degree (13%). Income was measured on a 12-point scale, with a mean of 5.18 (SD = 3.32). The survey did not use probability sampling; thus, caution is warranted in generalizing the results to the US population. In addition, the sample is not necessarily representative of Instagram users, who tend to be relatively young and are more likely to be Black, Hispanic, or Asian (Gottfried, 2024).

Treatments

Following Jarreau et al. (2019a), the experimental design focused on exposure to Instagram images. Each participant was randomly assigned to one of two treatment conditions or a control condition. Participants in the control condition (n = 354) did not receive any image and served as the baseline for comparison. Those in the treatment conditions were asked to read an Instagram post. Two different versions of the post were designed based on input from seven advanced undergraduate communication students familiar with the platform. Both versions included the same account name (Lydia.lab), profile photograph (a stock image), caption ("I'm so proud to have worked with my colleagues on the COVID-19 vaccine!"), and hashtag (#sciencematters). The main image in each post was a cropped stock photograph of a white woman in the foreground and a white man in the background; both versions featured the same models wearing white lab coats. The woman was wearing goggles and sitting at a table with lab equipment while holding a test tube and pen. In the *visible disability* condition (n = 343), participants received a version of the post showing the woman using a wheelchair (see Figure 1). In the *no visible disability* condition (n = 353), participants received a version of the post where no wheelchair was visible in the image (see Figure 2). This design allowed for testing the impact of specific images by comparing whether their effects differed relative to no image and relative to one another. However, it did not allow for testing the effects of these images relative to other possible images, such as images featuring only men or images featuring only women, or for testing the effects of images in a more naturalistic social media setting—two limitations the discussion revisits.

Dependent variables

After viewing their treatment image—or, in the case of the control condition, no image—participants were asked a series of questions measuring the study's key dependent variables.

Perceptions of scientists as warm were captured by two items asking respondents how well "friendly" and "sociable" described "scientists in general." Response options ranged on a five-category scale from extremely well (coded as 4) to not well at all (0). Given that responses to the two items were strongly correlated with one another ($r = 0.68$; $p \leq 0.01$), they were averaged to create an index ($M =$ 2.51; $SD = 0.92$).

Perceptions of scientists as competent were captured by two items asking respondents how well "competent" and "intelligent" described "scientists in general." These items used the same response options as before, coded in the same way. Responses to the items were strongly correlated with one another ($r =$ 0.69; $p \leq 0.01$) and, thus, were averaged to create an index ($M = 2.82$; $SD =$ 0.93).

Media use measures

The survey also included measures of Instagram use and other forms of media use.

Social media use was captured by a series of items asking respondents how often they used Instagram ($M = 1.39$; $SD = 1.32$), Facebook ($M = 1.88$; $SD = 1.27$), Twitter ($M = 1.04$; $SD = 1.23$), and YouTube ($M = 1.88$; $SD = 1.18$). Response options included nearly every day (3), a few times a week (2), a few times a month (1), and less often (0).

Overall television viewing (M = 3.03; SD = 1.60) was measured by a question asking, "On the average day, how much time do you spend watching television shows and movies (including viewing on a computer or mobile device)?" Responses ranged from four or more hours (4) to none (0).

Figure 1. Instagram treatment depicting a woman scientist with a visible disability

Figure 2. Instagram treatment depicting a woman scientist with no visible disability

Science fiction viewing was measured by an item asking respondents how often they watched science fiction shows (M = 1.11; SD = 1.07), using the same options and coding as the social media use measures.

Television news viewing was captured by an index (M = 1.39; SD = 1.32; α = 0.74) created by averaging across three items asking how often respondents watched

CNN, MSNBC, and national network television news on ABC, CBS, or NBC. These items used the same response options and coding as the social media use items.

Fox News viewing was measured by a parallel item asking respondents how often they watched the Fox News Channel (*M* = 1.18; *SD* = 1.18).

Following science news was measured by an item asking respondents how closely they followed such news (*M* = 1.59; *SD* = 0.99): very (3), somewhat (2), not too (1), or not at all (0).

Background variables
The analyses controlled for political ideology and religiosity, as well.

Political ideology was captured through a standard seven-category scale (*M* = 3.32; *SD* = 1.79) ranging from very conservative (6) to very liberal (0).

Religiosity was measured by an item asking respondents how important religion was in their life (*M* = 1.86; *SD* = 1.09), with options ranging from very (3) to not at all (0).

In addition, the analyses included controls for a set of demographics variables: gender, race and ethnicity, age, and education.

RESULTS
The first set of analyses used a pair of one-way ANOVAs to test whether the image treatments affected perceptions of scientists. Consistent with H1A, the treatments significantly influenced perceptions of scientists as warm, $F(2,1047) = 7.37$, $p \leq 0.01$. The size of this effect was small, $\eta^2 = 0.01$ (see Cohen, 1977). Post-hoc Bonferroni tests showed that participants who received the image of a woman scientist with a visible disability (*M* = 2.49; *SD* = 1.00; $p \leq 0.05$) and those who received the image of a woman scientist with no visible disability (*M* = 2.42; *SD* = 1.00; $p \leq 0.05$) were more likely than control participants (*M* = 2.21; *SD* = 0.95) to view scientists as warm. However, the treatments did not significantly affect perceptions of scientists as competent, $F(2,1047) = 2.24$, $p > 0.10$. Thus, the results did not support H1B. Nor did the effects of the treatments on perceptions of scientists as warm (RQ1A) or competent (RQ1B) differ depending on whether the image showed a woman scientist with a visible disability or one with no visible disability.

A series of supplementary two-way ANOVAs tested whether the effects of the treatments on perceptions of scientists as warm and competent differed across respondent gender and respondent age (recoded as 0 if age ≤ 30 and 1 if age > 30). These analyses revealed no significant interactions between experimental condition and gender or between condition and age. Given the ideological polarization in US public opinion toward both science in general (Funk et al., 2020) and the specific topic of COVID-19 (Kerr et al., 2021), which the image caption mentioned, another set of two-way ANOVAs tested whether the treatments interacted with political ideology. No significant interactions emerged between condition and ideology. In short, the effects of the images were not discernibly stronger among women than among men; neither were they stronger among young respondents than among older respondents, nor stronger among liberals than among conservatives.

A set of regression analyses tested how a broader range of factors predicted the key dependent variables. The model for each dependent variable included indicator variables for assignment to the two treatment conditions (for each, 1 = yes and 0 = no), the media use measures, and the background variables (see Table 1). The results for the treatment variables replicated the findings from the one-way ANOVAs: assignment to either image treatment led to perceiving scientists as warmer (for the visible disability treatment, $b = 0.31$; $p \leq 0.01$; for the no visible disability treatment, $b = 0.24$; $p \leq 0.01$) but did not influence perceptions of scientists as competent.

In addition, these analyses tested whether Instagram use predicted perceptions of scientists. Consistent with H2A, the results revealed a positive and significant relationship between Instagram use and perceptions of scientists as warm ($b = 0.07$; $p \leq 0.05$). A similar relationship emerged between Instagram use and perceptions of scientists as competent ($b = 0.08$; $p \leq 0.05$), supporting H2B.

Turning to other forms of media use, the analyses found that frequent Facebook users were particularly likely to see scientists as competent ($b = 0.05$; $p \leq 0.05$). No other forms of social media use were significantly related to perceptions of scientists as warm or competent. Nor did science fiction viewing predict these perceptions. However, overall television viewing went hand in hand with seeing scientists as more competent ($b = 0.06$; $p \leq 0.05$). Moreover, television news viewing was positively related to seeing scientists as warm ($b = 0.25$; $p \leq 0.01$) and competent ($b = 0.18$; $p \leq 0.01$). Similarly, following news about science was positively related to perceptions of scientists as warm ($b = 0.17$; $p \leq 0.01$) and competent ($b = 0.15$; $p \leq 0.01$). By contrast, Fox News viewing was negatively related to seeing scientists as competent ($b = -0.06$; $p \leq 0.05$); this pattern could reflect polarization in the specific context of COVID vaccines and/or broader polarization in views of science.

Among the background factors, political ideology did not predict either of the key dependent variables. Meanwhile, religiosity was positively related to seeing scientists as warm ($b = 0.12$; $p \leq 0.01$) and competent ($b = 0.07$; $p \leq 0.01$). Compared to men, women were more likely to see scientists as competent ($b = 0.12$; $p \leq 0.05$). Black respondents were particularly unlikely to see scientists as competent ($b = -0.39$; $p \leq 0.01$), a pattern which may reflect broader distrust in science based on a long history of racial discrimination and exploitation (Corbie-Smith et al., 1999; Freimuth et al., 2001); looking beyond the treatments in this study, exposure to Instagram images of Black scientists might counter this pattern. In addition, education was positively related to seeing scientists as competent ($b = 0.05$; $p \leq 0.05$). No other significant relationships emerged between the background factors and the key dependent variables.

Table 1. Predicting perceptions of scientists as warm and competent

	Scientists as warm	Scientists as competent
Image with visible disability	0.31**	0.00
	(0.07)	(0.07)
Image with no visible disability	0.24**	-0.12
	(0.07)	(0.07)
Instagram use	0.07*	0.08**
	(0.03)	(0.03)
Facebook use	0.04	0.05*
	(0.02)	(0.03)
Twitter use	0.03	0.01
	(0.03)	(0.03)
YouTube use	0.03	0.03
	(0.03)	(0.03)
Overall television viewing	0.05	0.06*
	(0.02)	(0.02)
Television news viewing	0.25**	0.18**
	(0.04)	(0.04)
Fox News viewing	-0.04	-0.06*
	(0.03)	(0.03)
Science fiction viewing	0.01	-0.02
	(0.03)	(0.03)
Following science news	0.17**	0.15**
	(0.03)	(0.03)
Political ideology	0.03	-0.03
	(0.02)	(0.02)
Importance of religion	0.12**	0.07**
	(0.03)	(0.03)
Identifies as a woman	0.08	0.12*
	(0.06)	(0.06)
Identifies as Black	-0.15	-0.39**
	(0.08)	(0.09)
Identifies as Hispanic	-0.02	-0.12
	(0.08)	(0.08)
Identifies as Asian American	-0.01	-0.03
	(0.10)	(0.10)
Age	-0.004	0.004
	(0.002)	(0.002)
Education	-0.01	0.05*
	(0.02)	(0.02)
Constant	1.15**	1.79**
	(0.17)	(0.17)
Adjusted R^2	0.21	0.17
N	1044	1044

Notes: * $p \leq 0.05$; ** $p \leq 0.01$. Table entries are Ordinary Least Squares regression coefficients, with standard errors in parentheses.

A series of supplementary regression analyses tested whether respondent gender or age moderated the extent to which Instagram use predicted perceptions. These analyses revealed no significant interactions. Thus, the results for Instagram use did not vary discernibly across gender or age.

DISCUSSION

This study sought to test how exposure to Instagram imagery of a woman scientist with or without a visible disability and overall Instagram use are linked to stereotypes of scientists. Taken together, the results highlight the potential for Instagram to foster positive perceptions of scientists—and, more broadly, STEM professionals. At the same time, the findings suggest limitations on the extent to which Instagram images of women scientists with or without visible disabilities may foster perceptions of competence.

A key finding from the experimental portion of the study was that seeing an image of a woman scientist led respondents to perceive scientists as warmer. Such a result follows from the stereotype content model (Fiske et al., 2002) and gender schema theory (Bem, 1993; Steinke, 2017; Steinke & Duncan, 2023). Specifically, it dovetails with previous findings regarding how Instagram images of scientists can influence audience members' perceptions (Jarreau et al., 2019a). Moreover, such an effect emerged in the present study when participants saw a woman scientist with no visible disability *and* when they saw a woman scientist with a visible disability—a pattern which suggests that images of disabled women scientists can help to bolster perceptions of scientists' warmth, just as images of scientists with no visible disabilities had previously been found to do.

On the other hand, seeing an image of a woman scientist with or without a visible disability had no discernible impact on perceptions of scientists as competent. Thus, the results speak to a potentially gendered pattern in how people respond to images of women STEM professionals, particularly given widely held stereotypes among the public that cast women as warmer but less competent than men (Eagly et al., 2020; Fiske, 2018). The absence of evidence for Instagram image effects on perceptions of scientists' competence may reflect the durability of gender schemas regarding science (Long et al., 2001; Steinke et al., 2007)—a tenacity reinforced by both the decades-spanning history of media stereotypes minimizing the expertise and contributions of women in STEM (Aladé et al., 2021; Cave et al., 2023; Dudo et al., 2011; Geena Davis Institute, 2018, 2024; Steinke & Tavarez, 2017; Weingart et al., 2003) and enduring societal assumptions about who can be a scientist (Hill et al., 2010; Ong et al., 2011). If there is a silver lining to be found here, it is that the study's participants did not evaluate scientists' competence any more negatively after viewing images of a scientist who belonged to one or even two groups (women and disabled people) that the public has historically associated with less competence (Coleman et al., 2015).

In one key respect, the findings for patterns in social media use reinforced the experimental results: greater Instagram use went hand in hand with perceiving scientists as warmer. However, Instagram use also predicted perceptions of scientists as more competent. One possibility here is that repeated exposures to scientists on the platform through habitual use of it may produce effects beyond those observed in response to single image exposures (in line with a cultivation-based account; see Brewer & Ley, 2021; O'Keeffe, 2013). If so, then the proliferation of Instagram accounts featuring women scientists (Phillips et al., 2022; Yammine et al., 2018) may play a role in generating cumulative impacts on stereotypes of scientists. More broadly, the findings here speak to how social media platforms—particularly those with image-sharing affordances (Treem & Leonardi, 2013; Tufekci, 2014)—can serve as tools for shifting public beliefs about what STEM professionals are like and who can (or should) become one. Given this, future research might explore potential mechanisms underlying links between social media use and such beliefs; these mechanisms could include social recommendations, social contact, modeling, and parasocial identification (Huber et al., 2019; O'Keeffe, 2013; Steinke & Long, 1996; Steinke et al., 2012).

Though this study focused on Instagram use, the results also reinforce arguments that other forms of media use can predict perceptions of STEM professionals. For example, overall television viewing predicted perceptions of scientists as competent—a finding in keeping with previous arguments derived from cultivation theory that overall television viewing is linked to more positive perceptions of scientists (Brewer & Ley, 2021). Consistent with previous research (Dudo et al., 2011; Nisbet et al., 2002), the results also suggest that news use can predict beliefs about scientists. Viewing television news and following science news were positively linked to perceptions of scientists as warm and competent, while Fox News use was negatively linked to perceiving scientists as competent. Here, the pattern of results may reflect a tendency of mainstream news sources to portray scientists favorably combined with a more hostile tone of coverage from Fox News (Hmielowski et al., 2014; Krause, 2023). Last, but not least, among the media variables, Facebook use predicted perceptions of scientists as warm; this result extends previous findings that exposure to specific Facebook messages can foster more positive attitudes toward scientists (Brewer & Ley, 2021).

Limitations and future directions

In weighing the present study's findings, it is important to consider several potential limitations of its approach. To begin with, the experimental design was relatively narrow in terms of the images it presented: both treatments featured a woman in the foreground and a man in the background. Accordingly, future studies could include images featuring scientists with different sets of gender identities, with and without visible disabilities, to provide fuller tests of how representations of gender and disability in imagery of scientists influence perceptions. The images also featured only one woman as a model—specifically, a white woman. Thus, the study did not capture the effects of images featuring women of color. Moreover, the treatment image featuring a scientist with a visible disability included only one visual signifier of disability (the use of a wheelchair). Indeed, it is worth noting that our search of a leading stock image provider's inventory yielded only one model representing a woman scientist with a visible disability. To capture how members of the public respond to a more diverse sample of women scientists, future studies could include images featuring women of color and women with different types of disabilities in testing the potential effects of "double binds" involving race and gender (Malcolm et al., 1976; Ong et al., 2011) and "triple binds" involving race, gender, and disability. Similarly, future research could test the impact of text-based disability disclosures on social media (such as through information included in an account's biographic profile). Furthermore, future research could test whether the effects of such treatments vary depending on the disability status of the receiver, which the present study did not capture.

Relatedly, the study's design cannot disentangle which specific message features produced the treatment effects observed. These effects could reflect not only the central image—the woman scientist in the foreground—but also the presence of an older white male scientist in the background, the laboratory equipment depicted, the profile name, the caption, and the hashtag. In addition, such effects could reflect subtle differences across the experimental stimuli (e.g., differences in hand gestures or image sizes for the individuals depicted). Accordingly, future research could incorporate additional manipulations to isolate the effects of specific message features. It is also worth noting that the present study, unlike a previous study on Instagram imagery and perceptions of scientists (Jarreau et al., 2019a), did not feature selfies as treatments. However, both that study and this one point to a shared conclusion: images of women scientists on social media in general and Instagram in particular can foster perceptions of scientists as warmer but not necessarily more competent.

Yet another limitation of the present study's experimental design is that it focused on the impact of specific Instagram images rather than the broader interactive experience of social media in a natural setting. The design used here allowed for analyses testing the effects of images, but it did not fully capture how people encounter such images in their daily lives. In part, the analyses of media use patterns address this limitation by testing for links between broader media habits—including Instagram use—and perceptions of scientists. At the same time, caution is warranted when interpreting the latter analyses, which relied on cross-sectional data. Drawing causal inferences from such data is inherently difficult: showing that Instagram use and other forms of media use predict the beliefs under study does not necessarily demonstrate that the former influence the latter. Accordingly, future research could draw on longitudinal data in further exploring these relationships.

A final limitation revolves around the present study's focus on one population: the general US public. Findings based on samples from this population may diverge from findings based on Instagram users, who differ from the broader public on dimensions such as gender, age, race and ethnicity, and age (Gottfried, 2024). Notably, factors such as gender (Yurdagül et al., 2021) and age (Noon et al., 2021) can influence how users interact with and respond to messages on the platform. The analyses presented here yielded no evidence that the roles of exposure to the treatments or Instagram use in predicting perceptions varied across respondent gender or age; however, broader patterns in Instagram use may shape who sees the types of images examined in this study. Looking beyond the context at hand, results based on a US sample may not generalize to other publics with different attitudes toward science (see, e.g., Funk et al., 2020) and patterns of social media use (see, e.g., Wike et al., 2022). Thus, it would be useful to examine the role of social media images and social media use across multiple nations.

Keeping in mind these limitations, the findings of the present study suggest both possibilities and pitfalls in using image-based social media platforms to shift perceptions of STEM professionals. Consistent with previous arguments for a social media-based approach (Yammine et al., 2018), the findings here illustrate how Instagram images of women scientists can help make scientists in general seem warmer. Furthermore, this study's results speak to how patterns in social media use—including Instagram use—may help to foster positive beliefs about STEM professionals. Yet the evidence for an Instagram-based approach appears to be clearer for some perceptions (traits involving warmth) than others (traits involving competence). Thus, strategies for using Instagram—and other image-based social media platforms—to foster a more positive and inclusive vision of STEM may work best when they supplement the sorts of images examined here with other approaches. For example, bolstering perceptions of STEM professionals as competent may require clearer visual, and perhaps textual, signifiers of this trait.

Although revising perceptions and challenging stereotypes of STEM professionals can help to address historical disparities in STEM (Blickenstaff, 2005; Gokhale et al., 2015; Steinke et al., 2006, 2009; Wyer, 2003), the persistence and social embeddedness of these disparities may also require institutional and policy solutions to address (Hill et al., 2010). Thus, it is important for future research to consider how social media messages and social media use may foster support for and action on such solutions.[2] For example, efforts at building support for gender inclusivity in STEM may benefit from messaging that directly counters gender stereotyping and sexism, particularly given previous findings that such an approach can sway perceptions (Brewer & Ley, 2017). When it comes to promoting a more inclusive environment for STEM professionals with disabilities, a multifaceted approach could address both the "symbolic annihilation" (Gerbner & Gross, 1976, p.182) of disabled STEM professionals by providing more social media images of them and the lack of awareness about the barriers they face by presenting messages that explicitly address ableism and disability-based discrimination in STEM (Booksh & Madsen, 2018; Sarju, 2021; Yerbury & Yerbury, 2021). Such efforts could not only counteract the relative invisibility of disabled STEM professionals —particularly women STEM professionals with disabilities—on social media and beyond but also highlight and challenge intersecting barriers to participation in STEM careers.

Approaches to these problems could also look beyond the specific social media platform and individualistic approach examined here. Though the present study's findings further demonstrate the potential of Instagram as a tool for changing public images of STEM, they also suggest a potential role for an older (and older-skewing) platform, Facebook, and could apply to newer (and even younger-skewing) platforms, such as TikTok (Gottfried, 2024). Nor is it necessarily sufficient to rely on the efforts of individual STEM professionals at creating social media accounts and posting messages on them. The systemic nature of the barriers facing women, disabled people, and other groups historically marginalized in STEM may require institutional initiatives and policy changes to address in full.

CONCLUSION

This study's findings replicate previous results regarding how Instagram images of women scientists influence broader perceptions of scientists as warm and competent (Jarreau et al., 2019a) while extending this research to incorporate an intersectional perspective on gender and disability (Grant & Zwier, 2011; Naples et al., 2019). As such, the study's findings reinforce how the stereotype content model (Fiske et al., 2002) can help to illuminate the effects of social media on perceptions of STEM professionals (Jarreau et al., 2019a). Furthermore, the findings build on and advance previous accounts of how media messages may influence gender schemas in the context of STEM—and, ultimately, carry consequences for audience members' identification with and self-images as scientists (Steinke, 2017; Steinke & Duncan, 2023; Steinke & Long, 1996; Steinke & Tavarez, 2017). In terms of practice, the present study's findings speak to debates within the STEM community regarding social media communication (Phillips et al., 2022; Wright, 2018; Yammine et al., 2018) by highlighting both the promise and potential limits of using Instagram images to promote a more positive and inclusive vision of this community.

ENDNOTES

[1] Given the range of views among disability activists (e.g., Center for Disability Rights, 2024; National Center on Disability and Journalism, 2021; National Disability Rights Network, 2020) on the use of person-first language (e.g., "people with disabilities") versus identity-first language (e.g., "disabled people"), the authors have chosen to incorporate both forms of language.

[2] The present study also included questions asking respondents whether they agreed or disagreed that "we should do more to promote opportunities for women to work in science" and "we should do more to promote opportunities for people with disabilities to work in science." Neither treatment influenced responses to these questions—a result which highlights potential limits of individual Instagram messages and individualistic social media approaches to addressing systemic barriers in science. Meanwhile, Instagram use predicted support for promoting opportunities for women to work in science but did not predict support for promoting opportunities for people with disabilities to work in science. One potential explanation here revolves around the relative invisibility of scientists with disabilities on social media and in other media, combined with a lack of awareness regarding the barriers facing disabled people in science (and society more broadly). The authors' search for Instagram accounts featuring women with visible disabilities in science revealed a relatively small number of such accounts—particularly when compared to the number of accounts featuring women scientists with no visible and/or publicly identified disability.

REFERENCES

Aladé, F., Lauricella, A., Kumar, Y., & Wartella, E. (2021). Who's modeling STEM for kids? A character analysis of children's STEM-focused television in the US. *Journal of Children and Media, 15*(3), 338-357.

Bem, S. L. (1993). *The lenses of gender: Transforming the debate on sexual inequality*. New Haven, CT: Yale University Press.

Besley, J. C., Lee, N. M., & Pressgrove, G. (2021). Reassessing the variables used to measure public perceptions of scientists. *Science Communication*, *43*(1), 3-32.

Blickenstaff, J. C. (2005). Women and science careers: Leaky pipeline or gender filter? *Gender and Education*, *17*(4), 369-386.

Bond, B. J. (2016). Fairy godmothers > robots: The influence of televised gender stereotypes and counter-stereotypes on girls' perceptions of STEM. *Bulletin of Science, Technology & Society*, *36*(2), 91-97.

Booksh, K. S., & Madsen, L. D. (2018). Academic pipeline for scientists with disabilities. *MRS Bulletin*, *43*(8), 625-632.

Brewer, P. R., & Ley, B. L. (2021). *Science in the media: Popular images and public perceptions*. Routledge.

Brewer, P. R., & Ley, B. L. (2017). "Where my ladies at?": Online videos, gender, and science attitudes among university students. *International Journal of Gender, Science and Technology*, *9*(3), 278-297.

Butkowski, C. P., Dixon, T. L., Weeks, K. R., & Smith, M. A. (2020). Quantifying the feminine self(ie): Gender display and social media feedback in young women's Instagram selfies. *New Media & Society*, *22*(5), 817-837.

Campbell, A., Shirley, L., & Candy, J. (2004). A longitudinal study of gender-related cognition and behaviour. *Developmental Science*, *7*(1), 1-9.

Cave, S., Dihal, K., Drage, E., & McInerney, K. (2023). Who makes AI? Gender and portrayals of AI scientists in popular film, 1920–2020. *Public Understanding of Science, 32*(6), 745-760.

Center for Disability Rights. (2024). Disability writing and journalism guidelines. https://cdrnys.org/disability-writing-journalism-guidelines/

Chambers, D. W. (1983). Stereotypic images of the scientist: The draw-a-scientist test. *Science Education*, *67*(2), 255-265.

Chappell, B. (2015). Distractingly sexy tweets are female scientists' retort to 'disappointing' comments. NPR. https://www.npr.org/sections/thetwo-way/2015/06/12/413986529/-distractinglysexy-tweets-are-female-scientists-retort-to-disappointing-comments

Cheryan, S., Plaut, V. C., Handron, C., & Hudson, L. (2013). The stereotypical computer scientist: Gendered media representations as a barrier to inclusion for women. *Sex Roles*, *69*(1-2), 58-71.

Cohen, J. (1977). *Statistical power analysis for the behavioral sciences.* Routledge.

Coleman, J. M., Brunell, A. B., & Haugen, I. M. (2015). Multiple forms of prejudice: How gender and disability stereotypes influence judgments of disabled women and men. *Current Psychology*, *34*(1), 177-189.

Corbie-Smith, G., Thomas, S. B., Williams, M. V., & Moody-Ayers, S. (1999). Attitudes and beliefs of African Americans toward participation in medical research. *Journal of General Internal Medicine*, *14*(9), 537-546.

Crenshaw, K. (1989). Demarginalizing the intersection of race and sex: A Black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics. *University of Chicago Legal Forum 140*,139-167.

DiChristina, M. (2012, Feb. 16). What a scientist looks like. *Scientific American*. https://www.scientificamerican.com/article/what-a-scientist-looks-like/

Dudo, A., Brossard, D., Shanahan, J., Scheufele, D. A., Morgan, M., & Signorielli, N. (2011). Science on television in the 21st Century: Recent trends in portrayals and their contributions to public attitudes toward science. *Communication Research*, *38*(6), 754-777.

Eagly, A. H., Nater, C., Miller, D. I., Kaufmann, M., & Sczesny, S. (2020). Gender stereotypes have changed: A cross-temporal meta-analysis of US public opinion polls from 1946 to 2018. *American Psychologist*, *75*(3), 301-315.

Fiske, S. T. (2018). Stereotype content: Warmth and competence endure. *Current Directions in Psychological Science*, *27*(2), 67-73.

Fiske, S. T., & Dupree, C. (2014). Gaining trust as well as respect in communicating to motivated audiences about science topics. *Proceedings of the National Academy of Sciences, 111*(4), 13593– 13597

Fiske, S. T., Cuddy, A. J., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. *Journal of Personality and Social Psychology*, *82*(6). 878-902.

Freimuth, V. S., Quinn, S. C., Thomas, S. B., Cole, G., Zook, E., & Duncan, T. (2001). African Americans' views on research and the Tuskegee Syphilis Study. *Social Science & Medicine*, *52*(5), 797-808.

Funk, C., Tyson, A., Kennedy, B., & Johnson, C. (2020, Sept. 29). Science and scientists held in high esteem across global publics. Pew Research Center. https://www.pewresearch.org/science/2020/09/29/science-and-scientists-held-in-high-esteem-across-global-publics/

Fujiwara, Y., Velasco, R. C. L., Jones, L. K., & Hite, R. L. (2022). Competent and cold: A directed content analysis of warmth and competence dimensions to identify and categorise stereotypes of scientists portrayed in meme-based GIFs. *International Journal of Science Education*, *44*(4), 694-715.

Geena Davis Institute on Gender in Media (2018). Portray her: Representations of women STEM characters in media. https://seejane.org/research-informs-empowers/portray-her/

Geena Davis Institute on Gender in Media (2019). The 'Scully effect': I want to believe … in STEM." https://seejane.org/wp-content/uploads/x-files-scully-effect-report-geena-davis-institute.pdf

Geena Davis Institute on Gender in Media (2024). Portray her 2.0: An analysis of 15 years of women in STEM on-screen, 2007–2022. https://seejane.org/research-informs-empowers/portray-her-2-0-an-analysis-of-15-years-of-women-in-stem-on-screen-2007-2022/

Gerbaudo, P. (2012). *Tweets and the streets: Social media and contemporary activism*. Pluto Press.

Gerbner, G. (1987). Science on television: How it affects public conceptions. *Issues in Science and Technology*, *3*(3), 109-115.

Gerbner, G., & Gross, L. (1976). Living with television: The violence profile. *Journal of Communication*, *26*(2), 172-199.

Gokhale, A. A., Rabe-Hemp, C., Woeste, L., & Machina, K. (2015). Gender differences in attitudes toward science and technology among majors. *Journal of Science Education and Technology*, *24*(4), 509-516.

Grant, C. A., & Zwier, E. (2011). Intersectionality and student outcomes: Sharpening the struggle against racism, sexism, classism, ableism, heterosexism, nationalism, and linguistic, religious, and geographical discrimination in teaching and learning. *Multicultural Perspectives*, *13*(4), 181-188.

Gottfried, J. (2024, Jan. 31). Americans' social media use. Pew Research Center. https://www.pewresearch.org/internet/2024/01/31/americans-social-media-use/

Hendriks, F., Mayweg-Paus, E., Felton, M., Iordanou, K., Jucks, R., & Zimmermann, M. (2020). Constraints and affordances of online engagement with scientific information—A literature review. *Frontiers in Psychology, 11,* 572744.

Hill, C., Corbett, C., & St Rose, A. (2010). *Why so few? Women in science, technology, engineering, and mathematics*. American Association of University Women. https://www.aauw.org/app/uploads/2020/03/why-so-few-research.pdf

Hmielowski, J. D., Feldman, L., Myers, T. A., Leiserowitz, A., & Maibach, E. (2014). An attack on science? Media use, trust in scientists, and perceptions of global warming. *Public Understanding of Science, 23*(7), 866-883.

Huber, B., Barnidge, M., Gil de Zúñiga, H., & Liu, J. (2019). Fostering public trust in science: The role of social media. *Public Understanding of Science*, *28*(7), 759-777.

Jackson, J. K. (2011). Doomsday ecology and empathy for nature: Women scientists in "B" horror movies. *Science Communication*, *33*(4), 533-555.

Jarreau, P. B., Cancellare, I. A., Carmichael, B. J., Porter, L., Toker, D., & Yammine, S. Z. (2019a). Using selfies to challenge public stereotypes of scientists. *PloS One*, *14*(5), e0216625.

Jarreau, P.B., Dahmen, N. S., & Jones, E. (2019b). Instagram and the science museum: A missed opportunity for public engagement. *Journal of Science Communication, 18*(2), A06.

Ke, Q., Ahn, Y. Y., & Sugimoto, C. R. (2017). A systematic identification and analysis of scientists on Twitter. *PLoS One*, *12*(4), e0175368.

Kerr, J., Panagopoulos, C., & van der Linden, S. (2021). Political polarization on COVID-19 pandemic response in the United States. *Personality and Individual Differences*, *179*, 110892.

Krause, N. M. (2023). Placing "trust" in science: The urban–rural divide and Americans' feelings of warmth toward scientists. *Public Understanding of Science, 32*(5), 596-604.

Ley, B. L., & Brewer, P. R. (2018). Social media, networked protest, and the March for Science. *Social Media+ Society, 4*(3), 2056305118793407.

Lippmann, W. (1922). *Public opinion.* Harcourt Brace and Company.

Lloyd, M. (1992). Does she boil eggs? Towards a feminist model of disability. *Disability, Handicap & Society*, *7*(3), 207-221.

Long, M., Boiarsky, G., & Thayer, G. (2001). Gender and racial counter-stereotypes in science education television: A content analysis. *Public Understanding of Science, 10*(3), 255-269.

Long, M., Steinke, J., Applegate, B., Lapinski, M. K., Johnson, M. J., & Ghosh, S. (2010). Portrayals of male and female scientists in television programs popular among middle school-age children. *Science Communication*, *32*(3), 356-382.

Malcolm, S. M., Hall, P. Q., & Brown, J. W. (1976, April). The double bind: The price of being a minority woman in science. Washington, DC: American Association for the Advancement of Science.

Miller, D. I., Nolla, K. M., Eagly, A. H., & Uttal, D. H. (2018). The development of children's gender-science stereotypes: A meta-analysis of 5 decades of US Draw-a-Scientist studies. *Child Development*, *89*(6), 1943-1955.

Naples, N. A., Mauldin, L., & Dillaway, H. (2019). From the guest editors: Gender, disability, and intersectionality. *Gender & Society*, *33*(1), 5-18.

National Center on Disability and Journalism (2021). Disability language style guide. https://ncdj.org/style-guide/

National Disability Rights Network (2020). Communicating about people with disabilities. https://www.ndrn.org/resource/communicating-about-people-with-disabilities/

National Science Board (2022). The state of US science and engineering 2022. https://ncses.nsf.gov/pubs/nsb20221

Nisbet, M. C., Scheufele, D. A., Shanahan, J., Moy, P., Brossard, D., & Lewenstein, B. V. (2002). Knowledge, reservations, or promise? A media effects model for public perceptions of science and technology. *Communication Research*, *29*(5), 584-608.

Noon, E. J., Schuck, L. A., Guțu, S. M., Şahin, B., Vujović, B., & Aydın, Z. (2021). To compare, or not to compare? Age moderates the relationship between social comparisons on instagram and identity processes during adolescence and emerging adulthood. *Journal of Adolescence, 93,* 134-145.

Not Common (2024). Most followed Instagram accounts in the world 2024. https://notcommon.com/most-followed/instagram

O'Keeffe, M. (2013). Lieutenant Uhura and the drench hypothesis: Diversity and the representation of STEM careers. *International Journal of Gender, Science and Technology*, *5*(1), 4-24.

Ong, M., Wright, C., Espinosa, L., & Orfield, G. (2011). Inside the double bind: A synthesis of empirical research on undergraduate and graduate women of color in science, technology, engineering, and mathematics. *Harvard Educational Review*, *81*(2), 172-209.

Pew Research Center (2024). Social media fact sheet. https://www.pewresearch.org/internet/fact-sheet/social-media/

Phillips, A. A., Walsh, C. R., Grayson, K. A., Penney, C. E., Husain, F., & Women Doing Science Team. (2022). Diversifying representations of female scientists on social media: A case study from the Women Doing Science Instagram. *Social Media + Society*, *8*(3), 20563051221113068.

Sarju, J. P. (2021). Nothing about us without us: Towards genuine inclusion of disabled scientists and science students post pandemic. *Chemistry–A European Journal*, *27*(41), 10489-10494.

Simis, M. J., Yeo, S. K., Rose, K. M., Brossard, D., Scheufele, D. A., Xenos, M. A., & Pope, B. K. (2015). New media audiences' perceptions of male and female scientists in two sci-fi movies. *Bulletin of Science, Technology & Society*, *35*(3-4), 93-103.

Steinke, J. (1997). A portrait of a woman as a scientist: Breaking down barriers created by gender-role stereotypes. *Public Understanding of Science*, *6*(4), 409-428.

Steinke, J. (1999). Women scientist role models on screen: A case study of *Contact*. *Science Communication*, *21*(2), 111-136.

Steinke, J. (2017). Adolescent girls' STEM identity formation and media images of STEM professionals: Considering the influence of contextual cues. *Frontiers in Psychology*, *8*:716.

Steinke, J., Applegate, B., Lapinski, M., Ryan, L., & Long, M. (2012). Gender differences in adolescents' wishful identification with scientist characters on television. *Science Communication*, *34*(2), 163-199.

Steinke, J., & Duncan, T. (2023). Challenging media stereotypes of STEM: Examining an intervention to change adolescent girls' gender stereotypes of STEM professionals. *International Journal of Gender, Science and Technology, 15*(2), 136-165.

Steinke, J., Lapinski, M., Zietsman-Thomas, A., Nwulu, P., Crocker, N., Williams, Y., Hingdon, S., & Kuchibhotla, S. (2006). Middle school-aged children's attitudes toward women in science, engineering, and technology and the effects of media literacy training. *Journal of Women and Minorities in Science and Engineering*, *12*(4), 295-323.

Steinke, J., Lapinski, M. K., Crocker, N., Zietsman-Thomas, A., Williams, Y., Evergreen, S. H., & Kuchibhotla, S. (2007). Assessing media influences on middle school–aged children's perceptions of women in science using the Draw-A-Scientist Test (DAST). *Science Communication*, *29*(1), 35-64.

Steinke, J., Lapinski, M., Long, M., Van Der Maas, C., Ryan, L., & Applegate, B. (2009). Seeing oneself as a scientist: Media influences and adolescent girls' science career-possible selves. *Journal of Women and Minorities in Science and Engineering*, *15*(4), 270-301.

Steinke, J., & Long, M. (1996). A lab of her own? Portrayals of female characters on children's educational science programs. *Science Communication*, *18*(2), 91-115.

Steinke, J., & Tavarez, P. M. P. (2017). Cultural representations of gender and STEM: Portrayals of female STEM characters in popular films 2002-2014. *International Journal of Gender, Science and Technology*, *9*(3), 244-277

Steinke, J., Applegate, B., Penny, J. R., & Merlino, S. (2022). Effects of diverse STEM role model videos in promoting adolescents' identification. *International Journal of Science and Mathematics Education*, *20*(2), 255-276.

Su, L. Y.-F., McKasy, M., Cacciatore, M. A., Yeo, S. K., DeGrauw, A. R., & Zhang, J. S. (2021). Generating science buzz: An examination of multidimensional engagement with humorous scientific messages on Twitter and Instagram. *Science Communication, 44*(1), 30–59.

The Brain Scoop. (2013, Nov. 27). Where my ladies at? https://www.youtube.com/watch?v=yRNt7ZLY0Kc

Treem, J. W., & Leonardi, P. M. (2013). Social media use in organizations: Exploring the affordances of visibility, editability, persistence, and association. *Annals of the International Communication Association*, *36*(1), 143-189.

Tufekci, Z. (2014). Big questions for social media big data: Representativeness, validity and other methodological pitfalls. arXiv preprint arXiv:1403.7400

Tufekci, Z. (2017). *Twitter and tear gas: The power and fragility of networked protest*. Yale University Press.

Weingart, P., Muhl, C., & Pansegrau, P. (2003). Of power maniacs and unethical geniuses: Science and scientists in fiction film. *Public Understanding of Science*, *12*(3), 279-287.

Welbourne, D. J., & Grant, W. J. (2016). Science communication on YouTube: Factors that affect channel and video popularity. *Public Understanding of Science*, 25(6), 706-718.

Wike, R., Silver, L., Fetterolf, J., Huang, C., Austin, S., Clancy, L., & Gubbala, S. (2022, Dec. 6). Social media seen as mostly good for democracy across many nations, but US is a major outlier. Pew Research Center.

https://www.pewresearch.org/global/2022/12/06/social-media-seen-as-mostly-good-for-democracy-across-many-nations-but-u-s-is-a-major-outlier/

Wright, M. (2018). Instagram won't solve inequality. *Science*, *359*(6381), 1294-1294.

Wyer, M. (2003). Intending to stay: Images of scientists, attitudes toward women, and gender as influences on persistence among science and engineering majors. *Journal of Women and Minorities in Science and Engineering*, *9*(1), 1-16.

Yammine, S. Z., Liu, C., Jarreau, P. B., & Coe, I. R. (2018). Social media for social change in science. *Science*, *360*(6385), 162-163.

Yerbury, J. J., & Yerbury, R. M. (2021). Disabled in academia: To be or not to be, that is the question. *Trends in Neurosciences*, *44*(7), 507-509.

Yurdagül, C., Kircaburun, K., Emirtekin, E., Wang, P., & Griffiths, M. D. (2021). Psychopathological consequences related to problematic Instagram use among adolescents: The mediating role of body image dissatisfaction and moderating role of gender. *International Journal of Mental Health and Addiction, 19*, 1385-1397.