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CELEBRITIES' CLIMATE CHANGE ADVOCACY ON TWITTER AND ITS EFFECTS ON
PUBLIC PERCEPTION AND BEHAVIORAL CHANGE

by

SEJUNG PARK

Under the Direction of Cynthia Hoffner, PhD

ABSTRACT

This research adds the growing body of literature on the role of celebrities as emergent spokespersons in climate advocacy and the process and consequences of its effects on public attitudes and behaviors to resolve the climate crisis. By applying social cognitive theory in conjunction with emotional appeals and language styles as message frames, the study examines the effects of role-modeling in adoption of eco-attitudes and behaviors. In a 2 x 2 design, the independent variables were emotion frame (fear, hope) and celebrity involvement frame (first person pronouns; FPP, non-first person pronouns; NFPP). For the manipulation check, the tweets were pilot tested. The main study was an experiment that asked participants to read tweets attributed to Leonardo DiCaprio or Pharrell Williams. Four main dependent variables were

attitudes toward climate change mitigation and three behaviors, including support for government action, intention to engage in sustainable behavior, and intention to participate in activism for climate change mitigation. The role of two mediating variables (risk awareness, response efficacy) and one moderating variable, parasocial interaction (PSI) with the celebrity, were also examined. First, one-way ANCOVAs compared the effects of emotion frames to the control group. No evidence of the effects of emotion frame over unrelated messages on any dependent variables was found. Second, 2 (fear vs hope) x 2 (FPP vs NFPP) ANCOVAs found that fear-framed messages were more effective than hope-framed messages in driving intention for participation in activism, but emotion frame did not affect any other variables. The results also found that FPP frames led to more positive attitude (compared to NFPP frames), but had no effect on behaviors. Third, regression analyses found no evidence that risk awareness or response efficacy mediated the effect of emotion frames on attitudes or behaviors. In addition, the study discovered that PSI was a strong positive predictor of attitudes and all behaviors, but PSI did not moderate the impact of the celebrity involvement frame. The findings provide empirical evidence of the potential for celebrities to serve as role models in climate advocacy by psychologically involving people, which can be translated to the adoption of attitudes and behaviors.

INDEX WORDS: Celebrity, Climate change, Environmental advocacy, Twitter, Message framing, Emotion

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SEJUNG PARK

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

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Georgia State University

2017

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Sejung Park
2017

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LIST OF ABBREVIATIONS

PSI (Parasocial Interaction)

FPP (First person pronouns)

NFPP (Non-first person pronouns)

1 INTRODUCTION

During the last several decades, celebrities have influenced media consumers in various ways, including their thinking, attitudes, beliefs, and social practices. Individuals develop psychological bonds with media personas or fictional characters, which can be translated to their interests in celebrities' life styles and the adoption of their behaviors such as fashion style, product choice, and risk management behavior (Brown, 2010; Giles, 2002; Hoffner & Buchanan, 2005; Hoffner & Cantor, 1991).

In the era of social media, the potential of celebrity influence on media users' cognition, perception, and social practices is multiplied, as social media enables individuals to navigate celebrities' real lives without constraints of time and space and even to interact with them (Alexander, 2013; Hoffner, 2008; Stever, 2013; Stever & Lawson, 2013). In particular, Twitter functions as both a public and interpersonal communication tool, connecting celebrities and individuals based on a real-time live stream that was not possible in earlier media eras. For instance, while celebrities enjoy disclosing their private stories and reaching international media consumers through Twitter, individuals can become closer to the lives of celebrities, which may increase the possibility of celebrity influence especially on young adults who are active social media users (Alexander, 2013).

Psychologists and media scholars have examined how celebrities can function as role models and influence audiences' attitudes and behaviors. Social cognitive theory and the phenomenon of parasocial interaction (PSI) are useful theoretical frameworks to understand this process and outcomes. Social cognitive theory premises that most aspects of human behavior are derived from observation of others beyond their direct experiences (Bandura, 1986). Scholars in the area of mass media have applied this theory to explain the mechanism of role-modeling (e.g.

Knobloch-Westerwick & Hastall, 2010; Nabi & Clark, 2008; Pajares, Prestin, Chen, & Nabi, 2009). Their findings suggest that audiences vicariously learn media figures' acts in specific situations and reference them in their lives.

As another theoretical framework in describing celebrity influence, the concept of parasocial relationships proposed by Horton and Wohl (1956) suggests that media consumers develop pseudo relationships with media personalities or celebrities. It has been found that audiences' parasocial relationships with celebrities produce attitudinal and behavior influences (Basil & Brown, 1997; Brown & Basil, 1995; Brown, Basil, & Bocarnea, 2003; Horton & Wohl, 1956; Papa et al., 2000; Rubin & Perse, 1987).

Scholars have also noted that the concept of framing is useful for understanding the dynamics of attitude and behavior change (Entman, 2007; Gamson & Modigliani, 1989; Gross, 2008; Kahneman & Tversky, 1981; Nisbet, 2009). Framing refers to an 'interpretative package' (Gamson & Modigliani, 1989) that drives how to understand an event or issue. As a result, framing is likely to affect the public's interpretation and focus on certain attributes of issues (Shah, McLeod, Gotlieb, & Lee, 2009). Empirical studies have confirmed that both cognition and emotion are involved in the persuasion process (Dillard & Shen, 2005; Shen & Dillard, 2007). These findings imply the necessity for understanding both cognitive and affective processes in exploring the role of framing in persuasion (Agrawal & Duhachek, 2010; DeSteno, Petty, Rucker, Wegener, & Braverman, 2004; Nabi, 1999; Tangney & Tracy, 2012).

In addition to understanding the process of the social influence of celebrities, scholars in the field of mass communication, consumer culture, and risk management have been motivated to uncover the persuasive outcome of using celebrity resources in shaping individuals' cognition, perception, and behavior. Previous studies suggest that celebrities are powerful not only in

selling products to the public, but also in promoting public ideas and public campaigns (Brown, 2010; t'Hart & Tindall, 2009). When celebrities are associated with social causes, celebrities can draw public attention to selected issues and influence public perception and involvement (Brown, 2010). High profile appearances of celebrities in mass media are useful to educate the public, evoke public emotion, and mobilize large numbers of people to engage in public causes (t'Hart & Tindall, 2009).

Today, among various important issues and causes that celebrities are involved in, including health, political, and environmental issues, the climate change issue is among those that have received the most attention and effort from major celebrities. Scholars and pundits have debated the role of celebrities in increasing public awareness, perception, and engagement in the climate change issue (Boykoff & Goodman, 2009; Corner & Pels, 2003; Street, 2004). This scholarship falls into two competing camps: the “democratization camp” and the “distraction camp.” On the one hand, the “democratization camp” argues that celebrity engagement in environmental problems leads to greater public awareness, participation, and discussion on the politics of climate change (e.g., Corner & Pels, 2003; Street, 2004). Scholars in this camp argue that celebrities are influential in stimulating pro-environmental behaviors of the public and shaping their perceptions and attitudes on climate-related issues. On the other hand, the “distraction camp” contends that celebrity climate change advocacy has no positive effects, and diverts public attention from the “real” issue (e.g., Weiskel, 2005). Scholars in this camp also point out that celebrity involvement is primarily effective in expanding celebrity branding, noting that such advocacy increases public awareness of the celebrity per se, but does less for awareness of climate change (Boykoff & Goodman, 2009).

The growing number of green celebrities who use social media to raise awareness about climate change and promote needed action renders the controversy between the two camps more relevant and requires empirical studies. However, little research has examined the impact of eco-celebrities' social media uses on public perceptions and behavior change toward climate change mitigation. To fill this research gap, grounded in social cognitive theory and framing theory, this project investigates the influence of celebrities' climate advocacy via social media on individuals' attitude and behaviors toward climate change mitigation. Based on these objectives, this study examines the consequences of celebrities' message framings (emotion and celebrity involvement frames) on individuals' attitudes and behaviors for climate change mitigation. The study also examines the mechanism of how these frames function by testing the mediating role of risk awareness and response efficacy in the influence of emotion frame as well as the role of PSI with celebrities as a separate predictor and a moderator of the impact of celebrity involvement frame.

This study contributes to the theoretical understanding of the role of celebrity advocacy and PSI with celebrities in driving pro-environmental attitudes and behaviors, and also provides insight regarding the impact of different message frames based on emotional appeals and language. The study also offers practical implications on how to effectively design environmental advocacy messages using celebrity sources and social media.

2 LITERATURE REVIEW

2.1 The Relationship between Celebrities and the Public

For many years, mass communication scholars have investigated mediated social influence. Parasocial relations provide a framework to understand the social influence of media figures on individuals by describing how audiences develop psychological bonds and

relationships with the media figures (Basil & Brown, 1997; Brown & Basil, 1995; Brown et al., 2003; Horton & Wohl, 1956; Papa et al., 2000; Rubin & Perse, 1987). Since Horton and Wohl coined the term “parasocial relations” in 1956, scholars in the field of media and communication have investigated the mechanism and consequences of parasocial relations between audience members and media figures, including television performers, television and radio talk-show hosts, soap opera characters, newscaster, athletes and audiences (Giles, 2002; Horton & Wohl, 1956). Recently, scholars have extended this concept to address information-seeking behavior of audiences regarding celebrities and communications between audience members and celebrities in the context of the web and social media (Hoffner, 2008; Stever & Lawson, 2013).

Parasocial relations.

Parasocial relations between media personas and audience members. The concept of “PSI” first appeared in the paper of Horton and Wohl in 1956. They coined the term to refer to the process of viewers’ perceptions during media exposure in which they presumably respond to media figures’ behaviors similarly to real-life encounters (Klimmt, Hartmann, & Schramm, 2006). Rubin and Perse (1987) described three dimensions of PSI: Cognitively-, affectively-, and behaviorally-oriented PSI. First, cognitively-oriented PSI is the degree to which an audience member pays attention to and thinks about a specific media figure’s behavior in a given situation. Second, affectively-oriented PSI occurs when an audience member becomes emotionally involved with a particular media figure. An audience member responds interpersonally to the media figure’s behavior as if they know the figure in real life. Lastly, behaviorally-oriented PSI refers to the degree to which an audience member explicitly reacts to a media figure such as talking about the figure to other audience members.

Other key responses to media figures that have been considered as related concepts with parasocial relations have been frequently discussed within media studies, such as identification and liking (e.g. Tian & Hoffner, 2010). Identification refers to the process by which an audience shares a character's perspective and engages in the story through the character's eyes during the program (Cohen, 1999). Brown (2010) contended that PSI and identification are closely related processes in which audiences are psychologically involved with celebrities. On the one hand, it has been argued that identification has been considered as a driver of parasocial relations. For instance, Tian and Hoffner (2010) found that identifying with a character is associated with stronger parasocial relations. On the other hands, others have suggested that PSI with celebrities often motivates identification, which sometimes leads behavior change (Boon & Lomore, 2001; Brown et al., 2003; Hoffner, 2008). Another type of reaction toward a media figure, "liking," has also received much research attention. Liking means to what extent an individual is attracted to a person (Rubin, 1970). Tian and Hoffner (2010) found that PSI was more likely to occur with liked characters than with characters about whom participants felt neutral.

Horton and Wohl (1956) contended that as a result of PSI, individuals can maintain and develop imagined relationships with media figures, which was termed as a "parasocial relationship". A parasocial relationship is "a seeming face-to-face relationship" created between a media persona and audience members (Horton & Wohl, 1956, p. 215). While a parasocial relationship resembles a social relationship in which individuals are motivated to form interpersonal attachment to others, it is a one-way and mediated relationship (Hoffner, 2008). This one-sided virtual relationship can be developed and maintained by audience members in their imagination although the media persona does not know the audience members personally. For instance, television viewers develop imagined relationships with media figures, from

celebrities to fictional characters, through repeated exposure to television programs. This is experienced as “seeking guidance from media personae, seeing media personalities as friends, imagining being part of a favorite program’s social world, and desiring to meet media performers” (Rubin, Perse, & Powell, 1985, p. 156–157).

Scholars have developed the notion of parasocial relations beyond the context of television viewers’ experience (e.g., Bird, 2003; Brown & Basil, 1995; Brown, Duane & Fraser, 1997; Hoffner, 2008; Murray, 1999; Valkenburg & Soeters, 2001). Their studies suggest that media consumers develop parasocial relationships with various kinds of media celebrities through multiple mediums and mediated events. For example, PSI occurs between sports fans and athletes in which the fans become emotionally involved with the athletes during exposure to televised sports events, talk show interviews, and commercials (Brown & Basil, 1995; Brown et al., 1997). It has been also argued that the use of the internet such as fan sites, celebrity websites, and fan fiction allows individuals to form and deepen parasocial relationships with media figures and celebrities (Bird, 2003; Murray, 1999; Valkenburg & Soeters, 2001).

The consequences of parasocial relations. Previous scholars in this field have made efforts to uncover whether and how a parasocial relation between media figures and media consumers has affective, cognitive, and behavioral consequences (e.g. Brown, 2010; Brown & Basil, 1995; Brown et al., 1997). Studies have found that media consumers’ parasocial relation with celebrities has persuasive influence on their knowledge, perceptions, and behaviors concerning specific social issues such as health, environment, and politics (Brown & Basil, 1995; Brown et al., 1997; Brown et al., 203). In addition, audiences are also likely to perform the behaviors advocated by celebrities and adopt attitudes and beliefs similar to those held by celebrities (Brown, 2010; Frederick, Lim, Clavio, & Walsh, 2012).

For example, in a study of social influence of an international celebrity, Brown et al. (2003) found that when individuals felt connected to a celebrity, they paid more attention to stories about that celebrity and social issues related to the celebrity. Similarly, Brown and Basil (1995) discovered that young adults' PSI with "Magic" Johnson increased their concern about AIDS and the risk of AIDS to heterosexuals, and promoted their HIV prevention practices. In line with this, Brown et al. (1997) noted that parasocial relations with OJ Simpson affected audiences' beliefs about him, with those who had a stronger parasocial bond with him tending to believe his innocence regarding murder charges.

In Brown's (2010) study on a celebrity's influence on wildlife conservation, he found that viewers who had stronger involvement with the celebrity, through PSI and identification, were more likely to increase their support of wildlife. The studies discussed above imply that the processes of PSI and parasocial relationship development can not only motivate individuals to think more about the celebrities' lives, but also lead to behavior change, through adoption of behaviors engaged in or advocated by the celebrities.

Parasocial relations between celebrities and social media users. Interactive features of the internet and social media influence the nature of social connections and provide opportunities for various celebrities and individuals to build, maintain and develop parasocial relations (Alexander, 2013; Frederick et al., 2012; Hoffner, 2008; Sanderson, 2011). Inspired by these technological innovations, recent scholars have sought to explore the changing dynamics of parasocial relations between celebrities and individuals in the context of social media and its implication for celebrity influence.

It has been argued that Twitter overcomes the one-sided parasocial relations between celebrities and audiences by allowing real interaction between them (Kassing & Sanderson,

2010; Marwick, 2011; Turker, 2013). For example, athletes seek to exchange ideas about their work with fans and meet the fans virtually (Sanderson, 2011). They are likely to interact with them directly through Twitter. Moreover, celebrities sometimes reply back to the fans' comments. The conversational function of "mention" and "reply" (@) and "hash tags" (#) initiated direct communication among celebrities and fans. In this sense, it can be argued that Twitter enables users and celebrities to build a social relationship beyond a parasocial relationship (Turker, 2013). To examine how parasocial relationships are enhanced on Twitter, Kassing and Sanderson (2010) qualitatively analyzed the contents of athletes' tweets during the 2009 Giro d'Italia. They found that three themes emerged on the tweets: "sharing commentary and opinions", "fostering interactivity", and "cultivating insider perspectives". They concluded that Twitter affords a more social than parasocial relationship between athletes and fans.

Interestingly, several scholars have noted that parasocial relationships formed via Twitter affect public engagement with celebrities and social issues the celebrities are involved in. For example, in a study of celebrities' practices on Twitter, Marwick (2011) suggested that if fans have stronger parasocial relationships with celebrities they are more likely to engage with the celebrities on Twitter. In the same line with this, Page (2012) analyzed the discourse styles of celebrities' tweets and found that celebrities often attempted to invite users to interact with them via their discourse styles; celebrities used conversational styles in their tweets that was a signal evoking PSI between the celebrities and users. In addition, they used hashtags (#) often to promote public campaigns and mobilize users' engagement. Some other studies also have suggested that although celebrities rarely comment back to their followers, celebrities' social media use still potentially contributes to the development of parasocial relations with users. Users are exposed to celebrities on a daily basis and they share details of the private lives of

celebrities on social media that are rarely found in traditional media (Sanderson, 2011; Stever & Lawson, 2013).

Social cognitive theory. Social cognitive theory has been widely applied to examine the influence of media exposure on audience attitudes and behavior change (Frederick et al., 2012; Giles, 2002; Hoffner, 2008; Horton & Wohl, 1956; Pajares et al., 2009). Social cognitive theory posits that humans are not only able to learn from their enactive experience, but also from vicarious experience through observation (Bandura, 1989). Bandura has conceptualized the latter as vicarious learning in which individuals acquire various social meanings of events and infer the consequences of certain behaviors without direct experiences by observing others' behaviors in social situations and the outcomes they produce.

Modeling. In social cognitive theory, modeling is a type of vicarious learning. In this process, a model provides useful guidance of conduct and educates people by assisting an observer's understanding of appropriate behaviors in diverse situations (Rosenthal & Bandura, 1978). Modeling allows people to extend their knowledge and skills. That is, models convey "knowledge, values, cognitive skills, and new styles of behavior" to audiences (Bandura, 2004, p. 78). For instance, modeling helps observers to cope with problems by providing exemplary performances, which portray useful solutions to the problems.

Through this mechanism, people learn how to think, respond, and behave in various situations from models in an immediate or mediated environment based on the following four subfunctions (Bandura, 2001): a) attentional; b) retentional; 3) behavioral production, and 4) motivational processes. The first subfunction governing modeling is an attentional process. This refers to people's selective attention to information from modeled events. The main determinants of attention are people's cognitive skills, preconceptions, and value preferences, as well as the

saliency, attractiveness, and functional value of the modeled activities. The second subfunction in modeling is a retentional process. Retention involves the process of reconstructing modeled events in people's own memories. Bandura pointed out that observers' preconceptions and affective states may produce biasing influences on the retention. The third subfunction is a behavioral production process. This refers to translating modeled conceptions into appropriate performance, which includes modifying or producing an action based on modeled behavior. These activities usually involve trial-and error. The fourth subfunction in modeling is a motivational process. Enacting vicariously learned behavior is determined by incentive motivators, including direct, vicarious, or self-produced incentives. It is suggested that people are motivated to exhibit a behavior if it leads to valued outcomes, whereas they are discouraged to do so if it results in unrewarding or punishing outcomes. For example, people are likely to perform a modeled behavior if they recognize a directly or vicariously experienced incentive.

Research within this framework has suggested three types of modeling consequences (Bandura, 1974). The first type of modeling effect is an "observational learning effect". This refers to people acquiring a new pattern of behavior by observing others' performances. The second type of modeling effect includes inhibitory or disinhibitory effects. An inhibitory effect occurs if observers reduce the modeled behavior because of observed punishing consequences of the model's behavior. A disinhibitory effect is indicated when observers increase a formerly constrained performance after observing a models' threatening or prohibited behaviors without subsequent adverse consequences. The third type of modeling effect is a response facilitation effect, which occurs when models prompt existing responses of observers.

Existing studies have found that people pay more attention to attractive or similar models in terms of age and gender and this increases the likelihood of modeling (Bandura, 2001; Pajares

et al., 2009). Scholars also suggested that self-efficacy plays a significant role in modeling (Bandura, 1982; Maddux & Rogers, 1983; Pajares et al., 2009; Witte, 1992). Bandura (1982) explicated two types of self-efficacy: perceived personal efficacy and response-outcome efficacy. The former refers to individuals' judgments of their ability to do what is recommended whereas the latter denotes individuals' expectation about if their actions can produce intended results (Bandura, 1982). In the health literature, these concepts have been labeled as self-efficacy and response efficacy (Maddux & Rogers, 1983). In a health campaign context, persuasive appeals influence both perceived self-efficacy, in which people believe they can carry out recommended actions, and perceived response efficacy, in which individuals believe that their responses can prevent the threat (Witte, 1992).

Symbolic modeling. Vicarious experience occurs in one's direct environment and mediated environment (Nabi & Clark, 2008). The latter has been conceptualized as "symbolic modeling" (Bandura, 1974). Bandura described that audiences can learn from a symbolic model that plays in the media. Grounded in social cognitive theory, media effects scholars have investigated the mechanism and impacts of symbolic modeling. The major advantage of symbolic modeling is that people can indirectly evolve in various situations without experiencing trial-and-error and get lessons from the models. Furthermore, they can extend the boundary of reality through modeling behaviors with which they have limited direct contact in their physical environment (Bandura, 2001).

Social cognitive theory predicts that audience members are prone to modeling the behavior of media figures if the outcome is positively portrayed, whereas they are less likely to behave like the models when negative consequences are portrayed. This theory has been applied to understand how and why media figures and celebrities serve as role models and influence

audiences in the area of entertainment education and health campaigns. Entertainment education incorporates prosocial messages into popular entertainment media to influence a viewer's awareness, knowledge, attitudes, and behaviors (Moyer-Gusé, 2008). Enjoyable educational messages in entertainment content are influential to persuade audiences by drawing audience attention and challenging resistance to the persuasive messages (Pajares et al., 2009).

Scholars in the field of health communication have also applied social cognitive theory to explain the influence of symbolic modeling on health education, by promoting healthy behavior and negatively portraying risky behaviors (Moyer-Gusé, 2008; Pajares et al., 2009). Through various narratives, mass media also provide healthy role models who demonstrate appropriate behaviors and codes of conduct in specific situations (Pajares et al., 2009). In particular, symbolic modeling helps to increase self-efficacy of audiences, resulting in enhanced confidence to emulate the behavior from the models (e.g., Maibach & Flora, 1993).

A contrasting argument has been made about the effect of outcome expectancies of viewers in the health campaign context. Nabi and Clark (2008) found that the portrayed outcome of a risky behavior in a television episode, which was rewarding or punishing, did not differently influence viewers' attitudes or intentions for behavior. They found that even though the media characters experienced negative consequences because of their risk behaviors, it did not discourage modeling the behavior. The authors argued that this was because of the audience's expectation that protagonists in television series usually survive and thrive although they have conducted unsafe health behaviors. Thus, they recommended careful consideration of applying and testing social cognitive theory in explaining behavioral modeling in the context of serial programming.

Recent scholars increasingly believe that new media and the internet, where individuals can interact with many people and experience a wide range of virtual relationships, provide various opportunities to examine the processes and consequences of modeling and behavior adoption (Pajares et al., 2009).

2.2 The Role of Celebrities in Environmental Advocacy and their Social Media Uses

The potential of celebrities in delivering advocacy messages is that celebrities attract public attention and they can serve role models for individuals in promoting prosocial behaviors. In recent days, celebrities with a wide range of fans are increasingly advocating environmental issues on popular social media. It has been argued that high profile appearances of celebrities in popular culture are useful to increase public awareness and knowledge, evoke public emotion, and mobilize large numbers of people to engage in environmental issues such as climate change (t'Hart & Tindall, 2009). It has been also expected that when celebrities use social media such as Twitter, the potential of their social influence can be amplified (Alexander, 2013). To understand the role of celebrities in environmental advocacy and their use of social media, this section reviews existing studies on how celebrity activists have been defined, the importance of social media use in environmental advocacy, and the role of celebrities' social media use for climate advocacy.

Definition of celebrity activists. The literature on cultural politics has conceptualized celebrity activists in various ways. The definition of 'celebrity' refers to "those people who, via mass media, enjoy a greater presence and wider scope of activity and agency than are those who make up the rest of the population (Street, 2004, p. 437). The notion of "celebrity politician" provided by John Street (2004) has been widely used among scholars to define celebrity activists. He described two types of celebrity politicians. The first type of celebrity politician is

“the traditional politician – the legitimately elected representative (or the one who aspires to be so) – who engages with the world of popular culture in order to enhance or advance their pre-established political functions and goals” (Street, 2004, p. 437). The second type of celebrity politician is an “entertainer who pronounces on politics and claims the right to represent people and causes, but who does so without seeking or acquiring elected office” (Street, 2004, p. 438). McCurdy (2013) extended this definition to other areas of activism beyond the context of politics and provided general categories of celebrity activists in relation to their social status: An entertainer or other prominent media figure who uses their popular status to undertake activism and an individual who becomes a celebrity by gaining publicity as a result of activism.

Other scholars have defined celebrity activists in more detail. For instance, Boykoff and Goodman (2009) provided six main categories of celebrity activists in terms of their occupation: celebrity business people (e.g., Richard Branson), celebrity musicians (e.g., Sheryl Crow, Coldplay), celebrity politicians (e.g., Arnold Schwarzenegger), celebrity actors (e.g., Leonardo DiCaprio), celebrity athletes/sports figures (e.g., David James), and celebrity public intellectuals (e.g., Michael Crichton, George Monbiot).

In recent days, “eco-celebrities” or “green celebrities” have been highlighted in the media landscape. They are characterized as celebrities who promote environmentalism in the public sphere or adopt an environmental-friendly lifestyle (White & Duram, 2012). Scholars note that a key driver of celebrity activists in engaging environmental advocacy is to gain more positive reputations by presenting themselves as socially conscious or responsible people (Anderson, 2011; Boykoff & Goodman, 2009; White & Duram, 2012). Based on discussions above, in this project eco-celebrities are defined as environmental advocates who have pre-established high profiles in popular culture.

Why social media matter in environmental advocacy. Scholars have noted the potential of social media such as Twitter and Facebook in issue dissemination, opinion formation, and mobilization of public engagement (e.g. Bruns, Highfield, & Lind, 2012; Drezner & Farrell, 2008; Himelboim, McCreery, & Smith, 2013; Park, Park, Lim, & Park, 2015; Tumasjan, Sprenger, Sandner, & Welp, 2010). With their ease of use, high mobility, and ability to reach a large number of media users, social media can serve as alternative communication channels to mainstream media and a new public discourse arena in various communication contexts (Bruns et al., 2012; Park et al., 2015). Social media allow real-time based connection and interaction among entities at the level of states, organizations, groups, and individuals without physical and cost constraints (Park et al., 2015). Users can create and share their stories based on everyday life and reach a number of other users through digital social networks (Smith, 2005).

It also has been argued that social media can provide alternative news outlets to traditional media, where diverse actors easily share ideas and interact with each other on particular social issues (Alexander, 2013). This implies the necessity of considering popular social media as an alternative news outlet and campaign tool in the context of environmental communication.

Twitter in particular is useful not only for disseminating newsworthy events, but also for stimulating public interest and engagement in social issues (Bruns & Burgess, 2012; Park et al., 2015). Twitter is a platform that combines public communication and interpersonal communication. Within the constraints of the text length (140 characters), users can easily broadcast what they want, share with the public, and interact with others at the same time.

In the context of environmental advocacy, social media can be used as a communication tool to increase public awareness and mobilize the public to support environmental issues. Fisher and Brockerhoff (2008) noticed the advantage of employing social media to communicate with target audiences from the user's perspective. For instance, when users communicate with social actors such as advocates and organizations via social media, it is likely that these social actors may be regarded as peers of the users rather than "authorities". Considering that people are willing to share ideas and collaborate with peers via social media, employing social media in promoting ideas has great potential (Fisher & Brockerhoff, 2008).

Social media use of celebrities and its potential for environmental advocacy. Scholars in the field of environmental management have drawn attention to influential news providers or brokers who disclose, represent, and disseminate environment-related information (Boykoff, 2011). Boykoff (2011) discovered that advocacy groups are more influential than news media in shaping the attitudes of audiences. A growing number of celebrities have engaged in environmental advocacy to educate the public and promote needed action. Scholars have contended that celebrities are influential in stimulating pro-environmental behaviors of the public and shaping their perceptions and attitudes (Corner & Pels, 2003; Street, 2004).

It is noteworthy that a growing number of eco-celebrities who are involved in environmental advocacy use social media (Alexander, 2013). The technological advantage of social media in terms of its high capability for social networking with the public provides celebrities with powerful tools to not only disseminate ideas, but also build, manage, and strengthen their positive image toward the public. Indeed, by utilizing social media celebrities can effectively attract public attention and mobilize collective action on social causes (Alexander, 2013). Considering that individuals increasingly tend to seek personalized and

entertainment-oriented information on the internet, celebrities' advocacy via social media has potential as an information resource and means to shape a wide range of users' perceptions and attitudes (Thrall et al., 2008).

Existing studies have examined how celebrity environmental involvement is represented in mainstream media, but few studies have examined this phenomenon in new media settings such as social media (Thrall et al., 2008). Considering the increasing use of social media by celebrities for advocacy, this is a remarkable research gap.

Research suggests that social media facilitate role-modeling for social causes or environmental advocacy (Alexander, 2013; Brown, 2010). For example, Alexander (2013) investigated the impact of an eco-celebrity's Twitter use on environmental advocacy among fans. He examined Ian Somerhalder, who is a famous actor on the television series *The Vampire Diaries*. Somerhalder has often tweeted on environmental issues and his fans on Twitter responded that they are willing to participate in the activities advocated by him. Similarly, Brown (2010) examined audience involvement in the death of Steve Irwin, who was a popular celebrity who appeared on an environmental documentary series in Australia and was a wild-life advocator in his real life. Irwin was accidently killed while working on his documentary series. Brown analyzed how audiences engaged in PSI with Irwin and the effects of the PSI on their perceptions of him and attitudes toward environmental protection. Brown found that audiences who had a stronger parasocial relation with Irwin were more likely to search for information about him on the internet, talk with others about the accident, perceive him as a great environmental advocator, and be willing to act for wildlife conservation.

The studies reviewed above suggest that celebrities are influential in promoting pro-environmental attitudes and behaviors. The findings also imply that formation of parasocial

relationships between celebrities and audience members via social media can increase the impact of celebrity advocacy for environmental issues. Specifically, individuals who follow the everyday lives of celebrities are more likely to adopt the celebrities' attitudes and beliefs in relation to environmental issues (Brown et al., 2003).

The potential of celebrities' self-presentation as role models. Social cognitive theory and studies applying the theory have argued that celebrities have the potential to play role models for individuals, who are likely to adopt celebrities' attitudes and behaviors in various contexts (Bandura, 2001, 2004; Moyer-Gusé, 2008; Pajares et al., 2009). The literature on marketing and advertising has well documented the persuasive effects of celebrity spokespersons and endorsements, showing that celebrities have impact on individuals (Smith, 2004). In line with this, recent scholars have noted that celebrities' social media use can facilitate role-modeling for social causes or environmental advocacy (Alexander, 2013; Brown, 2010). As Twitter is a useful medium for sharing information and opinions, many celebrities use Twitter to communicate with its users. Celebrities often use hash tags (#) to broadcast their topic-based tweets, which is a useful function to make the topic visible to many users, attract audience attention, and promote engagement in the topic (Page, 2012). Their tweets are usually about their personal information and their communication styles are informal (Stever & Lawson, 2013).

It is also noteworthy to examine how celebrities communicate about social causes, which may have an impact on public perception (Bramley, 2001; Djenar, 2008). While no empirical research has been located on the influence of celebrities' personal pronoun use in environmental advocacy, the function of pronominal choice has been studied in the area of political communication. In particular, using first person pronouns (FPP) (e.g. I, me, or, my) is a strategic way of representing a speaker's identity and expressing personal support on social issues,

because it explicitly references the self (Bramley, 2001). It has been found that politicians use the FPP singular pronoun “I” to strategically describe themselves, showing their personal opinions and positions toward certain issues (Bramley, 2001). It has been also argued that the choice of FPP may influence the perception of the speaker by others (Djenar, 2008).

In line with this, literature on marketing notes the function of personal pronouns, suggesting that using personal pronouns is an influential linguistic strategy to signal the relationship between advertisements and targeted people (Smith, 2004). Advertisers use personal pronouns to personalize their companies and which is useful to directly address potential customers. Indeed, personal pronoun uses have influence on audiences’ perceptions about the person (Djenar, 2008).

Overall, these past studies suggest that a celebrity’s FPP use can strategically position the celebrity as a role model by directly referencing what they do and how they engage in the recommended activities. Thus, it would be useful to examine if this has any effects on audience perception and their role-modeling in the context of celebrity environmental advocacy.

2.3 Persuasive Communication and Message Framing

Many communication scholars have used framing theory to understand persuasion. Framing studies take account of how an issue is characterized in the media and the influences of framing on how audiences understand the issue (Scheufele & Tewksbury, 2007). Literature on frames suggested that frames are significant in shaping audiences’ cognition and perceptions as they use the frames as a reference for their interpretations (Shah et al., 2009). In relation to this, psychologists have investigated the role of emotion in framing and they have suggested that using emotion-induced framing has potential to influence audience cognition and perception (Agrawal & Duhachek, 2010; DeSteno et al., 2004; Nabi, 1999; Tangney & Tracy, 2012). In the

context of environmental communication, scholars have examined how environmental issues are framed and the framing effects on risk perceptions, awareness, concerns, and actions for environmental protection (Gross 2008; Miller & Riechert, 2000; Turner, 2011). This section provides an overview of framing theory, existing studies on emotion-induced framing and how environmental issues are framed in the media.

Framing theory. The concept of “framing” has been conceptualized very broadly and there have been diverse approaches to study it. At a basic level, framing refers to “the process by which people develop a particular conceptualization of an issue or reorient their thinking about an issue” (Chong & Druckman, 2007, p. 104). Cole and Jenkins (2012) contended that a frame helps individuals to identify and perceive social issues and events. A frame functions by promoting a particular definition, interpretation, or evaluation of social issues (Goffman, 1974).

Scholars have focused on two types of frames, media frames and audience frames. A media frame refers to the words, images, phrases, and presentation styles an information provider uses (Gamson & Modigliani, 1989). Media framing has examined how an issue is presented in news coverage and influences the way audiences make sense of the issue (Scheufele & Tewksbury, 2007). Entman (2007) suggested frames in news representation create a narrative in a specific way, which is intended by the content’s producers. In line with this, Cole and Jenkins (2012) noted that media gatekeepers employ frames to help audiences to define and interpret relevant issues or events. Similarly, Lester (2010) argued that journalists use frames not only to increase the understanding of their audiences in an intended way, but also to strengthen their credibility as information providers. He further noted that when audiences are given frames, they are likely to identify, process, and remember particular information that is arranged through a frame.

In contrast to media frames, audience frames are defined as “mentally stored clusters of ideas that guide individuals’ processing of information” (Entman, 1993, p. 53). McLeod, Kosicki, Pan and Allen (1987) described that audience frames are cognitive devices that help people make sense of issues. For instance, audiences use specific frames to interpret meanings from information and to understand particular social events or issues.

Scholars in psychology and other social sciences have developed framing theory and applied it to health psychology and other areas. Prospect theory developed by Daniel Kahneman and Amos Tversky is one of the pioneering works. Kahneman and Tversky defined framing as “the decision-maker’s conception of the acts, outcomes, and contingencies associated with a particular choice” (Tversky & Kahneman, 1981, p. 453). In their Prospect theory, they described three elements of a choice: 1) the actor’s perception of the alternative action, 2) the outcomes related to those alternatives, and 3) the probabilities of particular outcomes. They examined which type of frame – gain or loss – was more influential over risky choices. In an analysis of decision-making under risk, they framed the outcome of a gamble in terms of gain or loss. Gain-framed statements can refer to “both good things that will happen and the bad things that will not happen, whereas loss-framed statements can refer to bad things that will happen and good things that will not happen” (Rothman, Bartels, Wlaschin, & Salovey, 2006, p. 203). Tversky and Kahneman (1981) found that people preferred to avoid risks if there was a potential gain whereas they were more willing to take risks if a potential loss was expected by the decision. Based on these results, they suggested that how a message is presented in an uncertain situation influences individuals’ responses, given that people’s perceptions depend on processed information.

Similarly, Shen and Dillard (2007) examined the influence of advantage and disadvantage framing, which is comparable to gain and loss framing. The advantage-framed

appeals focused on beneficial outcomes related to health behavior whereas disadvantage-framed messages emphasized the costs if people do not behave in accordance with the advocacy. The results indicated that advantage-framed appeals were more influential and induced stronger positive emotions from individuals than disadvantage-framed appeals, which led to negative emotions. These empirical findings suggest that how messages are framed results in different perceptions and emotions in persuasion. In line with this, Spence and Pidgeon (2010) examined the effects of gain and loss frames on public attitudes on climate change. They found that gain frames were superior to loss frames not only in boosting positive attitudes toward climate change mitigation, but also in affecting risk perception of climate change impacts.

Iyengar's (1991) work provides another approach to analyzing frames. He identified that network television news frames newscasts in episodic or thematic framings. He argued that while thematic frames locate issues into a broader context, episodic frames place issues focused on "concrete instances or events" (p. 18). He examined the effects of television news frames on viewers' attributions of responsibility for social issues. He found that audiences differently attributed responsibilities, depending upon the distinct framings. In response to news reports about poverty, participants who were exposed to the thematic frame attributed responsibility to inadequate social welfare programs, whereas participants who were exposed to the episodic frame attributed responsibility in terms of particular individuals or groups.

De Vreese, Peter and Semetko (2001) discussed issue-specific and generic frames. Issue-specific frames refers to frames covering "specific topics or news events". For example, local television coverage about the Persian Gulf War was framed in a several ways, including supporting administration policy and producing an illusion of military triumph (Reese & Buckalew, 1995). Generic frames are frames that can be applicable to different topics beyond

thematic limitations, time, and cultural contexts. Examples of generic frames are conflict frames, episodic and thematic frames, economic frames, or strategic frames.

The role of emotion as frame. Scholars have examined the role of emotion in persuasion. Communication studies have focused on how emotions influence the persuasive impact of messages. Emotional appeals have been used by politicians, marketers, and other campaigners. It has been argued that evoking or manipulating emotions is influential in shaping opinion and attitudes (DeSteno et al., 2004). Two basic theories of emotion – the dimensional perspective and the discrete emotion perspective – have guided most research (Nabi, 2010).

The dimensional approach to emotion represents emotions as combinations of a limited number of fundamental dimensions (Barrett, 1998). This approach argues that there is a common and interconnected physiological system that governs affective experiences (Posner, Russell, & Peterson, 2005). This includes common dimensions such as valence (degree of pleasantness or unpleasantness) and arousal (strength of intensity of emotions).

The discrete emotion approach conceptualizes emotions as “a limited number of distinct emotion types” that are universal across cultures (Hamann, 2012, p. 1). Each emotion is characterized as having specific properties, which are biologically inherited and physiologically unique (Hamann, 2012). Discrete emotion theorists contend that there is a common set of basic emotions such as anger, fear, disgust, happiness, sadness, and surprise.

The dimensional approach has been criticized in that it oversimplifies emotional experiences, and fails to differentiate specific emotions among positive (e.g., gratitude, joy) or negative (e.g., sadness, anger, disgust) emotions (DeSteno et al., 2004). The utility of the discrete emotion approach is that it enables researchers to capture common experience of human, measure personality and temperament, and explain individuals across cultures (Izard, 2007).

The discrete emotion approach was adopted in this project. Specific emotions can serve as frames for social issues in combination with particular ideas and events; these frames can influence individuals' interpretations of messages and their judgments of how the issues may affect them (Nabi, 2003). In line with this, DeStano et al. (2004) stated that discrete emotions play a significant role in reasoning processes. For instance, he found that discrete emotions such as anger and unhappiness differently influenced how people processed and perceived messages. In line with this, Agrawal and Duhacheck (2010) also explored the role of discrete emotions in framing. They analyzed the effect of emotion-inducing messages using guilt and shame for anti-drinking behavior. They found that people were likely to repair their negative mood states in different ways depending upon their specific mood states when processing the frame. These studies suggest that the ways people respond to framed messages are determined by their discrete emotions rather than emotional valence – either positive or negative emotion. To take account of this, discrete emotions need to be considered in framing studies (DeStano et al., 2004).

It has been shown that emotional appeals are useful means of persuasion (Agrawal & Duhachek, 2010; DeSteno et al., 2004; Nabi, 1999; Tangney & Tracy, 2012). Emotions can play an important role “as affective prompts for engagement with an issue” and have the potential to drive an action (Myers, Nisbet, Maibach, & Leiserowitz, 2012, p. 3). There is a large body of literature on health psychology demonstrating the role of emotion in attitudes and decisions about preventive health behaviors such as cancer screening or influenza vaccination (e.g., Chapman & Coups, 2006; Diefenbach, Miller, & Daly, 1999; McCaul, Branstetter, O'Donnell, Jacobson, & Quinlan, 1998; McCaul, Schroeder, & Reid, 1996). In line with this, previous studies on framing climate change communication have also considered the importance of respondents' emotions in driving pro-environmental attitudes and behaviors (e.g., Maibach,

Nisbet, Baldwin, Akerlof, & Diao, 2010; Myers et al., 2012; Spence & Pidgeon, 2010). While few studies have explicitly addressed emotion frames as predictors of pro-environmental behaviors, the empirical evidence suggests that emotions play a useful role in motivating issue engagement and adopting beliefs and behaviors (Baumeister, Vohs, DeWall, & Zhang, 2007; Leiserowitz 2006; Markowitz & Shariff, 2012; Snyder, 2002; Swim et al., 2010). Considering that climate change mitigation behavior is also a health-risk prevention behavior, the implications from previous studies in health psychology can be transferable to environmental risk communication as well (Spence & Pigeon, 2010).

Fear and hope are considered relevant emotions in recommending health-related behaviors. Fear appeals are intended to arouse fear of undesirable outcomes by highlighting the possible threat or danger if people do not adopt recommended actions to prevent those outcomes (Tannenbaum et al., 2015). The effectiveness of fear appeals comes from their focus on a recipient's perceived risk for the subsequent negative outcomes and the depicted severity and susceptibility of threat (Tannenbaum et al., 2015). Fear frames were found to be useful in driving attitudinal and behavioral changes related to adopting recommendation to avoid the depicted threat (Tannenbaum et al., 2015; Witte & Allen, 2000). It has been shown that fear appeals result in a greater level of risk awareness (Leiserowitz, 2006) that may drive a greater level of behavioral action to address climate change risk.

Within the area of environmental risks, studies discovered that fear appeals are influential in driving peoples' pro-environmental attitudes (e.g. Meijnders, Midden, & Wilke, 2001a, 2001b), pro-environmental behavioral intentions (Hass, Bagley, & Rogers, 1975), and pro-environmental behavioral changes (Hine & Gifford, 1991). These studies explicate the reason that fear appeals were effective in inducing high alarm and fearful feelings people were likely to

avoid. Fearful emotions can also result in a greater level of risk awareness (e.g., Leiserowitz, 2006) and the perception of severity of climate change impact (e.g., Spence & Pidgeon, 2010).

While hope is one of the basic and relevant emotions in driving human behavior, little has been studied about the concept of hope (MacInnis & De Mello, 2005). Hope is a positive emotion. Appraisal theory argues that hope arises based on one's interpretation or appraisals for goal-congruent outcomes (Roseman, 1991). Hope appeals elicit the perception of possibility that people can achieve their goals or positive outcomes (MacInnis & De Mello, 2005).

It is noteworthy that recent empirical studies demonstrate the effects of hope frames in encouraging climate change mitigation (Markowitz & Shariff, 2012; Myers et al., 2012). It has been argued that hope appeals are useful because they can evoke perceived efficacy (Bandura, 1977), which can consequently influence the likelihood of engagement in climate change mitigation (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007). It has been found that hope and perceived efficacy are strongly correlated with a willingness to engage in pro-environmental behaviors and to support climate change policies (Lorenzoni et al., 2007). On the contrary, hopelessness and perceived inefficacy of actions to address climate change made people ignore the climate change problem or rationalize inaction (Norgaard, 2011). These discussions above suggest that perceived efficacy can work as a key mediator of the impact of hope frame. The inconsistent results from previous studies suggest that it is necessary to clarify the different roles of discrete emotions and compare the effects in designing climate change communication.

Framing in environmental advocacy. In recent days, scholars have examined how news coverage frames environmental issues (Gross 2008; Miller & Riechert, 2000; Turner, 2011). Scholars have noted that framing environmental news coverage is critical in that there are great risks if the news providers include misleading scientific “facts” or “evidence” (Lester, 2010). For

instance, Riechert and Miller (1997) found that news frames of the Associated Press's coverage involving wetlands during the terms of three U.S. presidents coincided with the official government positions on the issue. They found that the habitat protection of target species was primarily discussed during the Reagan years whereas economic concerns were the main frame during the Bush administration and legal constraints and policies were considered during the Clinton presidency.

Scholars have examined how framing influences risk perceptions related to environmental issues and how risk perceptions can be translated into environmental awareness, concerns, and actions (Gross, 2008; Turner, 2011). Gross (2008) found that episodic framing is associated with emotional arousal and emotionally driven framing is more likely to gain policy support from the public. Scholars have argued that when the public is more exposed to information that frames environmental risk effectively, audiences are more likely to be concerned about the environmental risk, and this is linked to their actions for environmental advocacy and policy support. Recent studies found that message framing toward segmented audiences who have different political ideologies is an important strategy to increase audience concerns and policy support (Nisbet, 2009; Nisbet, Hart, Myers, & Ellithorpe, 2013). For example, conservative people tend to apply economic framing, which assumes climate change policy may prevent economic development. In this context, using economic advantage framing in which mitigation efforts can revitalize the economy over the long-term may be useful in encouraging conservative people to support the mitigation policy. These discussions suggest that how the climate change issue is framed is a key driver in shaping audience perceptions and behavior intentions.

Environmental issues are often reported during disasters. Scholars have contended that specific frames and wording are particularly effective in managing a national crisis by shaping public perceptions (Rausch, 2012). For instance, in reporting about the major Japan earthquake of March 2011, a local newspaper played a role in promoting economic stability and the rebuilding of communities by balancing “damage” and “recovery” frames in their news coverage and disseminating policy information and appropriate government reactions (Rausch, 2012). Other studies have found that in reporting climate-related news, wording leads to different attributions of the environmental risk. For example, a study by Schuldt, Konrath, and Schwarz (2011) suggests that the terms “global warming” and “climate change” influenced interpretations of public cognition because the terms have different connotations regarding human causation versus natural causation. The results suggest that while conservatives favor the term “global warming,” liberals prefer to use the term “climate change.”

The interpretation of frames occurs within the political orientations of audiences, such as whether they are Republicans or Democrats (Schuldt et al., 2011). In line with this, McClure, White, and Sibley (2009) investigated the effects of positive and negative framing concerning earthquake preparation. Their results suggest that negatively framed outcomes were associated with higher intentions to undertake both general and specific preparation.

Pidgeon, Lorenzoni, and Poortinga (2008) asserted that framing effects need to be investigated across related issues rather than a single issue. Their study suggests the public may accept nuclear power if people believe it can mitigate climate change. However, few people in their study preferred this choice over renewable sources of energy; their acceptance of nuclear power depended on the effectiveness of mitigating climate change. This study implies that multiple frames of an issue need to be considered because public beliefs and attitudes about

environmental issues are complicated and flexible, depending upon the relationship between different issues.

Recent scholars in public relations studies have noted that social media has become a vital tool for media and nonprofit organizations to frame environmental issues and motivate public action (Muralidharan, Rasmussen, Patterson & Shin, 2011). Jönsson (2011) emphasized that the representation of social actors in the mediated discourse presented in the news is an important factor in shaping interpretative frames that audiences tend to adopt.

However, no research has examined how influential agents on social media frame environmental issues and its effects. Accordingly, this research fills the gap by investigating framing practices of celebrities via social media. The research also examines the effects of two types of message frames for climate advocacy on Twitter - discrete emotions and references in terms of personal pronoun use - on public attitudes and behavior intentions toward climate change mitigation.

2.4 Overview of the Current Study

The current research examines the effects of celebrities' message framings in shaping people's attitudes and behaviors to mitigate climate change. It is important to understand how to effectively communicate about the climate change issue, given anticipated adverse consequences of climate change and high societal and public demands to address the issue in recent years (Nisbet et al., 2013; Pidgeon et al., 2008). The study conducts an experiment to examine the influences of emotion frame (fear or hope) and celebrity involvement frame (first person pronouns [FPP] or non-first person pronouns [NFPP]) used in a celebrity's climate advocacy on people's attitudes and behaviors for climate change mitigation. The role of key mediators (risk awareness and perceived response efficacy) in the influence of emotion frames are also

examined. In addition, the role of PSI with celebrities as a separate predictor and a moderator of the effects of the celebrity involvement frame are explored.

In recent days, an increasing number of celebrities advocate climate change mitigation and call for public action via social media. As high-profile public figures, popular celebrities' advocacy has potential in that they can not only attract public interest and mobilize large numbers of people to engage in the social causes they are involved in, but also serve as role models for those who are likely to adopt their behaviors and lifestyles (Brown et al., 2003; t'Hart & Tindall, 2009). In the media and communication literature, studies on the concept of PSI have found the significant role of celebrities in shaping public perceptions and behaviors (Boon & Lomore, 2001; Brown et al., 2003; Hoffner, 2008). It has been argued that Twitter, which directly connects celebrities and individuals, is useful to enhance parasocial relations that could lead to attitudinal and behavioral consequences (Alexander, 2013; Kassing & Sanderson, 2010; Marwick, 2011).

Studies in the domain of health and environmental communication have examined the effects of psychological involvement with celebrities who convey risk prevention messages on public's risk perception and behavioral change particularly among young people (Brown & Basil, 1995; Brown et al., 2010). While the existing studies provide some evidence of celebrity involvement in health and environmental issues, there has been no empirical study on how celebrities' environmental advocacies such as climate change mitigation influence public attitudes and behaviors.

To fill this gap, this study aims to explore how eco-celebrities' message frames on social media influence individuals' positive attitudes and behaviors for climate change mitigation. The study investigates the impacts of manipulating climate advocacy appeals attributed to one of two

celebrities (Leonardo DiCaprio or Pharrell Williams) in terms of discrete emotion frame (fear or hope) and celebrity involvement frame (FPP or NFPP). The interaction effects between celebrity involvement frames and emotion frames are also examined. Additionally, the study examines the role of key mediators (risk awareness and perceived response efficacy) that may be involved in the process by which the discrete emotion frames impact individuals' attitudes and behaviors. Finally, the study examines the moderating effect of PSI on the effect of celebrity involvement frames. Celebrity, political ideology, the extent of individuals' belief in climate change and knowledge of climate change were controlled because these variables have been identified as having impact on climate change mitigation behaviors (Nisbet, 2009; O'Connor, Bord, & Fisher, 1999).

The first focus of this study is on the influence of discrete emotion frames (fear and hope) on attitudes and behaviors related to climate change mitigation. It has been shown that emotion framing is a useful means of persuasion (Agrawal & Duhachek, 2010; DeSteno et al., 2004; Nabi, 1999; Tangney & Tracy, 2012). Emotions can play an important role "as affective prompts for engagement with an issue" and have the potential to drive an action (Myers et al., 2012, p. 3). While there is a large amount of literature on framings in the domain of health psychology in terms of gain or loss frames (e.g., Edwards, Elwyn, Covey, Matthews, & Pill, 2001; Rothman et al., 2006), few studies have explicitly investigated the impacts of emotions as frames (e.g., Nabi, 2003).

While both fear and hope are considered relevant emotions in recommending health-related behaviors, the growing body of studies on framing climate change has yielded mixed findings on which emotion plays a more important role in leveraging public perceptions and behaviors (Markowitz & Shariff, 2012; Myers et al., 2012; Tannenbaum et al., 2015). It has been

shown that fear appeals may induce a greater level of risk awareness (Leiserowitz, 2006) that has been linked with a greater level of behavioral action to address climate change risk. It is argued that hope-framed messages may invoke a greater sense of perceived response efficacy (Bandura, 1977) that can consequently lead to a greater level of intentions to engage in pro-environmental actions and support policies for climate change mitigation (Lorenzoni et al., 2007). Although these studies have provided evidence of the role of emotions in peoples' attitudes and behaviors toward climate change, they have overlooked the underlying process of how discrete emotion frames employed by influential advocates are differently construed by individuals. To understand the mechanism of how discrete emotions shape public attitudes and behaviors, it is necessary to understand key mediators that govern the effects. Accordingly, this study will not only examine the effects of fear and hope on attitudinal and behavioral consequences, but also reveal how key mediators account for the effects in fear and hope conditions (Leiserowitz, 2006; Markowitz & Shariff 2012; Snyder 2002; Swim et al., 2010).

The second focus of this study is to explore the impacts of differential celebrity involvement frames (FPP and NFPP) on individuals' attitudes and behaviors toward climate change mitigation. Social cognitive theory contends that people learn from others and that people are prone to emulate attractive models' behaviors (Bandura, 1977). Recent studies suggest the potential of celebrities who act as environmental advocates to serve as role models (Alexander, 2013; Brown, 2010). Bandura (1986) argued that role modeling is facilitated when models verbalize their thoughts and ideas such as speaking aloud. This happens in the context of social media, where celebrities' directly voice the necessity of climate change mitigation and address what they do for this cause. In this way, using FPP (e.g., I, me, or my) from celebrities for climate advocacy can be understood as positioning them as role models who actively engage in

the recommended behaviors. To explore this potential, this study will examine the impact of celebrity involvement frames in terms of personal pronoun use on public attitudes and behaviors toward climate change mitigation. This study will also test the interaction effect between celebrity involvement frames and emotion frames to see if the effect of the celebrity involvement frames differs depending on emotion frames. This will contribute to knowledge of the conditions in which use of FPP is most influential (i.e., when instilling fear or promoting hope).

In addition, based on the theoretical assumption that people with stronger PSI with celebrities are more inclined to emulate celebrities' beliefs, attitudes, and behaviors, the study will analyze the moderation effects of PSI that may alter the influence of celebrity involvement frame (Brown, 2010; Frederick et al., 2012). This will provide insights regarding whether the influence of celebrity language choice differs based upon their parasocial bond with the celebrities.

Overall, this empirical study will first help to understand the role of celebrities in climate change advocacy. Second, this study will contribute to establishing a theoretical foundation for the role of discrete emotions such as fear and hope as message frames in social media, and will also offer insights on the effectiveness of personal pronoun use for climate change mitigation advocacy. Third, the study can provide practical implications on how to effectively design environmental advocacy messages using social media.

2.5 Research Questions and Hypotheses

It has been argued that framing is influential in shaping public attitudes and behaviors (Entman, 2007; Gamson & Modigliani, 1989; Gross, 2008; Kahneman & Tversky, 1981; Nisbet, 2009). In the process of persuasion, both emotion and cognitive appeals work to appeal to audiences (DeSteno et al., 2004). Thus, an exploration of the key emotion and cognitive message

framings used in persuasion is useful in understanding the role of different framings in shaping eco-friendly perceptions and behaviors. This study will investigate the impacts of frames for celebrity climate advocacy messages in terms of discrete emotions (fear and hope) and celebrity involvement (FPP and NFPP) on people's attitudes and behaviors for climate change mitigation. Specifically, the study will use tweets attributed to one of two celebrities (to be selected from among three celebrities in a pilot test). This study will also explore the role of key mediators (individuals' risk awareness, perceived response efficacy) in the influence of the emotion frame and the effect of one moderator (PSI with the celebrity) in the impact of celebrity involvement frame.

Influence of emotion frame and celebrity involvement frame. Past studies found that fear and hope are key determinants of climate change engagement (Leiserowitz, 2006; Markowitz & Shariff 2012; Snyder 2002; Swim et al., 2010). On the one hand, it has been argued that fear frames are effective ways to influence people's health-related attitudes and behaviors by inducing threat or fear if they do not adopt the recommended behaviors (Tannenbaum, et al., 2015; Witte & Allen, 2000). Some applied studies of fear framing within the area of environmental risks also found that fear appeals are influential in driving peoples' attitudes (e.g. Meijnders et al., 2001a, 2001b), behaviors (Hass et al., 1975), and behavioral changes (Hine & Gifford, 1991). These studies suggest that fear appeals are effective in that they induce fearful feelings and people are likely to avoid negative outcomes. In the context of climate change, it has been suggested that induced fear leads to a greater level of risk awareness (e.g., Leiserowitz, 2006) and the perception of severity of climate change impact (e.g., Spence & Pidgeon, 2010).

On the other hand, the majority of empirical studies within the domain of environmental risk suggest that positive emotional appeals, such as a hope frame, are more compelling than negative frames in encouraging people to make an effort for climate change mitigation (Spence & Pidgeon, 2010; Maibach et al., 2010; Markowitz & Shariff, 2012). It has been argued that hope appeals are useful because they can evoke perceived response efficacy (Bandura, 1977) in that people believe the advocated behaviors would successfully manage environmental risk and this increases their intentions to engage in pro-environmental behaviors (Lorenzoni et al., 2007).

Empirical studies of climate change communication found that perceived response efficacy is a key driver of a sustainable behavior in that people are more willing to take an action to address climate change problem if they perceive it is manageable (Lorenzoni et al., 2007). Environmental issues can be thought of as relatively more difficult to cope with than many health issues within the short-term, so increasing perceived response efficacy would be a key strategy to motivate people to take action. The central ideal of the hope frame is to induce hopeful emotion in relation to coping with climate change or the ability to prevent adverse effects of the risk. Literature on health psychology suggests that a noteworthy predictor to promoting pro-health behaviors is high response efficacy (Rogers, 1983). In other words, this means that if people have more confidence that recommended behaviors will improve health, they are less likely to conduct those behaviors. A converse tendency was found in climate change communications. For example, Norgaard (2011) found that hopelessness and perceived inefficacy of addressing climate change were associated with ignoring the issue and rationalization of not taking action. Thus, hope frames have the potential to increase people's perceived response efficacy of addressing the climate change problem, which in turn could lead to their intentions to adopt sustainable behaviors.

Based on the discussion above, it is expected that emotionally framed climate change messages -- both fear and hope -- will lead to greater positive attitude and behaviors toward climate change mitigation than the messages unrelated to climate change. Based on this prediction, Hypothesis 1 is proposed. Theoretical and empirical investigations on the effectiveness of fear and hope frames in climate advocacy suggest inconsistent findings, implying the effects of both frames. Thus, it is hard to predict which frame will be more effective in climate change advocacy. To address this, Research Question 1 will examine which emotion frame is more effective in driving more positive attitude and greater behaviors toward climate change mitigation. Thus, the following hypothesis and research question are proposed:

Hypothesis 1: In celebrities' climate advocacy via Twitter, both emotion-framed messages (fear and hope) will result in more (a) positive attitudes and (b) behaviors toward climate change mitigation than the messages unrelated to climate change (control condition).

Research Question 1: In celebrities' climate advocacy via Twitter, is one emotion frame (hope or fear) more effective than the other in driving (a) positive attitudes and (b) behaviors toward climate change mitigation?

In addition, this study will examine the mediating roles of risk awareness and perceived response efficacy in the impact of the emotion frame. It is expected that the fear-framed messages will result in greater level of risk awareness than the hope-framed messages (H2), and that the hope-framed messages will result in more perceived response efficacy than the fear-framed messages (H3). The study then examined whether either of these variables (risk awareness, perceived response efficacy) mediated the influence of the emotion frame on attitudes

and behaviors related to climate change mitigation (RQ2, RQ3). Thus, the following hypotheses and research questions were proposed:

Hypothesis 2: In celebrities' climate advocacy via Twitter, the fear frame will induce more risk awareness than will the hope frame.

Research Question 2: Will risk awareness mediate the impact of the emotion frame on (a) attitudes and (b) behaviors toward climate change mitigation?

Hypothesis 3: In celebrities' climate advocacy via Twitter, the hope frame will result in more perceived response efficacy than will the fear frame.

Research Question 3: Will perceived response efficacy mediate the impact of the emotion frame on (a) attitudes and (b) behaviors toward climate change mitigation?

According to social cognitive theory, people learn by observing others' actions (Bandura, 1986). Existing studies have found that media users are likely to emulate attractive models in a mediated environment (Bandura, 2011; Pajares et al., 2009). In this way, recent scholars highlight the potential of celebrities who are seen as role models to suggest particular attitudes and behaviors (Alexander, 2013; Brown, 2010; Giles, 2002; Stever, 2013; Stever & Lawson, 2013). Indeed, an increasing number of celebrities serve as environmental activists, voicing environmentalism and they promote green lifestyles and actions to the public. Bandura (1986) contended that models verbalizing thoughts and ideas enhance observational learning in problem-solving activities, allowing individuals to observe the models' thoughts and ideas for adoption. While there is no empirical research on how models' verbal presentations on social causes affect modeled behaviors, social cognitive theory implicitly suggests the potential.

Literature on linguistics also found that the choice of personal pronouns is a subtle but influential strategy to shape audiences' perceptions toward speakers (Djenar, 2008). In particular, using FPP "I" is a strategic way of representing a speaker's identity and support on certain social issues in that I refer to a self (Bramley, 2001). "I" can demonstrate the speaker's personal voice and subjective opinion in conveying information (Bramley, 2001). It has been also argued that the choice of FPP may influence the perception of the speaker by others (Djenar, 2008).

While no empirical studies have been located on the effects of celebrities' pronoun use in the context of advocacy, it can be applied. For example, by using "I" in a tweet for climate advocacy, a celebrity can show his/her position on the climate change issue by expressing support and personal efforts in relation to climate change mitigation. This can possibly evoke a perception to the public that the celebrity is involved in the issue, and in this way, the celebrity can serve as a role model. Thus, it can be expected that when a celebrity advocates climate change mitigation by using a first person pronoun "I", there will be more likelihood of modeling. That is, it is expected that people who are exposed to a celebrity's advocacy messages with first-person pronouns are more likely to perceive that the celebrity is involved in the issue than messages that do not include first person pronouns. Based on this prediction, the following Hypothesis 4 is suggested:

Hypothesis 4: In celebrities' climate advocacy via Twitter, compared to NFPP frame, FPP frame will lead to a greater level of (a) positive attitudes and (b) behaviors toward climate change mitigation.

It is also likely that there will be an interaction between celebrity involvement frame and emotion frame. That is, the influence of the FPP frame compared to the NFPP frame may differ depending on whether the message is framed in terms of fear or hope. Specifically, FPP frame may be more effective if it is paired with a hope condition than a fear frame. If a celebrity uses “I” pronouns, explicitly addressing personal efforts to mitigate climate change, and evokes hopeful emotions at the same time, individuals may perceive that the influential person is confident and capable of solving the problem. Thus, this may increase participants’ positive attitude and lead to greater intent to adopt the advocated behavior. In other words, this would multiply their hopeful mind in that they can address the climate change problem with the influential advocate. Based on prediction above, the following Hypothesis 3 is proposed:

Hypothesis 5: In celebrities’ climate advocacy via Twitter, celebrity involvement frame and emotion frame will interact, such that the influence of the FPP frame will be greater for hope-framed messages than for fear-framed messages, whereas the influence of the NFPP frame will not differ based on the emotion frame.

Moderating role of PSI. Parasocial relationships suggest that media consumers develop pseudo relationships with media characters or celebrities, and become psychologically involved with them (Horton & Wohl, 1956). Literature on parasocial relations documents the influence of celebrities on individuals’ perceptions and behaviors (Boon & Lomore, 2001; Brown et al., 2003; Hoffner, 2008). Recent studies in the domain of celebrities’ issue involvement have argued that celebrities may serve as role models for the public, not only by promoting ideas, but also by mobilizing them to engage in social causes the celebrities are involved in (t’Hart & Tindall,

2009). Researchers found that individuals' psychological involvement with celebrities is likely to increase their response to information related to celebrities and intentions to adopt behaviors advocated by celebrities (Alexander, 2013; Brown, 2010). Thus, it can be expected that an emotional bond with celebrities through PSI increase individuals' positive attitudes and behaviors toward climate change mitigation. This tendency will be likely stronger if advocacy messages are framed with FPP that manifest the explicit reference of a speaker who conducts the suggested behavior.

Considering that messages with FPP frame highlights what the celebrities do, people who have a stronger psychological bond with a celebrity should be more likely to emulate their thoughts and actions within the FPP frame than the NFPP frame. Accordingly, it can be predicted that the level of PSI with the celebrity will moderate the effects of the celebrity involvement frames. In other words, the effect of the celebrity involvement frame predicted in Hypothesis 2 will be greater for people who have stronger PSI with the celebrity who advocates climate change mitigation. Specifically, people with stronger PSI with a celebrity are more likely to have greater positive attitudes and behaviors toward climate change mitigation when they are given messages with FPP frames (compared to NFPP frames). Based on discussions above, the Hypothesis 6 and 7 are suggested:

Hypothesis 6: In a celebrities' climate advocacy via Twitter, people who have a stronger PSI with the celebrity will have (a) more positive attitudes and (b) greater behaviors.

Hypothesis 7: In a celebrities' climate advocacy via Twitter, the beneficial influence of the FPP frame (compared to the NFPP frame) on (a) positive attitudes and (b) behaviors toward

climate change mitigation will be greater for people who have a stronger PSI with the celebrity.

3 PILOT TEST

3.1 Pilot Test Overview

The objective of the current study is to examine how celebrities' message framings of climate advocacy on Twitter influence individuals' attitude and behavioral intent toward climate change mitigation. Prior to conducting the main study, the study materials (tweets) were pilot tested to ensure that people would perceive differences based on the experimental manipulation of emotion frame and celebrity involvement fame. As a check that the frame manipulations did not inadvertently manipulate other variables, two evaluation items of the tweets, interestingness and informativeness, were also measured. These items were intended to ensure that the tweets were perceived similarly (except for the emotion frame and celebrity involvement frame) across the five groups. In addition, to determine the two celebrities to be used in the main study, three celebrities, including Leonardo DiCaprio, Ian Somerhalder, and Pharrell Williams who met the study criteria (involved in climate change advocacy and active on Twitter) were evaluated. Perceptions of each celebrity were obtained, including PSI, familiarity, likability, and attractiveness, to help identify the strength of the psychological bond respondents felt toward each celebrity. Perceived involvement in climate advocacy was also measured for each celebrity.

3.2 Procedures

This pilot test took place online through Survey Monkey (www.surveymonkey.com). The recruitment message, informed consent form, experimental stimuli, and questionnaire for the pilot test are included in Appendices A, B, C, and D. Before inviting potential participants, Georgia State University's Institutional Review Board (IRB) approved the proposed data

collection methods, recruitment email, an informed consent form, materials, and questionnaires. Upon receiving IRB approval, the researcher contacted several instructors of undergraduate classes in the Department of Communication. Six agreed instructors announced the study in their classes and forwarded the research invitation (Appendix A) with the link to the online questionnaire. Participants were asked to read the informed consent form (Appendix B) and click a link indicating either that they agree to participate or decline to participate. They were told that the pilot study was intended to validate messages that would be used for conducting an experiment exploring individuals' responses to celebrity messages on social media and they would be compensated extra credit (1 % of the points in the course) for completing the questionnaire. For those who did not want to participate but still liked to earn the extra credit, an alternative option was offered, that required them to write a 1-page paper, discussing how their class help prepare for the career they wished to pursue. No student selected the alternative option.

Once consented, participants were randomly assigned to one of four experimental conditions or to a control group. All participants were asked to imagine they were on Twitter and read seven tweets written by a celebrity, who was not identified (Appendix C). After reading the tweets, respondents rated each of the seven tweets separately. All respondents indicated the emotions they believed the tweets conveyed, and those in the four experimental conditions also rated the degree of celebrity involvement in climate advocacy conveyed by the tweets. All respondents also rated perceptions of three celebrities, including PSI, familiarity, likability, attractiveness, and involvement in climate advocacy. Appendix D presents the pilot test questionnaire. The sociodemographic characteristics of the respondents, including gender, age, and ethnicity were also asked. At the end of the questionnaire, a hyperlink to a new survey

appeared where they entered their full name, course instructor, and course title. Instructors awarded 1% of the total points in their course to students who completed the questionnaire. Because this identifying information was offered on a separate survey, participants' responses remained unidentified.

3.3 Participants

The pilot test used a convenience sample of college students. This demographic is particularly useful for the study of social media uses and effects. A total of 93 undergraduate students enrolled in courses under the Department of Communication at Georgia State University were recruited. Fifteen students who completed less than half of questions were excluded from analysis. Thus, the final sample used for the pilot test consisted of 78 undergraduate students (66 females, 10 males, and 2 not reported). The age of participants ranged from 18 to 65 years ($M = 21.68$, $SD = 5.97$). More than half of respondents (57.7%) identified themselves as Black/African American, 14.1% White/Caucasian, 6.4% as Asian/Pacific Islander, 3.8% as Hispanic/Latina(o), 1.3% as West Indies, 6.4% as multiracial, and 10.3% did not report their race/ethnicity.

3.4 Materials

The experimental stimuli utilized in the pilot test were developed by revising original tweets by Leonardo DiCaprio, Ian Somerhalder, and Pharrell Williams. Seven basic tweets about climate change were developed, and then each of the seven tweets was edited to create four different versions that represented the four cells of the experimental research design. The research design is a 2 (emotion frame: fear or hope) x 2 (celebrity involvement frame: FPP or NFPP) between-subjects factorial design. Four sets of tweets (seven tweets in each set) were created for the four experimental conditions: fear-framed tweets with FPP frame, fear-framed tweets with NFPP frame, hope-framed tweets with FPP frame, and hope-framed tweets with

NFPP frame. A fifth set of seven tweets was created for the control group. These tweets were unrelated messages without any information on climate advocacy. Each set of tweets included seven individual tweets, consisting of 140 characters or less, which were attributed to an unidentified celebrity; two of the tweets in each set contained a corresponding image. The messages were shown in the form of Twitter posts with Twitter ID “celebrity_____” and the username “-” to indicate it was posted by a celebrity. The profile pictures appeared as a white blank.

The emotion frame was manipulated by creating tweets that framed climate advocacy in terms of fear or hope. The fear-framed tweets emphasized the adverse consequences if people do not make efforts to resolve the climate change issue. These tweets focused on threat of climate change, evoking fear-related emotions (e.g., fear, threat, concern, or uncertainty) and adverse outcomes of climate change. The hope-framed tweets emphasized that acting to mitigate climate change can be effective and lead to beneficial outcomes for the environment. These tweets focused on success, inducing hope-related emotions (e.g., hope, optimism, or confidence) to solve the climate change problem.

The celebrity involvement frame is intended to induce the perception of the celebrity’s personal involvement in resolving the climate change issue. To manipulate this frame, the tweets were phrased using FPP singular pronouns (e.g. I, me, or my) or not. Specifically, the FPP condition contained the language of FPP singular pronouns to voice climate advocacy, which explicitly indicated the celebrity was personally involved in resolving the climate change issue. The NFPP condition did not contain FPP in stating climate advocacy.

3.5 Measures

Manipulation of emotion frame and celebrity involvement frame were evaluated by

analyzing how the differently framed tweets were perceived. To do this, participants in the experimental groups and the control group rated how fearful or hopeful they perceived the information conveyed by each tweet. Those in the four experimental conditions were also asked to rate to what extent the tweets conveyed the celebrity's involvement and public involvement in climate change mitigation. To rule out any unintended difference between the conditions, two additional evaluation items of interestingness and informativeness of the tweets were measured. In addition, to determine which two celebrities were perceived most similarly in terms of their psychological bond and how well known they were as environmental activists, the perceptions of the three celebrities were rated. Measures included PSI, familiarity, attractiveness, likability, and thoughts on celebrities' involvement in climate advocacy.

Emotion frame evaluation. To evaluate the manipulation of the emotion frame, the respondents in the experimental groups and control group reported to what extent they perceived that the celebrity's tweets conveyed fearful or hopeful emotions. Responses for the all items were measured based on 7-point scales (0=none of this feeling to 6= a lot of this feeling). For fear, they reported to what extent they felt the message was fearful with two items by modifying Dillard et al.'s (1996) measures. The wording of the one item was changed to reflect possible responses to climate change tweets (scared was changed to threatened). These items included: "The message that this tweet conveys is fearful." and "The message that this tweet conveys is threatening."

For hope, respondents were asked about how much they felt the message is hopeful with two items adapted from Dillard et al. (1996)'s measure. The wording of the one was revised to emphasize hopeful feelings about suggested actions for climate change mitigation (upbeat was changed to optimistic). The items were: "The message that this tweet conveys is hopeful." and

“The message that this tweet conveys is optimistic.”

Celebrity involvement frame evaluation. As a check on the manipulation of the celebrity involvement frame, respondents’ perceptions of celebrity involvement in climate change mitigation were measured by asking to what extent they thought that the tweets conveyed information about the celebrity’s involvement in the climate change issue. The four sets of experimental tweets were rated on two items. These two items were: “The celebrity is heavily engaged in activities for resolving the climate change issue” and “The celebrity makes extensive personal efforts to address the climate change issue”. Responses for the two items were measured based on 7-point scales (0=disagree strongly to 6=agree strongly). The two involvement items for each tweet were averaged. Scale reliability was high across all seven messages (Tweet #1, $\alpha = .88$; Tweet #2, $\alpha = .94$; Tweet #3, $\alpha = .94$; Tweet #4, $\alpha = .97$; Tweet #5, $\alpha = .95$; Tweet #6, $\alpha = .96$; Tweet #7, $\alpha = .95$).

Additionally, two items measured respondents’ perceptions of public involvement in climate change mitigation, to ensure that the celebrity involvement frame manipulation did not impact these perceptions. These items included: “Many people are engaged in activities for resolving the climate change issue” and “Many people make efforts to address the climate change issue”. Responses for both items were measured based on 7-points scale (0=strongly disagree to 6= strongly agree). Scores on the two items were averaged for each of the seven tweets. Scale reliability was high for all seven messages (Tweet #1, $\alpha = .87$; Tweet #2, $\alpha = .96$; Tweet #3, $\alpha = .91$; Tweet #4, $\alpha = .97$; Tweet #5, $\alpha = .93$; Tweet #6, $\alpha = .99$; Tweet #7, $\alpha = .99$).

Additional evaluations. To rule out any unintended difference among all the five conditions, respondents rated two additional evaluation items. They were asked to what extent they thought the message that the tweet was interesting and informative. Responses for the items

were measured using a 7-point scale (0=not at all to 6=very much).

Perceptions of celebrities. To assess the level of PSI with celebrities, including Leonardo DiCaprio, Ian Somerhalder, and Pharrell Williams, participants completed Rubin and Perse's (1987) 10-item PSI scale for each celebrity. As the scale was used for a study of television soap operas, a revised scale was used to suit the nature of PSI between users and a celebrity on Twitter. The examples of modified statements include: "I feel he is like a friend", "I look forward to seeing him in any media", "If he appeared in any media, I would want to watch it", "I see him as a natural, down-to-earth person", "If I saw a story about him in a newspaper or magazine, and I would want to read it". Responses for these items were measured using a 7-point scale (0=disagree strongly to 6=agree strongly). Scores for each celebrity were averaged. Scale reliability was high (Leonardo DiCaprio, $\alpha = .88$; Ian Somerhalder, $\alpha = .97$; Pharrell Williams, $\alpha = .95$).

Familiarity of the celebrities was also evaluated. Respondents were asked how familiar they were with each celebrity. Responses for the items were measured using a 7-point scale (0=not at all familiar to 6=very familiar). For these questions, pictures of the celebrities were presented to help recognition of them.

The level of likability of the celebrities were evaluated. The likability scale included two items was taken from Fleck, Korchia and Le Roy (2012). The items were: "I like him" and "He is somebody I like." These items were measured using a 7-point scale (0=disagree strongly to 6=agree strongly). Scores were averaged for each celebrity. Scale reliability was very high (Leonardo DiCaprio, $\alpha = .96$; Ian Somerhalder, $\alpha = .98$; Pharrell Williams, $\alpha = .98$).

Attractiveness of each celebrity was measured with two items adapted from Ohanian's (1999) scale. Oman's (1999) item of beautiful was modified to handsome, considering that the

gender of the celebrities was male. The other item was “He is classy”. Responses for the items were measured using a 7-point scale (0=strongly disagree to 6=strongly agree). Scores were averaged for each celebrity. Scale reliability was high (Leonardo DiCaprio, $\alpha = .83$; Ian Somerhalder, $\alpha = .89$; Pharrell Williams, $\alpha = .86$).

Additionally, perception of celebrity involvement in climate advocacy was measured. Respondents were asked to what extent they thought each celebrity was involved in advocating for climate change mitigation. Responses for the item was measured using a 7-point scale (0=not at all involved to 6=very involved).

3.6 Overview of Analyses

To check whether the manipulation of the emotion frame was successful, a one-way ANOVA was conducted for each tweet to compare the differences among the four experimental groups and the control group on four emotions (fearful, threatening, optimistic, hopeful). The analyses were followed by Tukey’s post hoc tests when a significant effect was found. It was hoped that the fear-framed messages would be perceived as conveying more fearful and threatening emotions than the hope-framed messages or the control messages, and that the hope-framed messages would be perceived as conveying more optimistic and hopeful emotions than the fear-framed messages or the control messages.

To check whether the celebrity involvement frame induction was successful, a 2 (emotion frame: fear vs. hope) x 2 ANOVA (celebrity involvement frame: FPP vs. NFPP) was conducted to compare the level of perception of celebrity involvement across the four experimental groups of participants. The control group was excluded because participants in that condition did not rate how the tweets conveyed the celebrity’s involvement in climate change. It was hoped that groups in the FPP would report a higher level of the perception of celebrity’s involvement than

those in the NFPP group, regardless of emotion frame condition. To ensure that the celebrity involvement frame manipulation did not inadvertently influence the perceived level of public involvement in climate change mitigation, it was also hoped that there would be no difference between FPP groups and NFPP groups in the perceived level of public involvement.

As a check that the frame manipulations did not inadvertently manipulate other variables, the two evaluation items (e.g., interestingness, informativeness) were analyzed using one-way ANOVAs comparing the five conditions. It was hoped that there would be no significant effects.

The perception of the three celebrities were evaluated, including PSI, familiarity, likability, attractiveness, and perception of celebrity involvement in climate advocacy. One-way ANOVAs and Tukey's post hoc tests were performed to compare the three celebrities on all those measures.

3.7 Results of Pilot Test

The results for each of the seven tweets are reported separately. For each tweet, two tables are presented. The first table present the means and standard deviations, one-way ANOVA results, and Tukey post hoc tests comparing the four experimental groups and the control group on perceived emotions conveyed in the tweets. The second table reports the means and standard deviations for the four experimental groups on perceived celebrity involvement conveyed by the tweets, as well as the main effect of celebrity involvement frame in the 2 x 2 ANOVAs; the means and standard deviation are presented separately for the four conditions for completeness. Finally, the analyses comparing the three celebrities on several evaluation measures are reported.

Responses to tweets.

Tweet #1. There were statistically significant differences among the four experimental groups and control group in the level of fearful emotion, hopeful emotion, and optimistic

emotion as determined by one-way ANOVAs. Table 1 shows that these differences were in the expected directions, but that the differences did not always reach significance.

Table 1 *Tweet 1: Perceived Emotions Conveyed by Tweets in Experimental Conditions and Control Condition*

	Fearful	Threatening	Hopeful	Optimistic
Fear with FPP	2.00(1.91) _b	1.29(2.16)	2.73(2.22) _b	2.14(1.75) _{ab}
Fear with NFPP	1.13(1.13) _{ab}	0.57(0.79)	1.88(1.36) _{ab}	1.63(1.19) _{ab}
Hope with FPP	0.75(1.14) _{ab}	0.64(1.21)	3.90(2.13) _b	3.83(1.90) _b
Hope with NFPP	0.79(1.03) _a	0.71(1.11)	3.13(2.10) _b	3.00(1.97) _b
Control group	0.00(0.00) _a	0.00(0.00)	0.35(0.86) _a	1.28(1.70) _a
One-way ANOVA	$F(4, 63) = 5.54^{**}$	$F(4, 61) = 1.99$	$F(4, 60) = 7.80^{***}$	$F(4, 63) = 4.69^{**}$

** $p < .01$ *** $p < .001$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same column that have no subscripts in common differ at $p < .05$ using the Tukey procedure.

For perceived involvement, 2 x 2 ANOVAs revealed that there were no differences between FPP and NFPP conditions on the perception of celebrity involvement or public involvement in climate change mitigation. See Table 2.

Table 2 *Tweet 1: Perceived Celebrity and Public Involvement Conveyed by Tweets in Experimental Conditions*

	Celebrity Involvement	Public Involvement
Fear with FPP	3.26(1.89)	2.81(1.63)
Fear with NFPP	2.00(1.04)	2.63(1.62)
Hope with FPP	2.68(1.82)	1.54(0.96)
Hope with NFPP	2.28(1.92)	2.36(1.76)
Main Effect of Celebrity Involvement Frame	$F(1, 52) = 2.672$	$F(1, 50) = 0.51$

Note. Means could range from 0 to 6. Standard deviations are in parentheses.

Unexpectedly, significant differences between groups were found in how interesting the tweets were perceived to be, $F(4, 59) = 5.41$, $p < .01$. Respondents in fear-framed FPP group reported that the tweets were more interesting ($M = 3.15$) than did those in hope-framed NFPP group ($M = 1.44$) or the control group ($M = 0.53$); the other groups fell in between (fear-framed,

NFPP, $M = 2.00$; hope-framed FPP, $M = 2.00$). Expectedly, there were no differences between the five groups in the level of informativeness, $F(4, 64) = .20, p > 0.10$.

Tweet #2. As Table 3 indicates, there were significant differences between groups in the level of fearful emotion, threatening emotion, and hopeful emotion.

Table 3 *Tweet 2: Perceived Emotions Conveyed by the Tweets Across Five Conditions*

	Fearful	Threatening	Hopeful	Optimistic
Fear with FPP	2.92(2.02) _c	1.92(1.68) _b	2.44(1.74) _{ab}	2.53(1.89)
Fear with NFPP	2.67(1.37) _{bc}	2.43(1.99) _b	2.14(1.22) _{ab}	1.88(1.25)
Hope with FPP	1.08(1.24) _{ab}	1.00(1.18) _{ab}	2.44(1.67) _{ab}	3.11(2.09)
Hope with NFPP	0.82(1.47) _a	0.31(0.60) _a	3.38(2.25) _b	3.79(2.07)
Control group	0.00(0.00) _a	0.00(0.00) _a	1.41(1.50) _a	2.63(1.95)
One-way ANOVA	$F(4, 59) = 10.514^{***}$	$F(4, 58) = 9.427^{***}$	$F(4, 60) = 2.561^*$	$F(4, 65) = 1.835$

* $p < .05$, *** $p < .001$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same column that have no subscripts in common differ at $p < .05$ using the Tukey procedure.

Table 4 indicates there were no significant differences between FPP and NFPP conditions on the perception of celebrity involvement and the perception of public involvement. Thus, celebrity involvement frame was not successful.

Table 4 *Tweet 2: Perceived Celebrity and Public Involvement Conveyed by Tweets in Experimental Conditions*

	Celebrity Involvement	Public Involvement
Fear with FPP	3.79(2.14)	2.36(1.70)
Fear with NFPP	3.07(0.45)	2.94(1.12)
Hope with FPP	2.58(2.12)	1.10(0.88)
Hope with NFPP	2.89(1.88)	2.28(1.61)
Main Effect of Celebrity Involvement Frame	$F(1, 50) = 0.139$	$F(1, 50) = 3.655^{\textcircled{a}}$

$\textcircled{a} p < .10$.

Note. Means could range from 0 to 6. Standard deviations are in parentheses.

As expected, for Tweet 2, there was no significant difference between the five groups in the level of interestingness, $F(4, 56) = 0.43, p > 0.10$. However, marginally significant differences were found between the five groups in the level of informativeness, $F(4, 66) = 2.35, p < 0.10$. Respondents in fear-framed FPP group reported that the tweets were more informative

($M = 3.81$) than did those in the control group ($M = 1.79$); the other groups fell in between (fear-framed, NFPP, $M = 3.14$; hope-framed FPP, $M = 2.82$; hope-framed, NFPP, $M = 3.22$).

Tweet #3. Table 5 shows that there were significant differences between groups in the level of fearful and threatening emotion, Thus, only fear manipulation was successful.

Table 5 *Tweet 3: Perceived Emotions Conveyed by Tweets in Experimental Conditions and Control Condition*

	Fearful	Threatening	Hopeful	Optimistic
Fear with FPP	1.40(2.13) _b	1.38(1.20) _b	3.58(2.40)	3.00(2.11)
Fear with NFPP	1.44(1.51) _b	1.56(1.33) _b	4.13(1.55)	3.50(1.60)
Hope with FPP	0.75(1.14) _{ab}	0.64(0.92) _{ab}	3.18(2.04)	3.27(1.74)
Hope with NFPP	0.58(0.96) _{ab}	0.58(0.84) _{ab}	3.78(1.96)	3.83(1.89)
Control group	0.06(0.24) _a	0.00(0.00) _a	2.61(2.00)	2.67(2.00)
One-way ANOVA	$F(4, 67) = 2.851^*$	$F(4, 66) = 3.777^{**}$	$F(4, 62) = 1.147$	$F(4, 64) = 0.928$

* $p < .05$, ** $p < .01$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same column that have no subscripts in common differ at $p < .05$ using the Tukey procedure.

As indicated in Table 6, there were no differences between FPP and NFPP conditions on the perception of celebrity involvement, but the two conditions differed in the perception of public involvement. Thus, the manipulation of celebrity involvement frame was not successful.

Table 6 *Tweet 3: Perceived Celebrity and Public Involvement Conveyed by Tweets in Experimental Conditions*

	Celebrity Involvement	Public Involvement
Fear with FPP	4.17(2.17)	2.73(1.79)
Fear with NFPP	3.75(1.69)	4.25(1.41)
Hope with FPP	3.17(1.83)	2.05(1.13)
Hope with NFPP	3.64(2.01)	3.41(1.83)
Main Effect of Celebrity Involvement Frame	$F(1, 49) = 0.002$	$F(1, 47) = 9.134^{**}$

** $p < .01$

Note. Means could range from 0 to 6. Standard deviations are in parentheses.

It was confirmed that for Tweet 3, there was no significant differences between the five groups in the level of interestingness, $F(4, 62) = 1.18$, $p > .05$ and informativeness, $F(4, 60) = 0.33$, $p > 0.10$.

Tweet #4. Table 7 shows that there were significant differences between groups in the level of fearful and threatening emotion. Unexpectedly, there was no significant difference between groups in the level of hopeful emotion or optimistic emotion. Thus, the emotion frame manipulation was partially successful.

Table 7 *Tweet 4: Perceived Emotions Conveyed by Tweets in Experimental Conditions and Control Condition*

	Fearful	Threatening	Hopeful	Optimistic
Fear with FPP	2.60(2.23) _b	1.85(2.04) _b	2.33(1.95)	2.20(2.08)
Fear with NFPP	1.29(1.26) _{ab}	1.78(1.40) _b	2.14(1.77)	2.25(1.67)
Hope with FPP	0.75(1.06) _a	1.00(1.56) _{ab}	3.00(1.41)	2.75(2.31)
Hope with NFPP	0.58(0.90) _a	0.63(1.07) _{ab}	3.20(1.77)	3.58(2.01)
Control group	0.37(1.38) _a	0.00(0.00) _a	3.72(2.22)	4.00(1.89)
One-way ANOVA	$F(4, 67) = 6.033^{***}$	$F(4, 64) = 5.145^{**}$	$F(4, 63) = 1.512$	$F(4, 64) = 2.426^@$

[@] $p < .10$, ^{**} $p < .01$, ^{***} $p < .001$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same column that have no subscripts in common differ at $p < .05$ using the Tukey procedure.

As shown in Table 8, a 2 x 2 ANOVA showed that there was no difference between FPP and NFPP conditions on the perception of celebrity involvement and the public involvement.

This informed that the celebrity involvement frame was not successful.

Table 8 *Tweet 4: Perceived Celebrity and Public Involvement Conveyed by Tweets in Experimental Conditions*

	Celebrity Involvement	Public Involvement
Fear with FPP	4.07(2.04)	2.60(1.56)
Fear with NFPP	2.94(2.07)	3.06(1.94)
Hope with FPP	2.25(1.21)	1.54(1.12)
Hope with NFPP	2.84(1.83)	2.92(1.79)
Main Effect of Celebrity Involvement Frame	$F(1, 49) = 0.251$	$F(1, 51) = 4.034^@$

[@] $p < .10$.

Note. Means could range from 0 to 6. Standard deviations are in parentheses.

As expected, there were no significant differences for Tweet 4 between groups in the level of interestingness, $F(4, 64) = 0.62$, $p > 0.10$ and informativeness, $F(4, 61) = 0.90$, $p > 0.10$.

Tweet #5. Table 9 shows that there were significant differences between the five groups in all the emotional responses. Groups in both fear conditions reported the tweets were more fearful and threatening than did those in both hope conditions and the control group, but the differences did not always reach significance. However, the differences in hopeful emotion and optimistic emotion were not in the expected direction. The control group reported more hopeful and optimistic emotion than did the experimental groups.

Table 9 *Tweet 5: Perceived Emotions Conveyed by Tweets in Experimental Conditions and Control Condition*

	Fearful	Threatening	Hopeful	Optimistic
Fear with FPP	1.93(1.64) ^b	2.06(1.77) ^b	2.00(1.65) _a	2.08(2.02) _a
Fear with NFPP	2.44(2.07) ^b	2.43(1.90) ^b	2.29(1.98) _{ab}	2.88(1.96) _{ab}
Hope with FPP	1.00(1.18) _{ab}	1.18(1.25) _{ab}	1.70(1.49) _a	1.13(1.13) _a
Hope with NFPP	1.12(1.27) _{ab}	1.21(1.51) _{ab}	2.63(1.59) _{ab}	2.72(1.64) _{ab}
Control group	0.06(0.24) ^a	0.11(0.47) ^a	3.83(1.91) ^b	4.20(1.54) _b
One-way ANOVA	$F(4, 64) = 6.610^{***}$	$F(4, 66) = 5.581^{**}$	$F(4, 58) = 3.356^*$	$F(4, 61) = 6.008^{***}$

* $p < .05$, ** $p < .01$, *** $p < .001$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same column that have no subscripts in common differ at $p < .05$ using the Tukey procedure.

As Table 10 shows, 2 x 2 ANOVAs indicated that there were no differences between FPP and NFPP conditions on the perception of celebrity involvement and public involvement. This informed that manipulation of the celebrity involvement frame failed.

Table 10 *Tweet 5: Perceived Celebrity and Public Involvement Conveyed by Tweets in Experimental Conditions*

	Celebrity Involvement	Public Involvement
Fear with FPP	3.63(2.26)	2.61(1.83)
Fear with NFPP	3.11(1.54)	3.22(1.39)
Hope with FPP	3.50(2.03)	2.18(1.23)
Hope with NFPP	3.00(1.55)	2.59(1.30)
Main Effect of Celebrity Involvement Frame	$F(1, 45) = 0.812$	$F(1, 47) = 1.456$

Note. Means could range from 0 to 6. Standard deviations are in parentheses.

Expectedly, for Tweet 5, there were no significant differences between groups in the level of interestingness, $F(4, 61) = 0.40$, $p > 0.10$. However, a significant difference between

groups in the level of informativeness was found, $F(4, 64) = 3.20, p < .05$. Specifically, by Tukey comparisons, the control tweets were seen as less interesting ($M = 2.67$) than the tweets that conveyed hope (hope with FPP, $M = 5.00$; hope without FPP, $M = 4.61$). The tweets that conveyed fear fell in between (fear with FPP, $M = 3.93$; fear without FPP, $M = 4.13$).

Tweet #6. Table 11 indicates that the emotion frame manipulation was partially successful. There were significant differences between groups in the level of fearful emotion and threatening emotion in the expected directions, but not in hopeful or optimistic emotion.

Table 11 *Perceived Emotions Conveyed by Tweets in Experimental Conditions and Control Condition*

	Fearful	Threatening	Hopeful	Optimistic
Fear with FPP	3.23(1.96) _b	2.79(2.36) _c	2.36(1.99)	2.56(1.97)
Fear with NFPP	2.88(1.96) _b	2.29(1.80) _{bc}	2.75(1.75)	3.24(1.98)
Hope with FPP	0.25(0.62) _a	0.67(1.07) _{ab}	3.00(1.94)	3.25(1.91)
Hope with NFPP	0.67(1.19) _a	0.68(1.16) _{ab}	4.06(2.01)	4.24(1.86)
Control group	0.06(0.24) _a	0.00(0.00) _a	3.05(2.17)	3.22(2.07)
One-way ANOVA	$F(4, 64) = 28.063^{***}$	$F(4, 65) = 9.724^{***}$	$F(4, 63) = 1.547$	$F(4, 66) = 1.540$

*** $p < .001$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same column that have no subscripts in common differ at $p < .05$ using the Tukey procedure.

As Table 12 demonstrates, 2 x 2 ANOVAs revealed no difference between FPP and NFPP conditions in the perception of celebrity involvement. In addition, there was a significant difference in perceived public involvement. Thus, this manipulation was not successful.

Table 12 *Perceived Emotions Conveyed by Tweets in Experimental Conditions and Control Condition*

	Celebrity Involvement	Public Involvement
Fear with FPP	3.47(2.24)	2.77(1.96)
Fear with NFPP	3.42(1.43)	4.21(1.52)
Hope with FPP	3.00(2.01)	2.04(1.14)
Hope with NFPP	2.88(1.94)	2.90(1.20)
Main Effect of Celebrity Involvement Frame	$F(1, 47) = 0.019$	$F(1, 50) = 4.911^*$

* $p < .05$

Note. Means could range from 0 to 6. Standard deviations are in parentheses.

Expectedly, for Tweet 6, there was no significant differences between the five groups in the level of interestingness, $F(4, 64) = 0.54, p > 0.10$ or informativeness, $F(4, 65) = 0.17, p > 0.10$.

Tweet #7. Table 13 shows that the emotion frame manipulation was partially successful. There were significant differences between groups in the level of fearful emotion and threatening emotion, in the expected direction. Although the ANOVAs for hopeful and optimistic emotions were significant, the differences were not as expected.

Table 13 *Tweet 7: Perceived Emotions Conveyed by Tweets in Experimental Conditions and Control Condition*

	Fearful	Threatening	Hopeful	Optimistic
Fear with FPP	3.23(2.05) _b	2.47(1.96) _b	2.00(2.08) _{ab}	2.20(1.97) _{ab}
Fear with NFPP	3.13(2.03) _b	2.67(2.40) _b	3.17(1.47) _b	3.63(1.51) _b
Hope with FPP	0.58(1.00) _a	0.92(1.17) _a	2.50(2.20) _{ab}	2.50(2.01) _b
Hope with NFPP	0.35(0.79) _a	0.42(0.84) _a	3.86(2.18) _b	3.77(2.17) _b
Control group	0.22(0.65) _a	0.00(0.00) _a	0.39(0.85) _a	0.50(1.04) _a
One-way ANOVA	$F(4, 63) = 17.228^{***}$	$F(4, 68) = 10.825^{***}$	$F(4, 54) = 8.226^{***}$	$F(4, 59) = 8.196^{***}$

*** $p < .001$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same column that have no subscripts in common differ at $p < .05$ using the Tukey procedure.

As shown in Table 14, a 2 x 2 ANOVA revealed no difference between FPP and NFPP on perception of celebrity involvement. In addition, differences in perceived public involvement were observed. Therefore, the manipulation of celebrity involvement was not successful.

Table 14 *Tweet 7: Perceived Celebrity and Public Involvement Conveyed by Tweets in Experimental Conditions*

	Celebrity Involvement	Public Involvement
Fear with FPP	3.66(2.07)	2.57(2.05)
Fear with NFPP	3.57(1.40)	3.43(1.51)
Hope with FPP	2.32(1.97)	1.79(1.03)
Hope with NFPP	2.97(2.00)	3.50(1.99)
Main Effect of Celebrity Involvement Frame	$F(1, 48) = 0.242$	$F(1, 49) = 6.011^*$

* $p < .05$

Note. Means could range from 0 to 6. Standard deviations are in parentheses.

Unexpectedly, for Tweet 7, there was a significant difference between groups in the level of interestingness, $F(4, 62) = 5.43, p < .01$. The difference was because respondents in the control group perceived the tweets as less interesting ($M = 0.68$) than did those in most of the experimental conditions (fear with FPP, $M = 3.07$; fear without FPP, $M = 3.00$; hope without FPP, $M = 2.93$). Ratings in the hope with FPP group ($M = 1.91$) did not differ from any other groups. There was also no significant difference between groups in the level of informativeness, $F(4, 66) = 0.92, p > 0.10$.

Responses to the three celebrities. One-way repeated measures ANOVAs were computed to evaluate the perception of the three celebrities, Leonardo DiCaprio, Ian Somerhalder, and Pharrell Williams, including PSI, familiarity, likability, attractiveness, and perceived celebrity involvement in climate advocacy. As the results of all five perception variables violated the assumption of sphericity, the ANOVAs with a Greenhouse-Geisser correction determined that the three celebrities differed significantly on all five perception variables. Fisher's LSD (Least Significant Difference) post-hoc tests were conducted to determine which means differed from the others. Table 15 summarizes the results of the ANOVAs and post-hoc tests for the perceptions of the three celebrities.

Table 15 *Perceptions of Celebrities*

	Leonardo DiCaprio	Ian Somerhalder	Pharrell Williams	One-way ANOVA
PSI	3.47 (1.25) _b	2.48 (1.89) _a	3.43 (1.56) _b	$F(1.647, 80.698) = 7.385^{**}$
Familiarity	5.19 (1.40) _c	1.69 (2.39) _a	4.69 (1.99) _b	$F(1.526, 93.113) = 66.270^{***}$
Likability	4.16 (1.82) _b	2.74 (2.20) _a	3.71 (1.98) _b	$F(1.731, 83.071) = 8.978^{**}$
Attractiveness	4.48 (1.60) _c	3.27 (1.91) _a	3.98 (1.65) _b	$F(1.671, 83.557) = 10.349^{***}$
Climate Advocacy	3.00(2.02) _b	1.41(1.54) _a	2.38(1.74) _b	$F(1.699, 56.071) = 10.974^{***}$

** $p < .01$, *** $p < .001$

Note. Means could range from 0 to 6. Standard deviations are in parentheses. Means in the same row that have no subscripts in common differ at $p < .05$ using the Fisher's LSD test. Degrees of freedom reflect the Greenhouse-Geisser correction.

Discussion of Pilot Test Findings.

Tweets. To decide which sets of tweets best meet the requirements of the experiment for the main study, the results of the pilot test for the seven sets of tweets used were reviewed to see whether they were indeed perceived as intended. Regarding the emotion frame, the perceived degree of fearful and threatening emotions was supposed to be higher for both fear groups (fear frame with FPP and fear frame with NFPP) than for both hope groups (hope frame with FPP and hope frame with NFPP) and the control group. On the contrary, the perceived degree of hopeful and optimistic emotions was supposed to be higher for both hope groups than for both fear groups and the control group. When groups differed, it was also checked whether the difference was in the right direction. Regarding the celebrity involvement frame, it was hoped that the perception of celebrity involvement in climate advocacy would be higher in the FPP groups than in the NFPP groups, and no significant differences were expected on the perception of public involvement. Finally, for the level of interestingness and informativeness, which were not independent variables, it was expected that groups should not be different.

After evaluating the pilot test results for all seven tweets, tweets #1, #4, #6, and #7 were selected. These tweets were closer to meeting the experimental requirements than were tweets #2, #3 or #5. Rationales for selecting each of the four tweets, as well as changes made to improve the manipulation of emotion frame and celebrity involvement frame, are explained below.

For tweet #1, the emotion manipulation was successful in that there were significant differences on all emotion ratings except for threatening emotion, and the all mean differences between groups were in the expected direction. Although there were no significant differences between the FPP and the NFPP groups in the celebrity involvement frame, the mean differences

were in the right direction. This indicates that both FPP groups (with both fear and hope) perceived a higher degree of celebrity involvement than did both NFPP groups.

For tweet #4, the emotion manipulation was successful in that there were significant differences on all emotions except for hopeful emotion, and all mean differences between groups were in the right direction. As there were no significant differences between the FPP and NFPP groups in the celebrity involvement frame, a celebrity's picture with the slogan of "climate justice now" was added to the tweet in the main study, to emphasize the celebrity's involvement in climate advocacy.

For tweet #6, there were significant differences among groups in the fear frame as required, but the hope frame had no significant differences. However, all the mean differences were in the right direction, indicating that participants in the hope frame groups tended to report more hopeful and optimistic emotions than groups in fear frames. Changes were made in language of the tweet to convey more hopeful emotions. For this tweet, no significant difference in celebrity involvement was found between the FPP groups and the NFPP groups. Thus, minor changes were made in the wording of the tweet to emphasize the celebrity's involvement in climate advocacy.

For tweet #7, the results indicated significant differences across groups in all four emotions. Ratings for the fearful and threatening emotions confirmed the expected differences between conditions. However, the differences for hopeful and optimistic emotions showed that generally, all experimental groups were perceived as more hopeful and optimistic than the control group. Thus, the hope-framed tweets were revised to convey more hopeful emotion. There were no significant differences between the FPP groups and the NFPP groups in the

celebrity involvement frame. Thus, minor changes were made in language to the FPP tweets to highlight the celebrity's involvement in climate advocacy.

Perception of celebrities. To select the two celebrities among Leonardo DiCaprio, Ian Somerhalder, and Pharrell Williams who would be used in the main study, the results of the pilot tests for the perceptions of the celebrities, including PSI, familiarity, likability, attractiveness, and celebrity's involvement in climate advocacy, were reviewed. It was ideal to choose the two celebrities with the most similar perceptions to ensure that besides manipulated independent variables, the celebrity's characteristics would not inadvertently influence the results. It was also considered ideal to select the celebrities whose perceived involvement in climate advocacy was not so high that the manipulated independent variables would not be able to have an effect. According to the results of the pilot test, the celebrities Leonardo DiCaprio and Pharrell Williams were selected, because respondents perceived them very similarly in terms of PSI, likability, and attractiveness. Their perceived involvement in climate change for the two celebrities were also similarly moderate.

4 METHOD: MAIN STUDY

4.1 Research Design Overview

The objective of the current study is to examine how celebrities' message framings of climate advocacy on Twitter influence individuals' attitude and behavioral intent toward climate change mitigation. This experiment investigated the effects of emotion frame (fear and hope) and celebrity involvement frame (FPP and NFPP) in tweets. The role of key mediators (risk awareness and perceived response efficacy) in the impacts of emotion frames were also analyzed. In addition, how PSI with the celebrity influences attitude and behavioral intent and how PSI moderates the effects of celebrity involvement frame was explored. For testing the

effects of message frames, participants in the experimental groups read one of four sets of messages on climate advocacy: Fear-framed tweets with FPP, fear-framed tweets with NFPP, hope-framed tweets with FPP, and hope-framed tweets with NFPP. A control group read four unrelated tweets without any information on climate change. The tweets were attributed to one of two celebrities who have actively used their social media to voice climate action: Leonardo DiCaprio or Pharrell Williams. The tweets and celebrities were selected based on the pilot test. After reading a set of tweets, participants completed a questionnaire that measured their emotional responses, risk awareness related to climate change, perceived response efficacy, attitude, behavioral intent toward climate change mitigation, and PSI with the celebrities. In addition, measures of their beliefs in climate change, knowledge of climate change, social media usage and sociodemographic characteristics were obtained.

4.2 Procedures

This experiment entirely took place online through Survey Monkey (www.surveymonkey.com). The recruitment message, informed consent form, experimental stimuli, and measures for the main study are listed in Appendices E, F, G, and H. Before inviting potential participants, Georgia State University's Institutional Review Board (IRB) approved the proposed data collection methods using deception, recruitment email, an informed consent form, materials, and questionnaires.

Upon receiving IRB approval, the researcher contacted instructors of undergraduate classes in the Department of Communication. Thirty-one agreed instructors announced the study in their classes and forwarded the research invitation (Appendix E) with the link to the online questionnaire. Participants were asked to read the informed consent form (Appendix F) and click a link indicating either that they agree to participate or decline to participate. This study used

deception by pretending that the messages presented were created by celebrities. In the consent form, participants were told that the experiment investigates responses to celebrities' messages via social media, that they may be led to believe some things that were not true, but that they would be told everything about the study at the end. They were also informed that they would be compensated extra credit (1 % of the points in the course) for completing the questionnaire. At the end of the survey, they were debriefed about the deception used in the study. The debriefing message appears in Appendix I. For those who did not want to participate or who were under 18 but still liked to earn the extra credit, an alternative option was offered, that required write a 1-page paper, discussing how their class helped prepare for the career they wished to pursue. No student selected the alternative option.

To ensure the random assignment of 10 different surveys, this study employed a html randomization code when creating the survey link. Thus, participants were randomly directed to one of the questionnaires (one of two celebrities, Leonardo DiCaprio or Pharrell Williams, as well as to one of four experimental conditions or a control group) when clicking the link.

Once consented, a set of seven tweets and questions were displayed. The messages for each condition are listed in Appendix G. After reading the tweets, the respondents rated their emotional responses, risk awareness related to climate change, perceived response efficacy, attitudes, and behaviors toward climate change mitigation, as well as PSI with Leonardo DiCaprio or Pharrell Williams. In addition, the participants' beliefs about climate change, knowledge about climate change, social media usage, and sociodemographic information were measured. Participants reported their full name, course instructor, and course title, for the purpose of assigning extra credit.

4.3 Participants

The main study used a convenience sample of college students. A total of 895 undergraduate students enrolled classes in the Department of Communication at Georgia State University were recruited. However, the first 137 responses collected were deleted as an error in the randomization code was found. After fixing the randomization error, a total of 758 participants' responses were gathered. Fifty six students who completed less than half of the measures were excluded from analysis. Additionally, 9 students who were under the age of 18 years were also excluded because the study was limited to participants aged 18 or older. Thus, the final sample used for the main study consisted of 693 undergraduate students. Among the total 693 participants, 351 participants read tweets attributed to Leonardo DiCaprio and the rest of the 342 participants read tweets attributed to Pharrell Williams.

The sample included about twice as many females as males (441 females, 208 males, 5 other, and 39 not reported). Responses written in the other category for gender included agender (0.1%) and nonbinary (0.1%). The age of participants ranged from 18 to 67 ($M = 19.90$ years old, $SD = 4.10$). More than one-third of respondents (37.8%) identified as Black/African American, 21.5% White/Caucasian, 14.6% as Asian/Pacific Islander, 8.1% as Hispanic/Latina(o), 0.3% as Native American, 9.7% as multiracial, 2.0% as others, and 6.1% did not report their race/ethnicity. On average, they were slightly politically liberal, reported around \$40,000 - \$49,999 average household annual income, and had parents who had some college education.

4.4 Materials

The experimental stimuli utilized in this study included five types of Twitter messages created for the purposes of this study by revising tweets of Leonardo DiCaprio, Ian Somerhalder, and Pharrell Williams. A total of seven tweets (in five versions, for each of the five conditions)

were pilot tested. Based on the results of pilot tests, four of these tweets were selected for inclusion in the main study. Some of the selected tweets were revised in an effort to convey more of the intended emotions and stronger celebrity involvement perception in the FPP condition. The messages were shown in the form of Twitter posts with the celebrity's ID and profile picture. The final tweets are presented in Appendix G.

The research design is a 2 (celebrity: Leonardo DiCaprio or Pharrell Williams) x 2 (emotion frame: fear or hope) x 2 (celebrity involvement frame: FPP or NFPP) between-subjects factorial design. A stand-alone control group was included for each celebrity. Figure 1 presents this research design.

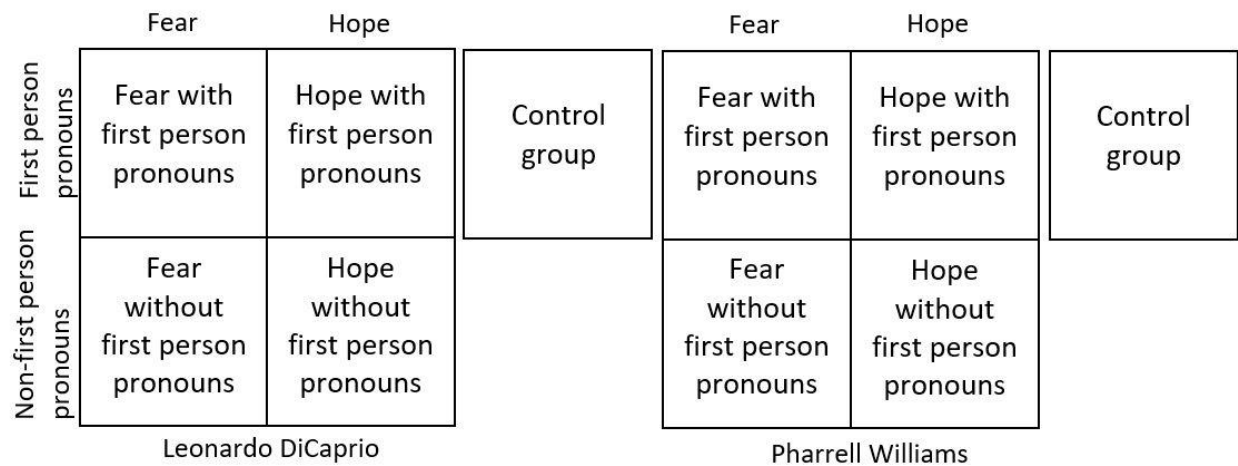


Figure 1 *Research Design*

Each respondent saw four individual tweets, consisting of 140 characters or less, two with a corresponding image. Four sets of tweets were created for the four experimental conditions: fear-framed tweets with FPP, fear-framed tweets without FPP, hope-framed tweets with FPP, and hope-framed tweets without FPP. The tweets contained information about the importance of taking an action for climate change mitigation. The two control groups viewed four unrelated tweets without any information on climate advocacy. Each set of tweets was attributed to either Leonardo DiCaprio or Pharrell Williams.

The emotion frame was manipulated by creating tweets that framed climate change in terms of fear or hope. The fear-framed tweets emphasized the adverse consequences of climate change. These tweets focused on threat and attempted to evoke fear-related emotions (e.g., fear, threat, concern, or uncertainty) about taking actions to mitigate climate change. The hope-framed tweets emphasized that taking action to mitigate climate change can be effective and lead to beneficial outcomes for the environment. These tweets focused on success and attempted to evoke hope-related emotions (e.g., hope, optimism, or confidence) about taking actions to mitigate climate change. For example, a fear-framed tweet stated, “The world is losing the fight against #climatechange,” whereas the parallel hope-framed tweet stated, “The world can win the fight against #climatechange.”

The celebrity involvement frame was manipulated by phrasing the tweets using the FPP (a celebrity’ voice) or not. The FPP condition used the language of first person singular pronouns (e.g. I, me, or my) to discuss efforts for resolving the climate change issue. The NFPP condition did not contain first person pronouns. For example, a FPP tweet stated, “I’m standing for clean air and #ActOnClimate” whereas the parallel NFPP tweet stated, “Stand for clean air and #ActOnClimate.”

4.5 Measures

Participants were measured for their risk awareness, perceived response efficacy, attitude toward climate change mitigation, behavioral intent toward climate change mitigation, PSI with the celebrity, belief in climate change, knowledge about climate change, sociodemographic information, and others. The measures can be found in Appendix H.

Measure of emotional responses to the tweets. After reading the tweets, the respondents were asked about how they felt by modifying Dillard et al. (1996)’s measures. The

wording of the two items was changed to reflect the focus on possible responses to tweets about climate advocacy (scared was changed to threatened; upbeat was changed to optimistic).

Participants rated to what extent they felt fear (fearful, worried, threatened), hope (hopeful, confident, optimistic), anger (angry, furious), sadness, guilt, shame, and depression by using a 7-point scale (1 = none of this feeling to 7 = a lot of this feeling).

Measure of risk awareness. Risk awareness toward climate change was measured using three items adapted from Spence and Pidgeon (2010): “The consequences of climate change will be severe”, “Impacts of climate change are likely to be extreme”, and “The effects of climate change are unlikely to be too serious”. The items were rated on a 7-point Likert scale (1=strongly disagree to 7=strongly agree). After reverse coding, the three items were averaged ($M = 5.44$, $SD = 1.27$). Scale reliability was acceptable ($\alpha = .73$).

Measure of perceived response efficacy. Perceived response efficacy toward climate change mitigation were measured with items based on Kellstedt, Zahran and Vedlitz’s (2008) personal efficacy scale and Morton, Rabinovich, Marshall and Bretschneider’s (2011) perceived collective response-efficacy scale. Five items comprise this scale. Among three items used by Kellstedt et al., two items were adopted for this study, and one item, about human responsibility, was dropped. Instead of this, this study added a new item: “Actions I take personally can help reduce the effects of climate change”. To clarify meaning, one item was revised. The modified item is “I believe my actions can have a beneficial influence on global warming and climate change”. The other two items were adopted from Morton et al.’s study. These items are “Climate change can be averted by mobilising collective effort” and “If we act collectively, we will be able to minimize the consequences of climate change”. All items were rated on a 7-point scale (1=strongly disagree to 7= strongly agree). The five items were averaged ($M = 5.01$, $SD = 1.17$).

Scale reliability was high ($\alpha = .85$).

Measure of attitude. Attitude toward climate change mitigation was measured using items adapted from Spence and Pidgeon (2010). These items examine respondents' overall attitude, attitude in terms of a personal focus, and attitude in terms of a social focus on climate change mitigation. Examples of the items include "overall how do you feel about climate change mitigation?" and "in terms of personal considerations only, do you feel overall positive or negative about climate change mitigation?" All items were rated on a 7-point scale (1=strongly negative to 7= strongly positive). The three items were averaged ($M = 4.44$, $SD = 1.46$). Scale reliability was high ($\alpha = .88$).

Measure of behaviors. Behaviors toward climate change mitigation were measured by three dimensions, including support for government action on climate change mitigation, intention for sustainable behavior, and intention for participation in activism toward climate change mitigation. Support for government action on climate mitigation was measured using three items adapted from Hart and Nisbet (2012). Examples of the items include: "we should immediately increase government regulation on industries and businesses that produce a great deal of greenhouse emissions" and "we should immediately increase taxes on industries and businesses that produce a great deal of greenhouse emissions". Given a possibility that the existing scale might be more favorable to people who are liberal than conservative, this study added two new items that may be more acceptable to conservative people. An example of the new items is "the government should offer economic incentives so that businesses and industries voluntarily reduce greenhouse emissions". The items were rated on a 7-point scale (1 = strongly disagree to 7 = strongly agree). After reverse coding, the five items were averaged ($M = 5.24$, $SD = 1.15$). Scale reliability was acceptable ($\alpha = .79$).

The items measuring intention for sustainable behaviors were taken from Gifford and Comeau (2011). Their scale includes 15 items. However, considering that the participants in this study were undergraduate students, eight items that suppose home ownership or car ownership were dropped. Only the seven items that can be applicable for most students were used. Examples of the items include “Switch off lights when not in use” and “recycle more”. The items were rated on a 3-point scale (1 = Definitely, 2 = Probably, 3 = Probably not). Two other response options were also included (I already do this; does not apply to me) and were treated as missing data. After reverse coding so that higher scores indicate greater intention to engage in sustainable behaviors, ratings for the seven items were averaged ($M = 1.77$, $SD = 0.52$). Scale reliability was high ($\alpha = .88$).

Intention for participation in activism toward climate change mitigation was measured with eight items adapted from the studies of Dono, Webb and Richardson (2010), Roser-Renouf and Nisbet (2008), and Valenzuela (2013). Examples of the items are “participate in events organized by environmental groups working for climate change mitigation” and “give financial support to environmental groups working for climate control”. This study also added three new items to assess activism via social media. All of the items were rated on a 3-point scale (1 = Definitely, 2 = Probably, 3 = Probably not). Two other options were also included (I already do this; does not apply to me) and were treated as missing data. After reverse coding so that higher scores indicate greater intention for activism, ratings for the eight items were averaged ($M = 1.58$, $SD = 0.53$). Scale reliability was very high ($\alpha = .90$).

Measure of PSI. Participants’ PSI with Leonardo DiCaprio or Pharrell Williams was measured. Based on Rubin and Perse (1987)’s 10-item PSI scale that was used for a study of television soap operas, a revised scale was used to suit the nature of PSI between users and a

celebrity on Twitter. The examples of modified statements are “I feel he is like a friend”, “I look forward to seeing him in any media”, “If he appeared in any media, I would want to watch it”, “I see him as a natural, down-to-earth person”, “If I saw a story about him in a newspaper or magazine, and I would want to read it”. The items were rated on a 7-point Likert scale (1 =strongly disagree to 7 = strongly agree). The ten items on this scale were averaged ($M = 3.84$, $SD = 1.34$). Scale reliability was very high ($\alpha = .91$).

Measures of belief. Belief was measured by two items, which assess belief in the validity of climate change and belief in human contributions to climate change. Belief in the validity of climate change was measured by asking respondents to indicate to what extent they agree with the argument that climate change has been happening (American Life Panel, 2006). Belief in human contributions to climate change addresses whether humans are the primary cause of climate change (Hart & Nisbet, 2012). This belief was measured by one item: “Global climate change is occurring and we humans are the primary cause”. These items were rated on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). The two items on this scale were averaged ($M = 5.68$, $SD = 1.25$). Scale reliability was high ($\alpha = .82$).

Measure of knowledge about climate change. Factual knowledge of respondents with respect to climate change was assessed with six items that covered both the scientific aspect (e.g., the greenhouse effect and climate gasses) and recent news (e.g., The Kyoto Protocol) of the topic. Responses to the items were offered as True or False. Among the six items, two items were adapted by Hart and Nisbet’s scale (2012). These items are “the hole in the ozone layer is the main cause of global climate change” (false) and “the average temperature of the earth has increased over the past 100 years” (true). One item was borrowed from the scale of prior knowledge on climate change developed by Braten, Strømsø, and Samuelstuen (2008). For this

study, their multiple-choice questions will be revised to True or False questions. The item is “the greenhouse effect is due to Streams of heat that do not get out of the atmosphere” (True). This study added three new items that assessed recent news on climate change. An example of these item is: “In 2015, a deal was made to limit the rise in global temperatures to less than 2 degrees C has been agreed at the climate change summit in Paris” (True). The sum of number of correct answers for these six items on this scale were calculated ($M = 4.15$, $SD = 1.12$). Higher values indicate higher knowledge about climate change.

Measure of perception of celebrity involvement. Participants’ perceptions on the celebrity’s involvement in climate change mitigation were measured with three items. Examples of the items include “I think Leonardo DiCaprio/Pharrell Williams is deeply involved in climate change mitigation” and “I think Leonardo DiCaprio/Pharrell Williams makes extensive personal efforts to address the climate change issue.” All items were rated on a 7-point scale (1 = strongly disagree to 7 = strongly agree). The three items were averaged ($M = 4.30$, $SD = 1.57$). Scale reliability was very high ($\alpha = .95$).

Measures of background characteristics. Participants’ sociodemographic characteristics were measured, including gender, age, ethnicity, and parents’ social economic status. Political ideology was measured using a single item (Hoffner & Rehkoff, 2011). Respondents were asked to “please indicate your political ideology on a 7-point scale (1= very liberal to 7= very conservative) ($M = 3.32$, $SD = 1.42$).

The questionnaire measured social media use, including whether respondents had social media accounts, frequency of access, the amount of time, the number of followers and followings (Twitter), and the number of celebrities they follow. Experience of involvement in environmental issues was measured. This included exposure to others’ posts on social media

regarding environmental issues, their posting experience on environmental issues, and the frequency of engagement in activism, petitions, and donation.

For potential use in future analyses, several additional variables were also measured. Respondents were asked to report whether they wanted to reply to or retweet each of the celebrities' tweets. In the experimental conditions, their perceptions of the celebrity's motivations for his climate advocacy (self-promotion or climate change mitigation) were also assessed. As noted above, respondents also reported their emotional responses to the tweets, but those measures were not analyzed in this dissertation.

Manipulation checks. Respondents' perceptions of the emotion frames and the celebrity involvement frames were measured. As a check on the manipulation of the emotion frames, the respondents reported to what extent they perceived that the tweets conveyed fearful or hopeful emotions associated with climate change mitigation. Respondents rated two items for each emotion (fear, hope). An example of a fear item is: "The tweets I read conveyed feelings of worry about what might happen without mitigating climate change" An example of a hope item is: "The tweets I read conveyed feelings of optimism about combating the climate crisis if we make efforts". Responses for all of these items were measured on a 7-point Likert-type scale (1 = none of this feeling to 7 = a lot of this feeling). The two items for each emotion were averaged. Scale reliabilities were high for fear ($\alpha = .90$) and hope ($\alpha = .87$).

As a check on the manipulation of the celebrity involvement frame, respondents' perceptions of the celebrity frames were measured by asking to what extent they perceived that the tweets conveyed information about the celebrity's (Leonardo DiCaprio/Pharrell Williams) involvement in climate change mitigation. Three items comprise this measure. An example item is "The tweets I read indicated that [celebrity] is deeply involved in climate change mitigation".

Additionally, three items measured respondents' perceptions of public involvement in climate change mitigation, to ensure that the manipulation did not impact these perceptions. An example of these items is "The tweets I read indicated that many people are involved in climate change mitigation". Responses for all of these items were measured on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree). Scores on each subscale were averaged. Scale reliabilities were high for both celebrity involvement ($\alpha = .81$) and public involvement ($\alpha = .90$).

5 RESULTS

5.1 Overview of Analyses

The hypotheses and research questions proposed for this study were addressed with a series of ANCOVAs and regression analyses. Independent variables included emotion frame (fear or hope) and celebrity involvement frame (FPP or NFPP) in celebrity messages advocating climate action, as well as PSI with the celebrity (either Leonardo DiCaprio or Pharrell Williams). Dependent variables used in the analyses were attitudes and behaviors toward climate change mitigation, including 1) attitudes toward climate change mitigation, 2) support for government action, 3) intent to behave sustainably, and 4) intent to participate in activism for climate change mitigation. Age and gender were controlled because these were correlated with the key dependent variables. Celebrity was also controlled as different perceptions toward each celebrity may have different effects on individuals' attitudes and behaviors on the climate change issue. In addition, political ideology, belief in climate change, and knowledge of climate change were controlled as these variables have been identified as factors influencing individuals' attitudes and behaviors regarding the climate change issue. Furthermore, the mediating role of risk awareness and response efficacy on the effects of emotion frames and moderating role of PSI on the effects of celebrity involvement frame were investigated.

The analysis for this study proceeded in seven stages. First, descriptive statistics were generated for all study variables. Second, respondents' perceptions of Leonardo DiCaprio and Pharrell Williams were compared, and the groups who read tweets from the two celebrities were compared on the dependent variables related to climate change mitigation. Third, experimental manipulation of emotion frames and celebrity involvement frames was checked. Fourth, to address H1, one-way analysis of covariance (ANCOVA) was conducted to compare the effects of emotion-framed messages (fear and hope) and unrelated control group messages on attitudes and on behaviors toward climate change mitigation. One analysis was conducted for each dependent variable. Fifth, to address RQ1, H4, and H5, 2 x 2 analyses of covariance (ANCOVA) were conducted to investigate the main effects and interaction of emotion frames and celebrity involvement frames. Emotion frame (fear or hope) and celebrity involvement frame (FPP or NFPP) are the independent variables, and in four separate analyses, attitude and behaviors toward climate change mitigation were the dependent variables. Sixth, mediation analysis was employed using the PROCESS developed by Andrew Hayes (Hayes, 2013) to understand the mechanism by which discrete emotion frames affect attitude and behavioral intent toward climate change mitigation. These analyses addressed the mediating role of risk awareness in the effects of the emotion-framed messages (H2, RQ2) and the mediating role of perceived response efficacy in the effects of emotion-framed messages (H3, RQ3). Finally, to address H6 and H7, hierarchical regression analysis was conducted to examine the impact of PSI with the celebrity on attitudes and the three behaviors as well as the moderating effect of PSI on the influence of celebrity involvement frames. Except for H1, participants in the control group were excluded from all the analyses that addressed hypotheses and research questions.

5.2 Descriptive Analysis

The means and standard deviations for key variables included in the study were calculated. These are reported in Table 16. Interestingly, participants reported a high level of belief that global warming is really happening and humans are the major cause of that, and positive attitudes toward mitigating climate change. It was also found that they had fairly high knowledge on the climate change issue. Respondents reported a high level of support for government action on climate change mitigation and intention for participation in activism toward climate change mitigation, and a moderate level of intention for sustainable behavior.

Table 16 *Means and Standard Deviations of Key Study Variables*

	<i>M</i>	<i>SD</i>	Cronbach's α
Attitude (3 items)	4.44	1.46	.88
Support for Government Action (5 items)	5.24	1.15	.79
Sustainable Behavior (7 items)	2.83	0.52	.88
Participation in Activism (8 items)	1.58	0.53	.90
Risk Awareness (3 items)	5.44	1.27	.73
Response Efficacy (5 items)	5.01	1.17	.85
PSI (10 items)	3.84	1.34	.91
Political Ideology (1 item)	3.32	1.42	---
Belief in Climate Change (2 items)	5.68	1.25	.82
Knowledge about Climate Change (6 items)	4.15	1.12	---

Note. All rating scales ranged from 1 to 7 except for sustainable behavior, participation in activism and knowledge. The rating scales for sustainable behavior and participation in activism are from 1 to 3, with higher scores indicating greater intention. Knowledge was the sum of the number correct, so scores could range from 1 to 6. For political ideology, higher scores are more conservative.

Table 17 shows characteristics of respondents' social media use. The results of descriptive analysis show that 49.5% of participants (n=343) have a Twitter account, 75.6% (n = 524) have an Instagram account, and 67.5% (n = 468) have a Facebook account. Of those who used each form of social media, Twitter and Instagram were used about 1.5 hours per day, whereas Facebook was used just under one hour per day. The number of followers they have on Twitter is approximately 101 to 150 and the number of people they follow is also about 101 to

150. It is noteworthy that the respondents reported that they rarely post or share content about the climate change issue on social media, but they do read such content slightly more often.

Table 17 *Social Media Use*

	n	<i>M (SD)</i>
Twitter Use Time per Day (minutes)	316	90.23 (147.44)
Twitter Use Days per Week	343	4.34 (2.81)
Facebook Use Time per Day (minutes)	458	57.08 (82.71)
Facebook Use Days per Week	463	3.96 (2.67)
Instagram Use Time per Day (minutes)	489	91.52 (117.29)
Instagram Use Days per Week	513	5.70 (2.09)
Posting/Sharing about Climate Change on Social Media	655	2.05 (1.00)
Reading Postings about Climate Change on Social Media	653	2.58 (0.96)

Note. Social media activities used a scale of 1= never to 5 = very often. The total N was 693.

To investigate relations among variables, Pearson's correlation analyses were employed. As all variables were not normally distributed, Spearman's correlation analyses were also checked and the results of both analyses were quite similar. Thus, the results of Pearson's correlation analyses were reported. Table 18 summarizes the results of zero-order correlations among variables. Variables are presented in the order of demographic variables, manipulated variables, dependent variables, mediator and moderator variables, and control variables. The table shows that older participants tend to have more positive attitude toward climate change mitigation and more knowledge about the climate change issue. Compared to males, females reported more intent to participate in activism, more risk awareness, and more response efficacy. More liberal respondents reported more positive attitudes toward climate change mitigation, greater support for government action, greater intent to participate in activism for climate change mitigation, more risk awareness, more response efficacy, more belief in climate change, and more knowledge about the climate change issue.

Table 18 Zero-Order Correlations among Study Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Age	---														
2. Gender	.073	---													
3. Twitter Use	-.004	-.041	---												
4. Emotion Frame	-.059	-.032	.034	---											
5. Celebrity Involvement Frame	.007	-.116**	-.005	.049	---										
6. Attitude	.084*	.050	-.004	-.024	.108*	---									
7. Support for Government Action	.057	-.051	.030	-.019	.016	.338**	---								
8. Sustainable Behavior	.004	-.023	.061	.051	-.017	.034	.177**	---							
9. Activism	.022	-.124**	.052	.120**	.005	.110**	.308**	.543**	---						
10. Risk Awareness	.041	-.079**	.027	.020	.019	.306**	.757**	.153**	.283**	---					
11. Response Efficacy	.068	-.117**	.015	.012	.018	.343**	.682**	.214**	.345**	.594**	---				
12. PSI	-.057	-.055	.004	.116**	.063	.185**	.194**	.081*	.234**	.166**	.276**	---			
13. Celebrity	-.002	-.049	-.028	.016	.074	.029	-.002	-.038	-.040	-.009	.006	.159**	---		
14. Political Ideology	-.003	.073	.013	.025	-.057	-.177**	-.248**	-.064	-.121**	-.249**	-.125**	-.007	-.071	---	
15. Belief in Climate Change	.033	-.073	.058	-.001	-.011	.268**	.637**	.162**	.248**	.636**	.524**	.170**	.010	-.211**	---
16. Knowledge about Climate Change	.099*	.051	-.006	-.046	.026	.140**	.262**	.108**	.108**	.285**	.196**	.023	.047	-.131**	.216**

* $p < .05$, ** $p < .01$

Note. Dichotomous variables: gender (0: female, 1: male), Twitter use (0: no, 1: yes), emotion frame (0: hope, 1: fear), celebrity involvement frame (0: NFPP, 1: FPP), celebrity (0: Pharrell Williams, 1: Leonardo DiCaprio). For political ideology, higher scores are more conservative.

The four dependent variables related to climate change (attitude, support for government action, sustainable behavior, participation in activism) and the two mediating climate change variables (risk awareness, response efficacy) were all positively correlated with each other with one exception: support for government action and intention for sustainable behavior were not correlated. These six variables were also positively correlated with belief in climate change and knowledge of climate change. In addition, greater PSI with the celebrity was associated with more favorable attitude toward climate change mitigation, more support for government action, more intention for sustainable behavior, more intention for participation in activism, more risk awareness, greater perceived response efficacy, and more belief in climate change.

5.3 Comparison of Celebrities on the Perceptions and Dependent Variables

Independent t-tests were conducted to compare perceptions of Leonardo DiCaprio and Pharrell Williams on PSI, familiarity, and involvement in climate change activism, and to compare the two celebrity conditions on the dependent variables (attitude toward climate change mitigation, support for government action, intent to behave sustainably, and intent to participate in activism for climate change mitigation). Table 19 displays the results of these t-tests.

Table 19 *Perceptions of Celebrities and Attitudes and Behaviors of Leonardo DiCaprio and Pharrell Williams Conditions*

	Leonardo DiCaprio Condition	Pharrell Williams Condition	
	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>
PSI	4.08 (1.36)	3.63 (1.33)	3.898***
Familiarity	5.52 (1.45)	5.16 (1.68)	2.530*
Climate Advocacy	4.47 (1.55)	4.41 (1.53)	0.438
Attitude	4.47 (1.43)	4.40 (1.51)	0.544
Support for Government Action	5.18 (1.16)	5.23 (1.15)	-0.468
Sustainable Behavior	1.72 (0.53)	1.82 (0.51)	-2.054*
Participation in Activism	1.53 (0.51)	1.62 (0.56)	-1.824 [@]

[@] $p < .10$, * $p < .05$, *** $p < .001$

Note. All rating scales ranged from 1 to 7 except for sustainable behavior and participation in activism. Scales for these measures are from 1 to 3; higher scores indicate greater intention.

Participants reported greater PSI with Leonardo DiCaprio ($M = 4.08$; $SD = 1.36$) than with Pharrell Williams ($M = 3.63$, $SD = 1.33$), $t(553) = 3.898$, $p < .001$. A significant difference also emerged regarding familiarity, such that participants reported being more familiar with Leonardo DiCaprio ($M = 5.52$, $SD = 1.45$) than with Pharrell Williams ($M = 5.16$, $SD = 1.68$), $t(486) = 2.530$, $p < .05$. However, there was no significant difference between the two celebrities in their perceived involvement in climate advocacy, $t(522) = .438$, $p > .10$. The two celebrity tweet conditions also did not differ on attitude [$t(540) = .544$, $p > .10$] or support for government action [$t(549) = -.468$, $p > .10$]. However, the conditions significantly differed on intent to behave sustainably [$t(527) = -2.054$, $p < .05$], and marginally differed on intent to participate in activism [$t(523) = -1.824$, $p < .10$]. Respondents in the Pharrell Williams condition reported a higher level of both intent to engage in sustainable behavior and intent to participate in activism than did those in the Leonardo DiCaprio condition. Considering the differences between the two celebrity conditions in respondents' PSI, familiarity, intent to behave sustainably, and intent to participate in activism, the celebrity was used as a control variable in the analyses for testing hypotheses and addressing research questions.

5.4 Framing Manipulation Checks

As a check of the emotion frame manipulation, a 2 (emotion frame: fear or hope) x 2 (celebrity involvement frame: FPP or NFPP) analysis of variance (ANOVA) was conducted to compare respondents' perceptions of the emotions conveyed by the tweets across the four experimental groups. They rated how fearful or hopeful they perceived the information conveyed by the tweets. Table 20 summarizes the results of perceived emotions conveyed by tweets in experimental conditions.

Table 20 *Perceived Emotions Conveyed by Tweets in Experimental Conditions*

Experimental Conditions	Fear	Hope
1. Fear with FPP	4.71 (1.65)	4.61 (1.58)
2. Fear without FPP	4.67 (1.61)	4.71 (1.50)
3. Hope with FPP	4.02 (1.87)	4.50 (1.71)
4. Hope without FPP	3.77 (1.73)	4.36 (1.59)
Main Effect of Emotion Frame	$F(1, 515) = 27.805^{***}$	$F(1, 516) = 2.752$
Emotion Frame x Celebrity Involvement Frame	$F(1, 515) = 0.460$	$F(1, 516) = 0.746$

*** $p < .001$

Note. The rating scales are from 1 to 7.

There was a significant main effect of emotion frame on perceived fear, $F(1, 515) = 27.805$, $p < .001$. Participants who received fear-framed messages reported perceiving the messages as more fearful ($M = 4.69$, $SD = 1.63$) than those who received hope-framed messages ($M = 3.90$, $SD = 1.80$). No significant interaction was found between the emotion frame and the celebrity involvement frame in the level of perceived fear, $F(1, 515) = 0.460$, $p > .10$. The main effect of celebrity involvement frame also was not significant, $F(1, 515) = 0.903$, $p > .10$.

However, there was no significant differences between fear and hope groups in the level of perceived hope, $F(1, 516) = 2.752$, $p > .10$. Fear frame groups ($M = 4.66$, $SD = 1.54$) and hope frame groups ($M = 4.43$, $SD = 1.65$) were similar in their perception of hope in the tweets. The results also indicated no interaction between the emotion frame and the celebrity involvement frame in the level of perceived hope, $F(1, 516) = 0.746$, $p > .10$. The main effect of celebrity involvement frame also was not significant, $F(1, 516) = 0.025$, $p > .10$. These results suggest that the manipulation of emotion frame was partially successful. The fear-framed and hope-framed tweets were perceived as differing as intended in the extent to which they conveyed fear but not hope.

As a check of the celebrity involvement frame manipulation, a 2 x 2 ANOVA was employed to compare the level of the perception of celebrity involvement in climate change

mitigation. Participants rated the extent to the tweets they read conveyed celebrity's involvement in climate change mitigation. Table 21 displays the results of perceived celebrity and public involvement conveyed by tweets in experimental conditions.

Table 21 *Perceived Celebrity and Public Involvement Conveyed by Tweets in Experimental Conditions*

Experimental Conditions	Celebrity Involvement	Public Involvement
1. Fear with FPP	4.57 (1.50)	4.13 (1.44)
2. Fear without FPP	4.53 (1.42)	4.25 (1.21)
3. Hope with FPP	4.24 (1.45)	4.03 (1.36)
4. Hope without FPP	4.33 (1.38)	4.16 (1.39)
Main Effect of Celebrity Involvement Frame	$F(1, 517) = 0.052$	$F(1, 517) = 1.056$
Emotion Frame * Celebrity Involvement Frame	$F(1, 517) = 0.237$	$F(1, 517) = 0.000$

Note. All of the rating scales are from 1 to 7.

Contrary to expectation, there was no difference between FPP and NFPP groups in the level of perceived celebrity involvement, $F(1, 517) = 0.052, p > .10$. FPP groups ($M = 4.41, SD = 1.49$) and NFPP groups ($M = 4.43, SD = 1.40$) reported similar levels of perception on celebrity involvement. The results also indicate no interaction between the emotion frame and the celebrity involvement frame in the level of perception of celebrity involvement, $F(1, 517) = .237, p > .10$. However, unexpectedly, the main effect of emotion frame was significant, $F(1, 517) = 4.248, p < .05$. This shows that the fear frame condition reported higher level of perceived celebrity involvement than did the hope frame condition.

In addition, it was found that there was no significant difference between FPP and NFPP groups in the perception of public involvement, $F(1, 517) = 1.056, p > .10$. NFPP groups ($M = 4.20, SD = 1.30$) reported similar level of perception of public involvement than FPP groups ($M = 4.08, SD = 1.40$). There was also no significant interaction between the emotion frame and the celebrity involvement frame in the perception of public involvement, $F(1, 517) = 0.000, p > .10$. The main effect of emotion frame also was not significant, $F(1, 517) = 0.578, p > .10$. These

results show that the manipulation of celebrity involvement frame was not effective, but it did not inadvertently influence the perceived level of public involvement in climate change mitigation.

5.5 The Effects of Climate Advocacy Messages on Attitudes and Behaviors toward Climate Change Mitigation

H1 predicted that, compared to the control messages, both the fear-framed and the hope-framed climate change messages would lead to more positive attitudes and greater behaviors toward climate change mitigation. To test this hypothesis, one-way analyses of covariance (ANCOVA) were conducted. One analysis was conducted for each dependent variable. Age, gender, celebrity, political ideology, belief in climate change, and knowledge of climate change were controlled. Levene's test and normality checks were carried out and the assumptions met. Results of these analyses, including adjusted means, standard errors, and F values are displayed in Table 22.

Contrary to H1, emotional frames had no effect on attitudes or behaviors compared to the control condition. The results showed no significant difference between experimental conditions and control condition for attitude in climate change mitigation [$F(2, 614) = 0.091, p > .10$], support for government action on climate change mitigation, [$F(2, 615) = 1.258, p > .10$], behavioral intention on sustainable behavior [$F(2, 605) = 0.142, p > .10$] when adjusted for the covariates. There was a marginally significant difference among groups in behavioral intention to participate in activism [$F(2, 600) = 2.538, p < .10$]. Post-hoc tests (Bonferroni) indicated that this was from the differences between the fear and hope conditions. These findings show that H1 was not supported.

Table 22 ANCOVAs Testing the Effects of Climate Advocacy Messages on Attitudes and Behaviors toward Climate Change Mitigation

Dependent Variable	Fear Experimental Group	Hope Experimental Group	Control Group	F	df	p value
	<i>M (SE)</i>	<i>M (SE)</i>	<i>M (SE)</i>			
Attitude	4.43 (0.09)	4.48 (0.09)	4.46 (0.12)	0.091	2, 614	0.913
Support for Government Action	5.17 (0.05)	5.22 (0.05)	5.32 (0.08)	1.258	2, 615	0.285
Sustainable Behavior	1.78 (0.03)	1.75 (0.03)	1.75 (0.05)	0.142	2, 605	0.868
Participation in Activism	1.62 (0.03)	1.52 (0.03)	1.59 (0.05)	2.538	2, 600	0.080 [@]

Note. Adjusted means are reported; standard errors are in parentheses. Rating scales for attitude and support for government action were 1 to 7. Rating scales for sustainable behavior and participation in activism were 1 to 3, with higher scores indicating greater intention.

5.6 The Effects of Emotion Frames and Celebrity Involvement Frames on Attitudes and Behaviors toward Climate Change Mitigation

To address RQ1, H4, and H5, 2 x 2 ANCOVAs were conducted to investigate the main effects and interaction of emotion frames and celebrity involvement frames on the four main dependent variables. Emotion frames (fear and hope) and celebrity involvement frames (FPP and NFPP) were used as the independent variables. In four separate analyses, attitude and the three behaviors toward climate change mitigation were included as the dependent variables. Age, gender, celebrity, political ideology, belief in climate change, and knowledge of climate change were used as the control variables. Levene's test and normality checks were carried out and the assumptions met.

RQ1 asked whether, in celebrities' climate advocacy via Twitter, one emotion frame (fear or hope) was more effective in driving positive attitudes and behaviors toward climate change. The adjusted means, standard errors, and F values associated with the main effects of emotion frame are displayed in Table 23.

Table 23 *Effects of Emotion Frames on Attitudes and Behaviors toward Climate Change Mitigation*

Dependent Variable	Fear	Hope	F	df	p value
	<i>M (SE)</i>	<i>M (SE)</i>			
Attitude	4.39 (0.09)	4.46 (0.09)	0.329	1, 484	0.566
Support for Government Action	5.14 (0.06)	5.20 (0.06)	0.550	1, 485	0.459
Sustainable Behavior	1.78 (0.03)	1.75 (0.03)	0.380	1, 478	0.538
Participation in Activism	1.62 (0.03)	1.51 (0.03)	5.115	1, 474	0.024

Note. Adjusted means were reported; standard errors are in parentheses. The F values are for the main effects of emotion frame. Rating scales for attitude and support for government action were 1 to 7. Rating scales for sustainable behavior and participation in activism were 1 to 3, with higher scores indicating greater intention.

The findings of the two-way ANCOVAs revealed no main effect of emotion frame for attitudes [$F(1, 484) = 0.329, p > .10$], support for government action on climate mitigation [$F(1, 485) = 0.550, p > .10$], or behavioral intention on sustainable behavior [$F(1, 478) = 1.920, p > .10$]. There was a significant main effect of emotion frame for behavioral intention to participate in activism for climate change mitigation, $F(1, 474) = 5.115, p < .05$. Table 23 shows that those who read the fear-framed tweets reported a greater intention to participate in activism than did those who read the hope-framed tweets.

H4 predicted that compared to messages without FPP, messages containing FPP would lead to greater positive attitudes and behaviors. This hypothesis was addressed by examining the main effects of celebrity involvement frame in the 2 x 2 ANCOVAs described above. Table 24 summarizes the adjusted means, standard errors, and F values associated with the main effects of celebrity involvement frame.

Table 24 *Effects of Celebrity Involvement Frames on Attitudes and Behaviors toward Climate Change Mitigation*

Dependent Variable	FPP	NFPP	F	df	p value
	<i>M (SE)</i>	<i>M (SE)</i>			
Attitude	4.58 (0.09)	4.28 (0.09)	5.699	1, 484	0.017
Support for Government Action	5.18 (0.05)	5.15 (0.06)	0.135	1, 485	0.714
Sustainable Behavior	1.76 (0.03)	1.77 (0.03)	0.133	1, 478	0.716
Participation in Activism	1.55(0.32)	1.58 (0.34)	0.235	1, 474	0.628

Note. Adjusted means are reported; standard errors are in parentheses. The F values are for the main effects of celebrity involvement frame. Rating scales for attitude and support for government action were 1 to 7. Rating scales for sustainable behavior and participation in activism were 1 to 3, with higher scores indicating greater intention.

There was a significant main effect of celebrity involvement frame for attitudes, $F(1, 484) = 5.699, p < .05$. Table 24 shows that attitudes were more positive among those in the FPP groups than those in the NFPP groups. The partial Eta Squared value indicated that 1.2% of the variance in the attitude was explained by the celebrity involvement frame. However, the analyses also revealed that there was no main effect of the celebrity involvement frame for any of the behavioral measures, including support for government action on climate mitigation [$F(1, 485) = 0.135, p > .10$], sustainable behavior [$F(1, 478) = 0.133, p > .10$], and participation in activism [$F(1, 474) = 0.235, p > .10$] when adjusted for the covariates. These findings support H4 for attitudes, but not for behaviors. Thus, H4 was partially supported.

The same 2 x 2 ANCOVAs tested H5, which predicted an interaction between emotion frame and celebrity involvement frame for each of the four dependent variables. More specifically, it anticipated that whereas the influence of the FPP condition would be greater for hope-framed messages than for fear-framed messages, the influence of the NFPP condition would not differ based on the emotion frame.

Contrary to H5, the analyses found no significant interaction between emotion frame and reference frame for attitude [$F(1, 484) = 0.000, p > .10$] or behaviors, including support for

government action on climate mitigation, [$F(1, 485) = 0.007, p > .10$], sustainable behavior [$F(1, 478) = 0.872, p > .10$], and participation in activism [$F(1, 474) = 0.533, p > .10$].

5.7 The Mediating Role of Risk Awareness and Response Efficacy in the Effects of Emotion Frames

H2 and RQ2 addressed the mediating role of risk awareness in the effect of the emotion-framed messages on the four attitudinal and behavioral dependent variables. Similarly, H3 and RQ3 addressed the mediating role of perceived response efficacy in the influence of emotion-framed messages on attitudes and behaviors. Mediation analyses using the PROCESS developed by Andrew F. Hayes were employed to understand the mechanism by which discrete emotion frames affect attitudes and behaviors toward climate change mitigation (Hayes, 2013).

A series of regression models were fitted to test the mediating role of risk awareness on the effects of emotion frame on attitudes and the three behavioral intention measures. First, a regression analysis predicted the significance of the relationship between the emotion frame as an independent variable and attitudes and behaviors as dependent variables. Then the significance of the relationship between the emotion frame and risk awareness as a mediator variable was computed. Next, the analyses calculated the significance of the relationship between risk awareness and attitudes and behaviors in the presence of risk awareness. Finally, the significance of the relationship between emotion frame and attitudes and behaviors in the presence of risk awareness. Each dependent variable was analyzed separately. Age, gender, celebrity, political ideology, believe in climate change, and knowledge of climate change were controlled.

H2 predicted that the fear-framed messages would lead to more risk awareness than would the hope-framed messages, and RQ2 asked if risk awareness would mediate the effect of

emotion frame on attitudes and behaviors toward climate change mitigation. According to the results of regression analysis, emotion frame was not a significant predictor of attitude, $b = -0.06$, $t(486) = -0.45$, $p > .10$, as was already reported in the ANCOVAs. In addition, contrary to H2, emotion frame was not a significant predictor of risk awareness, $b = 0.06$, $t(486) = 0.65$, $p > .10$. Thus, it was not possible for risk awareness to mediate the effect of emotion-framed messages on attitudes.

The results also demonstrated that risk awareness did not mediate the effect of the emotion frame on any behaviors toward climate change mitigation. In detail, as reported earlier in the ANCOVAs, the mediation models showed emotion frame was not a significant predictor of intention to support for government action [$b = -0.06$, $t(487) = -0.72$, $p > .10$] or intention on sustainable behavior [$b = 0.03$, $t(480) = 0.54$, $p > .10$]. Although the regression model revealed the significant relationship between emotion-framed messages and participation in activism [$b = 0.10$, $t(476) = 2.21$, $p < .05$], as reported above, emotion frame was not a significant predictor of risk awareness. Therefore, no mediation of the influence of emotion-framed messages on behaviors by risk awareness was possible. Thus, in sum, regarding RQ2, there was no evidence that risk awareness mediated the influence of the emotion frame on attitudes or behaviors related to climate change mitigation.

H3 predicted that the hope-framed message would lead to greater perceived response efficacy, and RQ3 asked if perceived response efficacy would mediate the effect of the emotion-framed messages on attitudes and behaviors toward climate change mitigation. Regarding RQ3, the findings of the mediation model show that perceived response efficacy did not mediate the influence of emotion frame on attitude and any behaviors. In detail, as reported in the preceding paragraphs, emotion frame was not a significant predictor of attitude [$b = -0.06$, $t(486) = -0.45$, p

> .10], support for government action [$b = -0.04$, $t(486) = -0.67$, $p > .10$], or intention for sustainable behavior [$b = 0.07$, $t(479) = 0.56$, $p > .10$], but did predict participation in activism [$b = 0.10$, $t(476) = 2.21$, $p < .05$]. Contrary to H3, emotion frame was not a significant predictor of perceived response efficacy [$b = -0.02$, $t(476) = -0.28$, $p > .10$]. Therefore, no mediation of the influence of emotion frame on behaviors by perceived response efficacy was possible.

5.8 The Moderating Effect of PSI on the Influence of Celebrity Involvement Frame

H6 proposed that PSI with the celebrity would be associated with more positive attitudes and behaviors, and H7 predicted that the effect proposed in H4 (greater positive attitudes and behaviors for tweets using FPP) would be stronger for people who have a stronger PSI with the celebrity. To address the H6 and H7, hierarchical regression analyses were performed to reveal the relationships between PSI and the four measures of attitudes and behaviors and the moderating role of PSI on the influence of celebrity involvement frame on attitudes and behaviors. For all four analyses, the first block of the model was comprised by control variables, including age, gender, celebrity, political ideology, belief in climate change, and knowledge of climate change. The second block included dummy coded celebrity involvement frame (0, NFPP; 1, FPP) and standardized PSI. The third block contained the interaction term between celebrity involvement frame and standardized PSI. One analysis was conducted for each dependent variable. The results are summarized in Table 25, Table 26, Table 27, and Table 28. In the following results, adjusted R^2 was reported.

Table 25 Regression Examining the Moderating Role of PSI in the Effect of Celebrity Involvement Frame on Attitude

	b	SE	Beta	R ² Change
1 Age	.018	.015	.051	.097***
Gender	.171	.135	.055	
Celebrity	.069	.126	.023	
Political Ideology	-.107	.046	-.102*	
Belief	.281	.052	.241***	
Knowledge	.587	.355	.073@	
2 Celebrity Involvement Frame	.295	.125	.101*	.036***
PSI	.176	.047	.163***	
3 Celebrity Involvement Frame x PSI	.027	.092	.019	.000

@ $p < .10$, * $p < .05$, *** $p < .001$

Note. The betas reported in the table are betas at entry. Gender (0: female, 1: male), Celebrity (0: Pharrell Williams, 1: Leonardo DiCaprio), Political ideology (high scores are more conservative), Celebrity involvement frame (0: NFPP, 1: FPP).

Table 26 Regression Examining the Moderating Role of PSI in the Effect of Celebrity Involvement Frame on Support for Government Action

	b	SE	Beta	R ² Change
1 Age	.005	.010	.018	.426***
Gender	-.086	.085	-.035	
Celebrity	-.042	.079	-.018	
Political Ideology	-.092	.029	-.111**	
Belief	.536	.032	.584***	
Knowledge	.759	.223	.120**	
2 Celebrity Involvement Frame	.013	.079	.006	.010*
PSI	.088	.030	.104**	
3 Celebrity Involvement Frame x PSI	-.011	.058	-.009	.000

* $p < .05$, ** $p < .01$, *** $p < .001$

Note. The betas reported in the table are betas at entry. Gender (0: female, 1: male), Celebrity (0: Pharrell Williams, 1: Leonardo DiCaprio), Political ideology (high scores are more conservative), Celebrity involvement frame (0: NFPP, 1: FPP).

Table 27 Regression Examining the Moderating Role of PSI in the Effects of Celebrity Involvement Frame in Intention on Sustainable Behavior

	b	SE	Beta	R ² Change
1 Age	-.005	.006	.000	.041**
Gender	-.025	.050	-.023	
Celebrity	-.095	.046	-.092*	
Political Ideology	-.018	.017	-.049	
Belief	.055	.019	.132**	
Knowledge	.216	.130	.075@	
2 Celebrity Involvement Frame	-.021	.047	-.020	.006
PSI	.029	.017	.076@	
3 Celebrity Involvement Frame x PSI	.003	.034	.005	.000

@ $p < .10$, * $p < .05$, ** $p < .01$

Note. The betas reported in the table are betas at entry. Gender (0: female, 1: male), Celebrity (0: Pharrell Williams, 1: Leonardo DiCaprio), Political ideology (high scores are more conservative), Celebrity involvement frame (0: NFPP, 1: FPP).

Table 28 Regression Examining the Moderating Role of PSI in the Effect of Celebrity Involvement Frame on Intention to Participate in Activism

	b	SE	Beta	R ² Change
1 Age	.002	.006	.014	.080***
Gender	-.147	.050	-.128**	
Celebrity	-.094	.047	-.087*	
Political Ideology	-.028	.017	-.071	
Belief	.078	.019	.183***	
Knowledge	.202	.133	.068	
2 Celebrity Involvement Frame	-.021	.046	-.019	.044***
PSI	.086	.017	.218***	
3 Celebrity Involvement Frame x PSI	-.018	.034	-.032	.000

* $p < .05$, ** $p < .01$, *** $p < .001$

Note. The betas reported in the table are betas at entry. Gender (0: female, 1: male), Celebrity (0: Pharrell Williams, 1: Leonardo DiCaprio), Political ideology (high scores are more conservative), Celebrity involvement frame (0: NFPP, 1: FPP).

As illustrated in Table 25, the results revealed that the control variables accounted for a significant amount of variance in attitude toward climate change, $R^2 = 0.086$, $F(6, 500) = 8.854$, $p < .001$. Specifically, attitudes were more positive among respondents who were more liberal and who reported greater belief in climate change. Celebrity involvement frame and PSI also accounted for a significant additional proportion of the variance [$R^2 = 0.119$, $F(8, 492) = 9.481$, p

$< .001$, $\Delta R^2 = 0.036$, $\Delta F(2, 492) = 10.356$, $p < .001$]. As reported above, attitude was more positive among those who read the FPP tweets than those who read tweets using NFPP language. In addition, as predicted by H6, respondents who had a stronger PSI with the celebrity reported more positive attitudes toward climate change. After adding the interaction term between celebrity involvement frame and PSI in the regression model, it was found that whereas the model was significant, it did not account for additional variance in attitude, suggesting no moderating role of PSI in the effects of celebrity involvement frame in attitude [$R^2 = 0.118$, $F(9, 491) = 8.422$, $p < .001$, $\Delta R^2 = 0.000$, $\Delta F(1, 491) = 0.089$, $p > .10$]. Thus, H6a was supported by the positive association between PSI and attitudes toward climate change mitigation. But H7a was not supported, because PSI did not moderate the influence of the celebrity involvement frame on attitudes.

According to the results of the other three regression analyses, PSI significantly predicted two of the three behavioral measures, but did not moderate the effects of celebrity involvement frame on any behaviors. In detail, as shown in Table 26, regarding support for government action, the first block of the regression model shows that control variables accounted for a significant proportion of variance, $R^2 = 0.419$, $F(6, 494) = 61.132$, $p < .001$. Specifically, support for government action was higher among respondents who were more liberal and who reported greater belief in climate change. The second block, containing celebrity involvement frame and PSI, accounted for a significant additional proportion of variance [$R^2 = .427$, $F(8, 492) = 47.612$, $p < .001$, $\Delta R^2 = 0.010$, $\Delta F(2, 492) = 4.472$, $p < .05$]. Respondents with stronger PSI with the celebrity reported more support for government action toward climate change. After adding the interaction between celebrity involvement frame and PSI, while the model was still significant, it

did not significantly explain more variance [$R^2 = 0.426$, $F(9, 491) = 42.242$, $p < .001$, $\Delta R^2 = 0.000$, $F(1, 491) = 0.033$, $p > .10$].

For behavior intent on sustainable behavior, Table 27 displays that in the first block, the control variables accounted for a significant portion of variance, $R^2 = 0.029$, $F(6, 492) = 3.509$, $p < .01$. Specifically, intention to engage in sustainable behavior was higher among those who read tweets from Pharrell Williams and those with a greater belief in climate change. Neither the second block [$R^2 = 0.031$, $F(8, 490) = 2.994$, $p < .01$, $\Delta R^2 = 0.006$, $\Delta F(2, 490) = 1.431$, $p > .10$] nor the third block [$R^2 = 0.029$, $F(9, 489) = 2.657$, $p < .01$, $\Delta R^2 = 0.000$, $\Delta F(1, 489) = 0.006$, $p > .10$] accounted for significant additional variance. However, PSI with the celebrity was associated with a marginally significant greater intent to engage in sustainable behavior.

Lastly, regarding the intent to participate in activism on climate change, as displayed in Table 28, control variables accounted for a significant proportion of variance [$R^2 = 0.068$, $F(6, 488) = 7.032$, $p < .001$]. Specifically, intention to participate in activism was higher among females, those who read tweets from Pharrell Williams, and those who had a greater belief in climate change. The second block, containing celebrity involvement frame and PSI, accounted for a significant additional proportion of variance [$R^2 = 0.109$, $F(8, 486) = 8.577$, $p < .001$, $\Delta R^2 = 0.044$, $\Delta F(2, 486) = 12.240$, $p < .001$]. This was entirely due to PSI, which showed that respondents who had a stronger PSI with the celebrity reported more intention to participate in action on climate change. However, after adding the interaction, the model did not significantly account for more variance, indicating no evidence of the moderation role ($R^2 = 0.108$, $F(9, 485) = 7.642$, $p < .001$, $\Delta R^2 = 0.000$, $\Delta F(1, 485) = 0.265$, $p > .10$). These results show that H6b was almost fully supported by the positive associations between PSI and behaviors toward climate change (one of the three predicted relationships was marginally significant). However, H7b was

not supported, because PSI did not moderate the influence of the celebrity involvement frame on behaviors.

6 DISCUSSION

A heated debate is going on about the role of celebrities as emergent agents in climate change communication. It has been argued that celebrities popularize the concern and catalyze action, which in turn help to combat climate crisis (Corner & Pels, 2003; Street, 2004). Criticism has also risen that their advocacy has little effect, but rather reduces the domain of politics of climate change to commodity action, such as fashion and green product purchasing, and distracts from the real issue (Boycoff & Goodman, 2009; Weiskel, 2005). While these possibilities call for investigations, little research has examined the process and consequences of celebrity climate advocacy on public attitudes and behaviors on the issue of climate change. Grounded in social cognitive theory, PSI, and framing theory, this experiment empirically addressed this research gap by investigating how celebrities' voices circulated on social media function in the promotion of positive attitudes and behaviors for climate change mitigation through the lens of message framings. In addition to measuring attitudes, the study examined three key behaviors: support for government action, behavioral intention for sustainable behavior, and behavioral intention to participate in activism toward climate change mitigation. These behaviors were measured as they have been considered as important in solving the issue of climate change (Dono et al., 2010; Gifford & Comeau, 2011; Hart & Nisbet, 2012).

The major findings of the study are briefly summarized here. Each of the findings of the analyses are discussed in greater detail below. First, prior to conducting the analyses for testing hypotheses and research questions, the manipulation of the emotion frame and the celebrity involvement frame were checked. According to the results, the emotion frame was partially

effective, such that the fear-framed and hope-framed tweets were perceived as differing as intended in the extent to which they conveyed fear but not hope. Additionally, the results showed that the manipulation of celebrity involvement frame was not effective. The FPP tweets that were expected to induce more perceived celebrity involvement in climate advocacy were not perceived differently in the extent to which they conveyed celebrity involvement in the issue of climate change.

Second, this research explored the overall effectiveness of the climate change tweets compared to the tweets unrelated to the issue of climate change in driving positive attitudes and behaviors toward climate change mitigation. It was assumed that the climate change tweets, articulating the importance of climate advocacy (fear and hope appeals) would result in more positive attitudes and behaviors toward climate change. Contrary to the expectation, the results found no differences between the experimental conditions and the control condition in attitudes or any of the behaviors.

Third, the study examined the influence of the emotional frame – fear or hope – on attitudes and behaviors related to climate change. In comparing the fear-framed and hope-framed messages, it was found that while fear and hope did not differ in driving positive attitudes, support for government action toward climate change, or behavioral intention on sustainable behavior, the fear-framed tweets were more effective in motivating intention for participation in activism. The study also explored the mediating roles of risk awareness and perceived response efficacy in this persuasive process. The results suggest that neither risk awareness nor perceived response efficacy mediated the influence of emotion frame on attitudes or any of the behaviors. In addition, it was predicted that the influence of the FPP messages would be greater for hope-framed messages than for fear-framed messages. However, the results showed no significant

interaction between emotion frame and celebrity involvement frame for attitude or any of the behaviors.

Lastly, this research investigated the influence of the celebrity involvement frame (which varied use of FPP or NFPP in the advocacy messages) on attitudes and behaviors related to climate change mitigations, as well as the role of PSI as a separate predictor and as a moderator in the process of persuasion. The results revealed that compared to messages without FPP, messages with FPP were more effective in driving attitudes, but not any of the behaviors. The results also showed that PSI was a predictor of the all dependent variables, such that respondents who had a stronger PSI with the celebrity reported more positive attitudes and more behaviors toward climate change mitigation. However, PSI did not moderate the influence of the celebrity involvement frame on attitudes or behaviors.

In all of the analyses, age, gender, celebrity, political ideology, belief in climate change, and knowledge of climate change were controlled, as the results found that these factors were related to climate attitudes and behaviors. For example, it was revealed that belief in climate change, knowledge of climate change, and liberal political orientation were associated with more positive attitudes toward climate change mitigation and greater support for government action. Younger participants also reported more positive attitudes. It is noteworthy that those who read Pharrell Williams' tweets reported more intent to behave sustainably in the future. Females and those who had stronger belief in climate change reported more intent to participate in activism.

The discussion chapter unfolds in seven sections. The first section discusses the findings from the effects of emotion frame on attitudes and behaviors, including support for government action, intent to behave sustainably, and intent to participate in activism for climate change mitigation, as well as the mediating roles of risk awareness and perceived response efficacy in

this process. The second section reviews the effects of the celebrity involvement frame and PSI on individuals' positive attitudes toward climate change mitigation, the three behaviors, as well as the moderating role of PSI in this process. The third section presents theoretical implications emerged from this study. The fourth section discusses the study limitations. The fifth section discusses practical implications this study offers. Then, the chapter suggests directions for future research. The discussion chapter closes with conclusion.

6.1 The Effects of Emotion Frame and the Mediating Roles of Risk Awareness and Response Efficacy in Celebrity's Climate Advocacy

In the literature on health psychology, emotional appeals have been addressed as useful in driving preventive health attitudes and actions. While there has been little attempt to address emotion frames as predictors of pro-environmental attitudes and behaviors, the results of existing studies suggest the importance of people's emotions in motivating positive attitudes, engagement in environmental issues, and sustainable behaviors (Maibach et al., 2010; Myers et al., 2012; Spence & Pidgeon, 2010). Given fear and hope have been discussed as relevant drivers in shaping people's attitudes and encouraging needed actions regarding environmental risk, the study tested whether the fear-framed and hope-framed messages about a celebrity's climate advocacy resulted in more positive attitudes and eco-behaviors toward climate change mitigation compared to the messages unrelated to climate change. This experiment used fear-framed tweets emphasizing the threats of climate change and adverse consequences if people do not make efforts to take action for climate change mitigation. The hope framed tweets highlighted optimism to combat the climate problem and making efforts for the climate change issue can create beneficial outcomes for the environment. However, contrary to expectations, the results

showed no evidence of the effects of a celebrity's climate change tweets over a celebrity's tweets unrelated to climate change messages on attitudes or any of the behaviors.

This finding can be interpreted that considering respondents were well aware of Leonardo DiCaprio's and Pharrell Williams's involvement in climate change, reading their tweets unrelated to climate change may have reminded people about climate change. Leonardo DiCaprio's engagement in the People's Climate March held on September 21, 2014 in New York City, the first and largest protest against global warming, garnered substantial media attention and gave him an image as a climate messenger who may call the issue to the mind of the public (Chaos International, 2014). Leas et al. (2016)'s study also supported Leonardo DiCaprio's leverage in catalyzing enormous public concern on climate change issue by showing spiked search results on climate change when he talked about the issue at his Oscar acceptance speech in 2016. Similarly, Pharrell Williams officially became a climate star who brought hopeful messages to tackle climate change at the United Nations for the international day of happiness that took place on March 20, 2015 (CBS news, 2015). At the event, he and the UN foundation also launched the "happy party for a happy planet" online by utilizing his global hit song "happy". Such environmental activities and symbolic green identities of these two celebrities may have come to the respondents' mind when they read their tweets even without any mention of climate change.

No differences between the climate change tweets and unrelated tweets may also indicate that generating public support regarding climate threats may be a more complicated process than can be accomplished with one set of tweets. Specifically, a single set of messages may not be enough to result in substantial outcomes, and other factors that may influence the process need to be considered.

Next, motivated by the mixed results of previous studies regarding the role of fear and hope in the domain of environmental risk (Maibach et al., 2010; Markowitz & Shariff, 2012; Meijnders et al., 2001a, 2001b; Spence & Pidgeon, 2010), the study compared the impact of two discrete emotion frames on persuasion related to climate change issues. The analyses found no effect of emotion frame for attitudes, support for government action, or behavioral intention on sustainable behavior, showing that the fear frame and the hope frame did not differ. However, it is noteworthy that respondents who read the fear-framed messages reported greater intent to participate in activism to resolve the climate change problem than did those who read the hope-framed messages. These results demonstrate that a fear appeal was effective for climate advocacy in encouraging participation in activism, but not other measures. The reason why fear-framed messages were more effective in influencing participation in activism, but not driving support for government action or sustainable behaviors may be due to the nature of the behaviors. Compared to the other two behaviors, participation in activism is more collectivistic and can be perceived as immediately influencing outcomes on the issue. This is in line with the finding of previous studies, indicating that one of the barriers in taking climate action is that people tended to feel their individual action would have little impact to manage the issue compared with collective action at the larger scale (Eden, 1996). It could be argued that fear of climate change activates thoughts that some action is required, but may motivate change only when people also expect those specific actions can counter the danger (Patchen, 2006; Weber, 2010). People know climate change is a complex issue that will take a long time to address and can hardly be managed by their individual behaviors, but they may see collective action as a viable way to make a difference (Eden, 1996). Thus, fearful messages may have invoked their

intention to engage in collective action through participation in activism such as giving financial support to environmental groups, protest, and sharing information on social media.

However, it should be acknowledged that according to manipulation checks, although fear was affected by the frame, hope was not manipulated in the expected way. This indicates that eliciting hope is difficult for the case of climate change mitigation. Although the celebrity talked about optimism for tackling climate change and highlighted the benefits of taking action, the emotion frame failed to affect people's hopeful feelings about climate change. A possible explanation for this is that the majority of individuals associate risk with climate change rather than the benefits (Lorenzoni & Pidgeon, 2006). This suggests that interpretation of the results related to hope appeals are open.

In addition to a comparison of the effects of fear-framed and hope-framed messages, this study addressed the mechanism by which emotion frames in a celebrity's climate advocacy may influence attitudes and behaviors. The study examined the mediating roles of risk awareness and perceived response efficacy in the effect of emotion frame on attitudes and behaviors. The results showed no evidence of a mediating role of risk awareness, mainly because the emotion frame had no influence on risk awareness. It was surprising that the fear frame did not lead to greater risk awareness than the hope frame, given that past studies suggest that induced fear leads to risk awareness (Leiserowitz, 2006; Spence & Pidgeon, 2010).

For the mediating role of perceived response efficacy in the effect of emotion frame, it was found that perceived response efficacy did not mediate the influences of emotion frame on attitudes or any of the behaviors. This outcome was due to the fact that the emotion frame had no influence on perceived response efficacy. Prior studies that have shown that hope appeals can evoke perceived response efficacy (Bandura, 1997), which in turn leads intentions to engage in

pro-environmental behaviors (Lorenzoni et al., 2007). However, in this study, the fear frame and the hope frame did not differ in the extent to which they were perceived as conveying hope. This may have influenced the result that unexpectedly the emotion frame had no effect on perceived response efficacy.

6.2 The Effects of Celebrity Involvement Frame and the Moderating Role of Parasocial Interaction in Celebrity's Climate Advocacy

As the manipulation of the celebrity involvement frame was not successful to induce the perception of celebrity involvement in the issue, the interpretation of the findings related to the frame must be made with caution. It was predicted that in the celebrity's climate advocacy via Twitter, compared to messages without FPP, messages with FPP would lead to a greater level of positive attitudes and support for government action, intent to behave sustainably, and intent to participate in activism for climate change mitigation. This prediction was supported for attitudes but not for any of the behavioral measures. Respondents who read tweets using FPP in the celebrity's climate advocacy reported more positive attitudes toward climate change mitigation than those who read tweets that did not use FPP. This finding can be interpreted that when celebrities used FPP in voicing climate advocacy, it signified their efforts in combating the climate problem, which in turn may bolster the audience's perception about the authenticity of celebrity's involvement in the issue. While celebrities' hypocritical engagement in social causes have been criticized by people and reduced the credibility of their messages, the perceived authenticity of a celebrity's advocacy may increase the potential of the advocated messages (Boykoff & Goodman, 2009).

The literature on linguistics also contends that using FPP "I" is a useful communication skill to represent the speaker's identity and support on social issues (Bramley, 2001). In line with

this, Bandura's (1986)'s social cognitive theory premises that models' verbal description of thoughts and ideas provide audiences with opportunities to observe and further imitate models' behaviors particularly for problem-solving activities. The result of the effect of messages with FPP offers empirical evidence for this assumption that the way of verbal presentation has an impact in adopting models' attitudes on environmental issues. At the same time, it might be also attributed to the setting of advocacy. On Twitter, where a short text message is a primary means of self-disclosure and communication, a subtle linguistic cue may be more prominent and this may empower the communicator's purpose to affect how the information is perceived by the audience.

This result is also consistent with an existing framing study on the effect of wording on belief in existence of climate change in relation to political ideology (Schuldt et al., 2011). Their study offered evidence that whether the climate issue was termed as global warming or climate change influenced belief in existence of climate change for people. Specifically, they showed that for those who identified as Republicans, the term of global warming was ineffective, by lowering the belief in existence of climate change. Given that attitudes are premised on beliefs, their study findings are consistent with this study's finding (Hogg & Vaughan 2005). In addition, this result supports framing theory in that the choice of personal pronouns mattered in strategically framing textual information on climate change.

However, contrary to expectations, the FPP condition did not differ from the NFPP condition in driving any behaviors toward climate change mitigation. These findings indicate that while an explicit reference of celebrity's involvement in climate advocacy had an attitudinal effect, which is a key predictor of pro-environmental behavior, the effect did not go beyond attitudes.

As expected, regression analyses found that respondents who had a stronger PSI with the celebrity reported not only more positive attitudes toward climate change mitigation, but also more pro-environmental behaviors, including support for government action, intent to behave sustainably (marginally significant), and intent to participate in activism for climate change mitigation. These findings suggest that green celebrities can play a vital role in environmental advocacy. Their influence arises in part from the psychological bond between a celebrity and their fans, which functions to motivate agreement with the celebrities' thoughts on issues and boost intentions to adopt their behaviors. In line with several recent studies in the area of health and environmental communication (Alexander, 2013; Brown, 2010; Brown & Basil, 1995), these results suggest that a celebrity's power of emotional involvement with people is translated to the adoption of their eco-life styles to combat climate change threat. However, as this is a correlational finding, the results might not reflect the effects of celebrity sources on attitudes or behaviors. Rather, it is also possible that the study participants who were already supportive of climate mitigation may have been drawn to these eco-celebrities due to their climate activism.

However, the expected moderating role of PSI in the influence of the celebrity involvement frame on climate change attitudes and behaviors was not observed. The celebrity involvement frame did not interact with PSI in predicting attitudes or behaviors. Thus, the influence of messages with FPP or NFPP on attitudes and pro-environmental behaviors did not differ based on respondents' PSI with the celebrity. This lack of moderation means that PSI did not empower the effect of celebrity involvement frame paired with FPP. This can be interpreted that as PSI was not emergent perception, but strong preexisting views about the celebrities, there is little room that this can change the way they respond to celebrities' actions.

6.3 Theoretical Implications

This study represents an initial empirical attempt to apply Bandura's social cognitive theory (1986) to delineate the effects of role-modeling in promoting attitudes and behaviors toward climate change mitigation. The results revealed that messages with FPP that had connotations of celebrity's engagement in the issue led to more positive attitudes toward climate change mitigation than did messages with NFPP. This study discovered a celebrity's climate message that signified the celebrity's involvement in the climate change issue prompted greater attitudes toward climate mitigation. From the perspective of social cognitive theory, this means that models' verbal presentation of appropriate action on social causes provides explicit reference to their direct experiences. In turn, this successfully guided people to adapt the attitudes based on their observation of what the eco celebrity did. This finding extends the social cognitive theory by providing an empirical evidence that the way of verbal presentation role models has an impact in adopting models' attitudes on social causes by bolstering their efforts to address the issue (Bandura, 1986). In other words, this implies that if people were given to messages that enables observation of models' attitudes, they were prone to adopt the models' attitudes. In line with this, these results also demonstrate the usefulness of combining social cognitive theory and framing theory in that the choice of personal pronouns matters in advocating the climate change issue and role-modeling process.

The study also revealed that PSI with a celebrity was related to individuals' attitudes and behaviors toward climate change mitigation. These results are in line with existing studies (e.g., Brown, 2010), which show that role modeling on social causes takes place when individuals are emotionally involved with the models and celebrities who are supporting those causes. People who have stronger PSI appear to be more willing to act like the eco-celebrities by joining the

celebrities' activities (Brown, 2010). These results demonstrated that social cognitive theory is a useful conceptual framework to explicate the influence of celebrities as effective prompts of eco-friendly attitudes and eco-friendly behaviors.

One other theoretical contribution of this study relates to confirming the use of discrete emotions as frames (Nabi, 2003). The study manipulated fear and hope as frames in advocacy messages and found that fear was more effective in driving behavioral intention to participate in activism for climate change mitigation. The results indicate that fear appeal messages influenced intended participation in activism, but did not affect attitudes or other behaviors, implying that a fearful message may be more appropriate to motivate collectivistic behavior. When people encounter great threat and experience fear, they may be more willing to do something that they perceive could help avoid the negative outcome (Patchen, 2006; Weber, 2010). Perhaps personally engaging in activism was seen as more likely to make a tangible impact than supporting government action or engaging in sustainable behaviors at a personal level (e.g., in the home). Presenting climate change as a great threat for people rather than emphasizing a hopeful message may be more useful in boosting collective action. This possibility requires additional research.

However, it should be noted that in this study, hope-framed messages did not successfully increase participants' hopeful emotion. This means that participants who read hope-framed tweets did not feel more hopeful emotion in coping with climate change or alleviating the adverse effects of it, as had been expected (Spence & Pidgeon, 2010; Maibach et al., 2010; Markowitz & Shariff, 2012). Therefore, the role of hope appeals in impacting attitudes and behaviors is still open. In line with this, the link between hope-framed tweets and perceived response efficacy also needs to be verified.

6.4 Practical Implications

Based on the interpretations of the study results, this study offers very interesting practical insights in designing effective environmental campaigns using social media in terms of the selection of influential messengers, messages framing tactics in conjunction with emotional appeals and languages.

One of the remarkable findings that emerged from this study is the relationship between individuals' PSI with the eco-celebrity and greater positive attitudes and behaviors to combat climate crisis. Although correlational, these results suggest that a celebrity's power of emotional involvement with people can be translated to role-modeling, by adopting eco-celebrities' attitudes and behaviors. This finding challenges the criticisms that have arisen regarding using celebrity sources in health and environmental campaigns, that while privileged voices tend to garner media and public attention, they rarely lead to any outcomes but distract from the real issues (Boykoff & Goodman, 2009; Weiskel, 2005). Bortree (2012) emphasizes a 'value-based' approach in promoting pro-environmental behaviors that focuses on relationship building between environmental NGO organizations and the public, leading to long-term commitment and behaviors. The study results support this perspective by offering evidence that climate change advocacy can be influential when spoken by celebrities who are neither scientists nor experts, but are emotionally close to people and are seen as having a cool persona (Alexander, 2013).

Although the specific celebrity tweets respondents read in this study had limited influence on their attitudes and behaviors, this exposure was short-term and was not selected by respondents themselves. The correlational findings for PSI suggest that respondents' past exposure to the eco-celebrity's messages may have had an influence or may have reinforced attitudes and behaviors favorable to climate change mitigation. Thus, this study suggests there is

a strong potential for celebrities who choose to advocate climate change mitigation to generate attitudinal and behavioral outcomes, in part because they have the capability to develop emotional connections with people.

This study explored three dimensions of eco-behavior including support for government action, intention for sustainable behavior, and intention for participation in activism (Dono et al., 2010; Gifford & Comeau, 2011; Hart & Nisbet, 2012). According to the results, fear appeals were more effective than hope appeals only in leading participation in activism, but not for attitudes or the other behaviors. The results suggest the capability of discrete emotion in persuading climate action differ in terms of the types of eco-behaviors and the extent of perception to make tangible impact to avoid the negative outcomes. It practically implies that various dimensions of behaviors should be separately accounted for when emotional intervention is used.

The fact that the two emotion frames were not perceived as differing in hope suggests that it may be difficult to induce hopeful emotions for the case of climate crisis, given that people may already have a high level of perceived risk associated with climate change (Lorenzoni & Pidgeon, 2006). Thus, this may limit the possibility of being influenced by hopeful messages. It also indicates that compared to other health preventive behaviors, environmental problems are much more complex and uncertain phenomena (Patchen, 2006). Thus, conveying confidence and optimism about alleviating negative consequences are not enough to result in hope in people's minds. Perhaps other key factors, such as dispositional optimism or preferred coping styles, may moderate the influence of messages that communicate hopeful emotions (Lazarus & Folkman, 1984; Scheier & Carver, 1985).

Another notable finding from the results is the effect of FPP on attitudes. Although use of first person pronouns (compared to non-first person pronouns) did not affect perceived celebrity involvement in the climate change issue, nonetheless the choice of language affected respondents' attitudes toward climate change mitigation. It may be that the influence of the language choice was more subtle. First person pronouns such as "I" may have functioned not only as reference to the celebrity's involvement in the social cause, but also demonstrated their individual action to address the issue of climate change mitigation. Considering the setting of Twitter where the amount of information presented is highly limited, wording matters in framing issues, and subtle linguistic strategies can impact readers' perceptions. Moreover, as Schuldt et al. (2011) noted, a strategic choice of terms or wording could be also influential in other communication channels such as web sites as well. Practitioners should consider that messages with first person pronouns that are more conversational and signal a celebrity's direct voice may be more effective in advocating social causes

6.5 Limitations

While this study discovered both attitudinal and behavioral consequences of role-modeling in a celebrity's climate advocacy and offers many interesting insights, the study also has limitations that need to be acknowledged. First of all, a major concern of this study is that the manipulation of the emotion frame was only partially successful, in that the two emotion frames differed as expected in fear but not hope. A tone of voice in boosting confidence and optimism to combat the climate crisis by the eco-celebrities were not successful to induce hopeful emotion. This manipulation failure may be the reason why no effects of hopeful emotion on dependent variables were observed. The manipulation of perception of celebrity involvement in the climate change issue was also not successful. This may have influenced the study results. The lack of

effect of FPP on perceptions of celebrity involvement may be attributed the fact that many participants may have already been highly aware of the celebrity's involvement in the climate change issues. Thus, language choice may have been insufficient to lead to different perception in the celebrity involvement frame. It was possible that the celebrity's messages, voicing climate advocacy, regardless of using FPP, likely induced a perception that the celebrity was involved in the issue.

Second, because this study used a sample of college students, the participants of the experiment were mostly young adults. In addition, the students all attended the same university. These factors limited the study results' generalizability. Because this study was an experiment and participants were randomly assigned to conditions, the age or geographical origins of the participants cannot account for any condition differences. In particular, for the issue of climate change, age is one of the predictors in climate concern and action in which young participants have more concern on climate change (Kellstedt et al., 2008). Participants in this study were mostly young adults, who tend to have greater intention to engage in sustainable behavior, so there might be little room for the message frames to have an impact on this variable. Despite the limitations of the sample, considering the research setting of this study is Twitter and young adults are very active social media users, using a college student sample is appropriate to investigate the effects of climate tweets conveyed by social media (Alexander, 2013).

Third, the use of an experiment in which participants were assigned to read a set of tweets from a specific celebrity limited the ecological validity of the study. An experimental design was chosen to isolate specific frames while keeping the content of the tweets as similar as possible, and to limit the variability in the celebrity sources. The tweets were made as similar as possible to actual tweets when manipulating message frames, by using activist celebrities' own

advocacy messages posted on their Twitter accounts with some modification. Considering Leonardo DiCaprio and Pharrell Williams are world famous eco-stars and they have been very active in climate activism using Twitter, using modified versions of their actual tweets enhanced the ecological validity of the study. Thus, the tweets used in this experiment mostly reflected their thoughts and arguments from their tweets. This minimizes the inherent limitation of an experimental study by creating conditions seemingly like the real world.

The limited effects of the emotion frame and the celebrity involvement frame also cast a critical question about the design of the experimental stimuli. The emotion frame affected only behavioral intention to participate in activism toward climate change mitigation and not attitudes or any other behaviors. The celebrity involvement frame was only effective in influencing attitudes, but not any of the behaviors. While the tweets were intended to induce certain emotions or perceptions of celebrity involvement in the climate issue, less attention was given to the nature of the behaviors modeled by the celebrities in the tweets or the recommendations for action. It may be that these tweets were deficient in providing detailed instructions or guidelines for how people can resolve the climate problem or contribute to positive outcomes. This could have limited the impact of the tweets, especially on behavioral outcomes. It should be also acknowledged that the celebrities' advocacy tweets were inherently more toward collectivistic action than individualistic action. For instance, the messages recommended joining activism efforts using current popular hash tags such as #ClimateAction.

This experiment analyzed participants' short-term responses to a small selection of assigned tweets rather than examining natural exposure to tweets on Twitter. It must be acknowledged that encountering celebrity tweets by choice and reading them in a natural environment may have led to different outcomes than were observed in this study. This is

because in reality exposure is more dynamic, with people selecting any postings they wish to read, and exposure occurs over an extended period time. In addition, this exposure could involve interaction with the celebrity or other social media users (Alexander, 2013; Page, 2012). Because this study was designed to analyze short-term effects, it could not capture any delayed or long term effects that would be likely to happen in the reality. It should be also noted that there are other possible factors such as scandal or popularity that could alter the impact of a celebrity's advocacy. In particular, a celebrity's power in social causes rises and falls in relation to their popularity, which depends on the value audiences attach to the celebrity (Boykoff & Goodman, 2009).

Regarding the effects of celebrities as role models, while the experiment used two celebrities to minimize the possibility that effects on the dependent variables were due to unique characteristics of a single celebrity, it was still a limitation that both were males. This study also did not compare celebrity sources with other sources. Therefore, it is hard to gauge the power of celebrity in climate advocacy.

One other limitation is that this study used only Twitter in the experiment, not other social media platforms. Recently, an increasing number of green celebrities address environmental issues on diverse social media platforms such as Instagram and Facebook as well as Twitter. The ways in what people use and respond to celebrities may differ across social media platforms (Park, Lim, & Park, 2015). Only about half of the study participants reported using Twitter, which could have played a role in their responses. However, it should be noted that Twitter use was not correlated with attitudes or any behaviors regarding climate change mitigation.

Lastly, one of the participants offered feedback in an open comment box that the wording of “climate change mitigation” might have been difficult to understand for some participants. Since this phrase was used in most of the measures in this experiment, it might possibly have caused some problems for participants to construe what the questions asked and thus may have unintentionally impacted the results. In relation to this, one other possibility is that the participants might not have fully understood the impact of the three eco-behaviors (support for government action, sustainable behavior, and participation in activism) due to the reference to climate change mitigation in many of the items. More detailed examination of the wording used in these measures, to improve understanding, would be useful.

6.6 Future Research

Based on the results of this study and the limitations, there are several future research topics and directions to develop related to celebrities, social media, and climate communication campaigns. Results of the study indicates that the fear was more effective than hope in promoting willingness to participate in activism, but not in influencing attitudes, government policy support or intention of taking sustainable behavior. It was argued that one reason for this outcome may be that participation in activism is a collective, collaborative action that could be perceived as more effective in making a tangible impact on the threat of climate change. This assumption calls for future study to verify the presumed link between fear and the perceived value of collective efforts for climate mitigation. While previous studies have focused on the positive association between hope and perceived response efficacy in health-related behaviors (e.g. Lorenzoni et al., 2007), this result also provides a hint that perceived response efficacy at the collective level may moderate the effects of fear appeals on eco-attitudes and eco-behaviors. Specifically, it is necessary to uncover if people perceive their collective action would be effective to manage or

avoid the environmental threat aroused by fear appeals, whether they are more likely to take an action or not. In line with this, while the measure of response efficacy used in this study combined people's response efficacy at both the individual and the collective level, it would be useful to separate these scales to see if any differences emerge for the two types of response efficacy.

The study was unable to provide insight on the role of hope in climate advocacy, because the effort to convey hopeful emotion related to climate change via celebrity tweets was unsuccessful. Unlike findings from previous studies (e.g., Lorenzoni et al. 2007), the study also found that compared to fear, hope was not more associated with perceived response efficacy on climate change. Future studies should investigate whether more effective hope stimuli can elicit the perception of benefits associated with climate action and the possibility that people can contribute to future change through climate action.

Although the manipulation of celebrity involvement frame using FPP (vs. NFPP) was not successful, FPP use was associated with more positive attitudes on climate change mitigation, but was not related to any of the behaviors. This finding implies that 'I' language can emphasize a celebrity's green identity, which in turn can lead to the adoption of the celebrity's attitude. As the study verified there was no moderating role of PSI in this process, future studies need to explore which factors can reinforce the effects of I language use by celebrities in leading climate action. Considering the lack of research on this topic, additional exploratory studies are needed on peoples' responses to celebrity messages using FPP versus without FPP.

One of the more remarkable findings of this study is that PSI was strongly associated with the celebrity's attitude and behaviors related to climate change mitigation. Despite the limits of framing effects, these results empirically reinforce an optimist perspective that celebrity

sources have potential to increase public concern on climate change and promote climate action. Considering that little previous research paid attention to this, there is an urgent need to continue to assess the strategies, processes, and effects of eco-celebrities' climate advocacy on climate awareness, beliefs, attitudes, and behaviors. Relevant topics for future studies include how celebrities utilize their star persona in climate advocacy, what communicative strategies and practices they employ to reach the public, and who responds to their appeals (Alexander, 2013; Page, 2012). Given that PSI is formed and developed over an extended time span, research on the effects of longer-term exposure to eco-celebrity activism is needed (Brown & Basil, 1995; Brown et al., 1997). It is also necessary to explore whether social media interaction between eco-celebrities and the public enhances PSI, which in turn strengthens green identity and green lifestyles (Kassing & Sanderson, 2010; Marwick, 2011; Turker, 2013). Qualitative research such as discourse analysis of celebrities' social media posts that promote environmentalism and the responses of the public to the advocacy, and interviews with celebrity followers would contribute useful data for addressing these topics.

Other ways that social media may play a role in climate activism also should be investigated in future research. For example, future research topics could include the role of social networks and normative pressure in spreading environmental messages and the collaborative mode of communication such as replies or retweeting climate information or activism. It should also be considered that in social media universe the stream of political information is significantly polarized where hyper-partisan gatekeepers occupy the information sources and opinions (Benkler, Faris, Roberts, & Zuckerman, 2016). It also applies to the issues of climate change. The two major polarized frames of climate change - global warming (skepticism on climate advocacy) and climate change (pro-climate advocacy) – occupy the

argumentative ground (Jang & Hart, 2015). Future studies need to explore how people construe these slanted message frames and what role celebrities play in accelerating or moderating this information framing and interpretation process.

Regarding social media use for advocacy, it was found that only about the half of the participants in this study were Twitter users and that they used Instagram and Facebook more than Twitter. This suggests that future studies need to consider the role of celebrity advocacy on Instagram or Facebook. An increasing number of young adults and celebrities enjoy the live video function of social media (e.g. Snapchat, Instagram, Facebook) (Dobies & Nelson, 2016). This calls for future studies on the effects of multimedia features, as the power of message frames in advocacy messages may be stronger in multimedia formats. In the context of environmental advocacy, vivid visuals of environmental disaster may help to stimulate risk awareness, concern, and action. Such formats may also be useful to facilitate role-modeling by demonstrating diverse environmentally-friendly behaviors celebrities conduct in their real lives, which can provide detailed guidance to audiences. In addition to environmental issues, future research should continue to explore celebrity effects on a variety of social causes through the process of psychological involvement with celebrities. Social causes in which celebrities have prompted public attention and financial support include health issues such as HIV/AIDS prevention and treatment (e.g., Brown & Basil, 1995), combating mental health stigma (e.g., Gekoski & Broome, 2014; Hoffner & Cohen, 2012), and endorsement of certain political statements (Jackson & Darrow, 2005)

6.7 Conclusion

This research employed mixed theoretical approaches by applying Bandura's social cognitive theory (1986) and framing theory (Scheufele & Tewksbury, 2007) in conjunction with

emotional appeals to examine the effects of role-modeling in promoting attitudes and behaviors toward climate change mitigation.

This study explicated the role of discrete emotion in climate advocacy by comparing fear and hope appeals. It was discovered that a fear appeal was more effective than a hope appeal for motivating participation in activism for climate change, but the emotion frame had no effect on attitudes or other behaviors (support for government action and sustainable behavior). The emotion frame used in this study was also unsuccessful in conveying more hopeful emotion related to climate change via the hope-framed messages (compared to fear-framed messages), and the emotion frame was not linked to perceived response efficacy. These findings provide limited support for the value of using discrete emotions as frames, but leave open the question of the role of hope and optimism in motivating attitudes and behaviors related to climate change mitigation. This issue requires future research.

The other key contribution of the study involves the use of social cognitive theory in the context of role-modeling in celebrity's climate advocacy. By uncovering a greater impact of first person singular pronouns (e.g. I, me, or my) on attitudes (compared to non-first person pronouns), the study verified that the verbal presentation used by a role model had an impact on the adoption of the models' attitudes on climate advocacy (Bandura, 1986). Although behavioral impacts were not found, the results suggest an advantage of using FPP that may function to amplify the celebrity's voice and efforts in activism. This finding also reinforces the significance of framing theory in that subtle language choices mattered in advocating the climate change issue (Schuldt et al., 2011). In addition, this study discovered that PSI with eco-celebrities was strongly associated with the adoption of attitudes and behaviors related to climate change. This finding challenges the critical perspective on the role of celebrities in social causes, which argues

that they produce hardly any outcomes but distract from the real issue (Boykoff & Goodman, 2009; Weiskel, 2005). Contrary to this view, the present findings are consistent with the democratization camp that contends celebrities have potential to change attitudes and behaviors through their climate advocacy.

Based on the findings, this study concludes that it is time to go beyond the dispute on the role of celebrities in environmental communication. It is urgent to investigate how to maximize the effects of using celebrities in climate advocacy, what are the most effective emotional and language frames, what are key mediators and moderators in the influence process, and the function of social media in enhancing celebrities' efforts to combat climate change.

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APPENDICES

Appendix A. Recruitment Email for the Pilot Test

Subject Line: Dissertation Research on Responses to Celebrities' Messages on Social Issues via Social Media

Dear Students:

My name is Sejung Park and I am a PhD student at Georgia State University. I am doing a research study on people's responses to celebrities' messages on social issues via social media.

As a part of this study, I am conducting a pilot test using this online questionnaire to know people's perception on celebrities' messages. The messages will be used for conducting an experiment for the main study. Participating in this study will take about 10 minutes. Please read the Consent Form. If you agree to participate in this pilot test, you will receive extra course credit (1% of the points in the course) for participating.

I would really appreciate it if you could take time from your busy schedule to complete this questionnaire. This research will help us understand which message framings for climate change mitigation is effective to increase public belief, risk awareness, and behavior intentions for mitigating climate change. The survey is available at:

If you have any questions pertaining to this study, please contact me at spark74@gsu.edu

Thank you for your assistance.

Sejung Park

Appendix B. Informed Consent for the Pilot Test

Title: Celebrity Tweets Pilot Test

Principal Investigator: Cynthia A. Hoffner

Student Principal Investigator: Sejung Park

- I. Purpose: You are invited to take part in a pilot research study to validate messages, which will be used for conducting an experiment exploring people's responses to celebrity messages on social media. You are invited to participate because you are an undergraduate student at GSU. A total of 75 participants will be recruited for this pilot test. Participation will require about 15-20 minutes of your time over on a single day.
- II. Procedures: If you decide to participate, you will complete an online survey on SurveyMonkey.com. When you click the "I Agree" below, you will be directed to the first page of the survey. The survey will address individuals' responses to celebrity messages about a social issue on social media. You will be asked about your emotional responses and thoughts about the messages, your feelings toward several celebrities who regularly post on social media, and demographics. The survey will take about 15-20 minutes.
- III. Risks: In this study, you will not have any more risks than you would in a normal day of life.
- IV. Benefits: Participation in this study may not benefit you personally. This pilot study will be used to develop research that will provide insight into how people respond to celebrity messages on social issues.
- V. Compensation: For participating in the study, you will receive extra credit in one course.

One (1) percent of the total points available in the course will be given to you. For this purpose, you will be asked to enter your name and course information on a separate page at the end of the survey. This information will be stored separately from your survey responses. If you decide not to participate but would still like to earn the extra credit, you can write a 1-page paper. The paper will discuss how your class helps prepare you for the career you want to pursue. To take advantage of this option, please notify the Student Principal Investigator, Se Jung Park, before the study is closed.

- VI. Voluntary Participation and Withdrawal: Participation in research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip survey questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.
- VII. Confidentiality: We will keep your records private to the extent allowed by law. Cynthia Hoffner and Se Jung Park will have access to the information you provide. Information may also be shared with those who make sure the study is done correctly (GSU Institutional Review Board and the Office for Human Research Protection). Because this is an online study, anonymity cannot be guaranteed. However, we will not ask for any identifying information about you, except for the purpose of assigning extra credit. Your name and course information (provided by you on a separate page at the end of the survey) will be stored in a separate file from your responses to the survey. No identifying information will be connected to your answers. The information you provide will be stored on the researchers' firewall-protected computers, in a locked GSU office or home office. Your name and other facts that might point to you will not appear when we present this study or

publish its results. The findings will be summarized and reported in group form. You will not be identified personally.

VIII. Contact Persons:

Contact Dr. Cynthia Hoffner at 404-413-5650 and choffner@gsu.edu or Se Jung Park at 404-747-2905 and spark74@gsu.edu if you have questions, concerns, or complaints about this study. You can also call if you think you have been harmed by the study. Call Susan Vogtner in the Georgia State University Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu if you want to talk to someone who is not part of the study team. You can talk about questions, concerns, offer input, obtain information, or suggestions about the study. You can also call Susan Vogtner if you have questions or concerns about your rights in this study.

IX. Copy of Consent Form to Subject:

If you wish to keep a copy of this consent form, please print a copy.

If you are willing to volunteer for this research, please check “I Agree” below.

I Agree

I Decline

Appendix C. Experimental Stimuli for Pilot Test

Tweet set #1: Fear-framed tweets with FPP frames.

#1.



#2.



#3.



#4.

- @celebrity____ · 2m
 Not acting on [#ClimateChange](#) could cost wildlife their homes & food. That's why I support [#ClimateAction](#)!

← ↻ ❤️ 📊 ⋮

#5.

- @celebrity____ · 18m
 Forest loss contributes to 6-12% of CO2 emissions every year. [#climatechangeisreal](#) I'm fighting climate change.

← ↻ ❤️ 📊 ⋮

#6.

- @celebrity____ · 17m
 The world faces a dismal future. I am fearful for our [#EndangeredPlanet](#) so I am taking [#ClimateAction](#). Join me.

← ↻ ❤️ 📊 ⋮

#7.

- @celebrity____ · 17m
 The world is losing the fight against [#climatechange](#). I am taking action to make a difference. Join me now for [#EarthToParis](#).

← ↻ ❤️ 📊 ⋮

Tweet set #2: Fear-framed tweets with NFPP frames.

#1.

- @celebrity____ · 9m
 People are standing for clean air and [#ActOnClimate](#). What will the world look like if all the ice melts?

← ↻ ❤️ 📊 ⋮

#2.

- @celebrity____ · 6m
 The future: [#CADrought](#), wildfires, extreme weather, rising seas. Ask the government to pass climate bill [#SB32](#).



← ↻ ❤️ 📊 ⋮

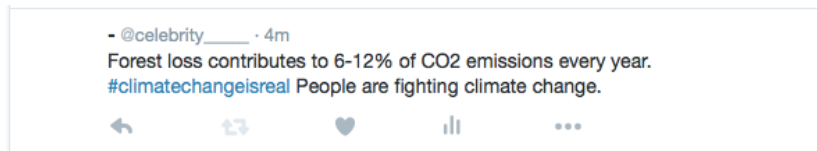
#3.



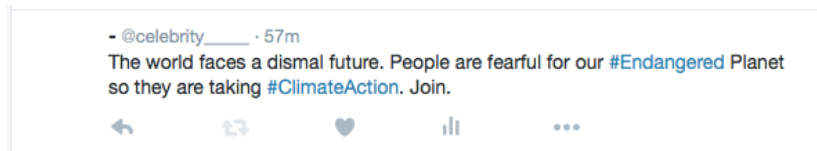
#4.



#5.



#6.



#7.



Tweet set #3: Hope-framed tweets with FPP frames.

#1.



#2.

- @celebrity____ · 11m
Let's prevent #CADrought, wildfires, extreme weather, rising seas. I am asking the government to pass climate bill #SB32.



#3.

- @celebrity____ · 11m
Help me to support Climate Action. Protecting the environment protects the earth. momentforaction.org



#4.

- @celebrity____ · 11m
Acting on #ClimateChange can help protect the homes & food of wildlife. That's why I support #ClimateAction!

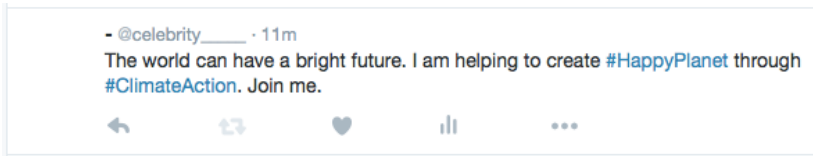


#5.

- @celebrity____ · 11m
Prevent forest loss, which contributes to 6-12% of CO2 emissions every year. [#climatechangeisreal](#) I'm fighting climate change.



#6.



#7.



Tweet set #4: Hope-framed tweets with NFPP frames.

#1.



#2.



#3.

- @celebrity____ · 11m
Help others to support Climate Action. Protecting the environment protects the earth. momentforaction.org



← ↻ ❤️ 📊 ⋮

#4.

- @celebrity____ · 11m
Acting on [#ClimateChange](#) can help protect the homes & food of wildlife. That's why people support [#ClimateAction](#)!

← ↻ ❤️ 📊 ⋮

#5.

- @celebrity____ · 13m
Prevent forest loss, which contributes to 6-12% of CO2 emissions every year. [#climatechangeisreal](#) People are fighting climate change.

← ↻ ❤️ 📊 ⋮

#6.

- @celebrity____ · 13m
The world can have a bright future. People are helping to create [#HappyPlanet](#) through [#ClimateAction](#). Join.

← ↻ ❤️ 📊 ⋮

#7.


- @celebrity____ · 10m
The world can win the fight against [#climatechange](#). People are taking action to make a difference. Join now for [#EarthToParis](#).

← ↻ ❤️ 📊 ⋮

Tweet set #5: Control group messages.

#1.

- @celebrity_____ · 10m
I had a long day today. Feel very #tired. Finally going to bed now. Good night world... #Goodnightworld



#2.

- @celebrity_____ · 10m
Sunday morning. #SundayMorning Relaxing. I'm fully ready to eat my favorite cupcake. #Cupcake #Breakfast



#3.

- @celebrity_____ · 21s
Going out tomorrow to promote my next endeavor.



#4.

- @celebrity____ · 10m
#Todaythought No act of kindness no matter how small is ever wasted – Aesop
#Kindness #act






#5.

- @celebrity____ · 12m
If you want to turn your #life around, try #thankfulness. It will change your life mightily - Gerald Good #GeraldGood




#6.

- @celebrity____ · 12m
Had the absolute #pleasure of meeting/ sharing my work with the world.
#Greatness requires #effort.

#7.

- @celebrity____ · 13m
#140words #Whatishappening I have mad clothes to fold and work to do yet I'm laying in bed and playing with a blue bird on Twitter.

Appendix D. Questionnaires for the Pilot Test

Imagine you are on Twitter and read a celebrity's tweets. A total of 7 tweets are presented below, each on a separate page. After you read each tweet, please rate your responses to THAT tweet on the items that follow.

[Ratings of emotion were obtained for each tweet in the four experimental conditions and the control condition. But ratings of celebrity involvement and public involvement in climate advocacy were obtained only for the four experimental conditions]

The message that this tweet conveys is (0 = not at all to 6 = very much):

1. Fearful
2. Hopeful
3. Threatening
4. Optimistic
5. Interesting
6. Informative

To what extent do you agree or disagree that this tweet conveys each of the following messages (0=disagree strongly to 6=agree strongly)?

1. The celebrity is heavily engaged in activities for resolving the climate change issue.
2. Many people are engaged in activities for resolving the climate change issue.
3. The celebrity makes extensive personal efforts to address the climate change issue.
4. Many people make efforts to address the climate change issue.

The following items will be asked about Leonardo DiCaprio.

Leonardo DiCaprio



How familiar are you with Leonardo DiCaprio (0=not at all familiar to 6=very familiar)?

Please indicate your agreement with the following statements about Leonardo DiCaprio. If you are NOT familiar with him at all, you can skip this question (0=disagree strongly to 6=agree strongly)

1. I feel he is like a friend
2. I see him as a natural, down-to-earth person.
3. I look forward to seeing him on any media.
4. If he appeared on any media, I would want to watch it.
5. He seems to understand the kinds of things I want to know.
6. If I saw a story about him in a newspaper or magazine, I would want to read it.
7. I would miss him if I could not see him on any media for a while.
8. If I could, I would like to meet him in person.
9. I would feel sorry for him if he made a mistake.
10. I find him to be attractive.
11. I like him.

12. He is somebody I like

13. He is classy

14. He is handsome.

To your knowledge, how involved is Leonardo DiCaprio in advocating for climate change mitigation (0=not at all involved to 6=very involved)?

The following items will be asked about Ian Somerhalder.

Ian Somerhalder



How familiar are you with Ian Somerhalder (0=not at all familiar to 6=very familiar)?

Please indicate your agreement with the following statements about Ian Somerhalder. If you are NOT familiar with him at all, you can skip this question (0=disagree strongly to 6=agree strongly)

1. I feel he is like a friend
2. I see him as a natural, down-to-earth person.
3. I look forward to seeing him on any media.
4. If he appeared on any media, I would want to watch it.

5. He seems to understand the kinds of things I want to know.
6. If I saw a story about him in a newspaper or magazine, I would want to read it.
7. I would miss him if I could not see him on any media for a while.
8. If I could, I would like to meet him in person.
9. I would feel sorry for him if he made a mistake.
10. I find him to be attractive.
11. I like him.
12. He is somebody I like
13. He is classy
14. He is handsome.

To your knowledge, how involved is Ian Somerhalder in advocating for climate change mitigation (0=not at all involved to 6=very involved)?

The following items will be asked about Pharrell Williams.

Pharrell Williams



How familiar are you with Pharrell Williams (0=not at all familiar to 6=very familiar)?

Please indicate your agreement with the following statements about Pharrell Williams. If you are NOT familiar with him at all, you can skip this question (0=disagree strongly to 6=agree strongly)

1. I feel he is like a friend
2. I see him as a natural, down-to-earth person.
3. I look forward to seeing him on any media.
4. If he appeared on any media, I would want to watch it.
5. He seems to understand the kinds of things I want to know.
6. If I saw a story about him in a newspaper or magazine, I would want to read it.
7. I would miss him if I could not see him on any media for a while.
8. If I could, I would like to meet him in person.
9. I would feel sorry for him if he made a mistake.
10. I find him to be attractive.
11. I like him.
12. He is somebody I like
13. He is classy
14. He is handsome.

To your knowledge, how involved is Pharrell Williams in advocating for climate change mitigation (0=not at all involved to 6=very involved)?

Appendix E. Recruitment Email for the Main Study

Subject Line: Dissertation Research on Responses to Celebrities' Messages on Social Media

Dear Students:

My name is Sejung Park and I am a PhD student at Georgia State University. I am doing a research on people's responses to celebrities' messages on social media. As a part of this study, I am conducting an experiment to know people's perception on celebrities' messages. Participants will be asked to answer online questionnaires after reading some messages. Participating in this study will take about 20-25 minutes. Please read the Consent Form. If you agree to participate in this pilot test, you will receive extra course credit (1% of the points in the course) for participating.

I would really appreciate it if you could take time from your busy schedule to complete this questionnaire. This research will help us understand which message framings for climate change mitigation is effective to increase public belief, risk awareness, and behavior intentions for mitigating climate change. The survey is available at:

If you have any questions pertaining to this study, please contact me at spark74@gsu.edu

Thank you for your assistance.

Sejung Park

Appendix F. Informed Consent for the Main Study

Title: People's Responses to Celebrities' Messages on Social Issues via Social Media

Principal Investigator: Cynthia A. Hoffner

Student Principal Investigator: Sejung Park

- I. Purpose: You are invited to participate in a research study. The purpose of the study is to investigate responses to celebrities' messages via social media. You are invited to participate because you are an undergraduate student at GSU. A total of 300 participants will be recruited for this study. Participation will require about 20-25 minutes of your time over on a single day.
- II. Procedures: If you decide to participate, you will complete an online survey on SurveyMonkey.com. When you click the "I Agree" below, you will be directed to the first page of the survey. The survey will address individuals' responses to celebrities' messages on social issues via social media. All respondents will be asked about their emotional responses and thoughts about celebrities' messages on social media, social media experience, and demographics. During the study you may be led to believe some things that are not true. When the study is over, we will tell you everything. At that time you can choose whether you want to let us use your information or not. The survey will take about 20-25 minutes.
- III. Risks: In this study, you will not have any more risks than you would in a normal day of life.
- IV. Benefits: Participation in this study may not benefit you personally. Overall, we hope to gain insight into how people respond to celebrities' messages on social issues.

- V. **Compensation:** For participating in the study, you will receive extra credit in one course. One (1) percent of the total points available in the course will be given to you. For this purpose, you will be asked to enter your name and course information on a separate page at the end of the survey. This information will be stored separately from your survey responses. If you decide not to participate but would still like to earn the extra credit, you can review a short article related to your course and write a 1-page response paper. To take advantage of this option, please notify the Student Principal Investigator Sejung Park before the study is closed.
- VI. **Voluntary Participation and Withdrawal:** Participation in research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip survey questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.
- VII. **Confidentiality:** We will keep your records private to the extent allowed by law. Cynthia Hoffner and Se Jung Park will have access to the information you provide. Information may also be shared with those who make sure the study is done correctly (GSU Institutional Review Board and the Office for Human Research Protection). This is an online study, so you should be aware that data sent over the Internet may not be secure. We will ask your name and course information for the purpose of assigning extra credit. This is the only identifying information we will collect. After data collection is complete, your name (and the names of all participants) will be removed from the data set and no record linking your name with your responses will be kept. The information you provide will be stored on the researchers' firewall-protected computers, in a locked GSU office or home office. Your

name and other facts that might point to you will not appear when we present this study or publish its results. The findings will be summarized and reported in group form. You will not be identified personally.

VIII. Contact Persons: Contact Dr. Cynthia Hoffner at 404-413-5650 and choffner@gsu.edu or Sejung Park at 404-747-2905 and spark74@gsu.edu if you have questions, concerns, or complaints about this study. You can also call if you think you have been harmed by the study. Call Susan Vogtner in the Georgia State University Office of Research Integrity at 404-413-3513 or svogtner1@gsu.edu if you want to talk to someone who is not part of the study team. You can talk about questions, concerns, offer input, obtain information, or suggestions about the study. You can also call Susan Vogtner if you have questions or concerns about your rights in this study.

IX. Copy of Consent Form to Subject

If you wish to keep a copy of this consent form, please print a copy. If you are willing to volunteer for this research, please check “I Agree” below.

I Agree

I Decline

Appendix G. Experimental Stimuli for Main Study

Tweet set #1: Fear-framed tweets with FPP frames by Leonardo DiCaprio

#1.



Leonardo DiCaprio @LeoDiCaprio · Aug 29

What will the world look like if all the ice melts? I'm standing for clean air and #ActOnClimate.



#2.



Leonardo DiCaprio @LeoDiCaprio · Aug 29

Not acting on #ClimateChange could endanger the homes & food of wildlife. That's why I support #ClimateAction!



#3.



Leonardo DiCaprio @LeoDiCaprio · Aug 29

The world faces a dismal future. #EndangeredPlanet. That's why I support #ClimateAction. Join me now.



#4.



Leonardo DiCaprio @LeoDiCaprio · Aug 29

The world is losing the fight against #ClimateChange. I am proud of to be a part of #ClimateAction. Join me now.



Tweet set #2: Fear-framed tweets with NFPP frames by Leonardo DiCaprio.

#1.



#2.



#3.



#4.



Tweet Set #3: Hope-framed tweets with FPP frames by Leonardo DiCaprio.

#1.



#2.

 **Leonardo DiCaprio** @LeoDiCaprio · 6m
Acting on #ClimateChange could help protect the homes & food of wildlife.
That's why I support #ClimateAction!



#3.

 **Leonardo DiCaprio** @LeoDiCaprio · 6m
The world can have a bright future. #HappyPlanet. That's why I support
#ClimateAction. Join me now.



#4.

 **Leonardo DiCaprio** @LeoDiCaprio · 6m
The world can win the fight against #climatechange. I am proud of to be a part of
#ClimateAction. Join me now.



Tweet set #4: Hope-framed tweets with NFPP frames by Leonardo DiCaprio.

#1.

 **Leonardo DiCaprio** @LeoDiCaprio · 7m
People can stop all the ice melting. #ActOnClimate. Stand for clean air and
#ActOnClimateChange.



#2.



Leonardo DiCaprio @LeoDiCaprio · 6m

Acting on [#ClimateChange](#) could help protect the homes & food of wildlife. That's why support is needed for [#ClimateAction](#)!



#3.



Leonardo DiCaprio @LeoDiCaprio · 7m

The world can have a bright future. [#HappyPlanet](#). Help support [#ClimateAction](#). Join now.



#4.



Leonardo DiCaprio @LeoDiCaprio · 7m

The world can win the fight against [#climatechange](#). Be a part of [#ClimateAction](#). Join now.



Tweet set #5: Control group messages by Leonardo DiCaprio.

#1.



Leonardo DiCaprio @LeoDiCaprio · 7m

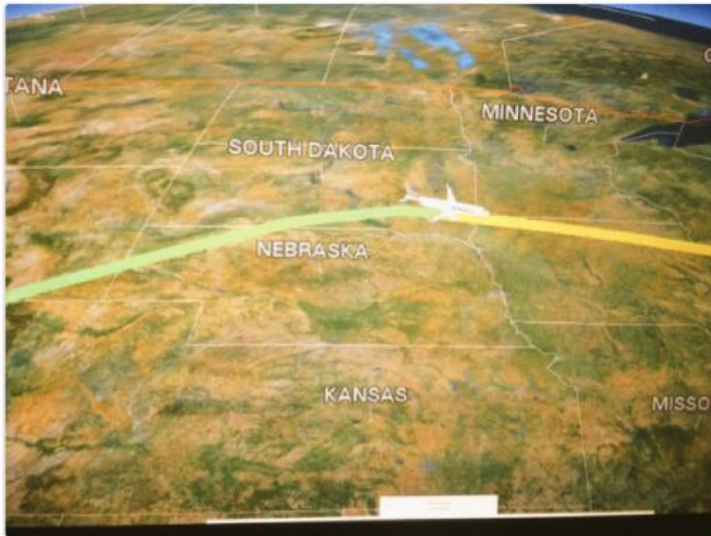
Had the long meeting/ sharing my work with the world. [#Greatness](#) requires [#effort](#). Now I'm going to go to bed.



#2.



Leonardo DiCaprio @LeoDiCaprio · 6m
Going out tomorrow to promote my next endeavor. How excited I am! #endeavor #happiness #DreamsComeTrue



#3.



Leonardo DiCaprio @LeoDiCaprio · 6m
Sunday morning. #SundayMorning Relaxing, I'm fully ready to eat my favorite cupcake. #Cupcake #Breakfast



#4.



Leonardo DiCaprio @LeoDiCaprio · 6m
If you want to turn your #life round, try #thankfulness. It will change your life mightily. – Gerald Good #GeraldGood



Tweet set #6: Fear-framed tweets with FPP frames by Pharrell Williams.

#1.



Pharrell Williams @Pharrell · 18m

What will the world look like if all the ice melts? I'm standing for clean air and [#ActOnClimate](#).



#2.



Pharrell Williams @Pharrell now

Not acting on [#ClimateChange](#) could endanger the homes & food of wildlife. That's why I support [#ClimateAction](#)!



#3.



Pharrell Williams @Pharrell 18m

The world faces a dismal future. [#EndangeredPlanet](#). That's why I support [#ClimateAction](#). Join me now.



#4.



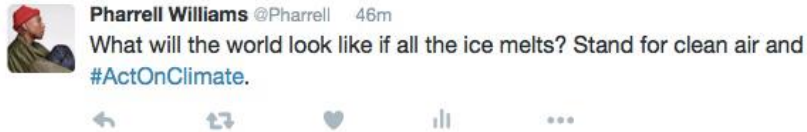
Pharrell Williams @Pharrell · 18m

The world is losing the fight against [#ClimateChange](#). I am proud of to be a part of [#ClimateAction](#). Join me now.



Tweet set #7: Fear-framed tweets with NFPP frames by Pharrell Williams.

#1.



#2.



#3.



#4.



Tweet set #8: Hope-framed tweets with FPP frames by Pharrell Williams.

#1.



#2.



#3.



#4.



Tweet set #9: Hope-framed tweets with NFPP frames by Pharrell Williams.

#1.



#2.



#3.



#4.



Tweet set #10: Control group messages by Pharrell Williams.

#1.



Pharrell Williams @Pharrell 38m

Had the long meeting/ sharing my work with the world. #Greatness requires #effort. Now I'm going to go to bed.

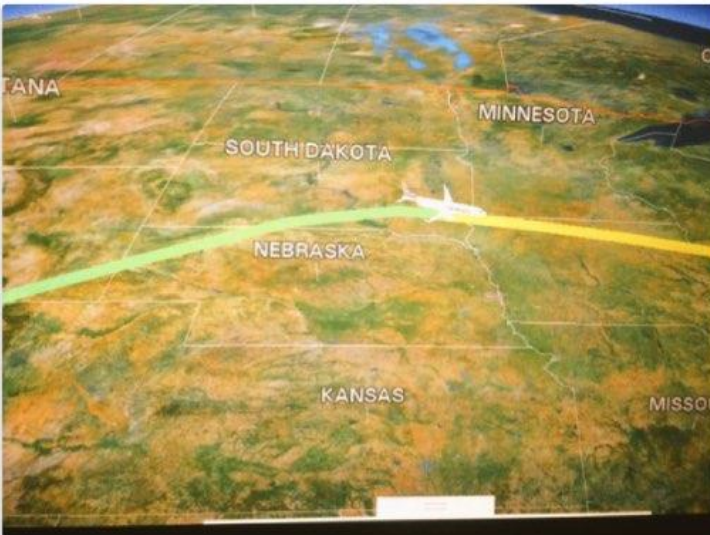


#2.



Pharrell Williams @Pharrell 37m

Going out tomorrow to promote my next endeavor. How excited I am! #endeavor #happiness #DreamsComeTrue



#3.



Pharrell Williams @Pharrell · 36m

Sunday morning. #SundayMorning Relaxing, I'm fully ready to eat my favorite cupcake. #Cupcake #Breakfast



#4.

**Pharrell Williams** @Pharrell 36m

If you want to turn your [#life](#) round, try [#thankfulness](#). It will change your life mightily. – Gerald Good [#GeraldGood](#)



Appendix H. Scales and Measures for the Main Study

Measure of emotional responses to the tweets.

Please rate how much you felt each of the emotions listed (1=none of this feeling to 7=a lot of this feeling).

While reading these tweets, I felt:

1. Fearful
2. Worried
3. Threatened
4. Hopeful
5. Optimistic
6. Confident
7. Angry
8. Furious
9. Shame
10. Sad
11. Guilty
12. Depressed

Measure of risk awareness (Spence & Pidgeon, 2010).

To what extent do you agree or disagree with the following statements about climate change (1=strongly disagree to 7=strongly agree)?

1. The consequences of climate change will be severe.
2. Impacts of climate change are likely to be extreme.

3. The effects of climate change are unlikely to be too serious. (Reverse Coded)

Measure of perceived response efficacy (Kellstedt et al., 2008; Morton et al., 2011).

To what extent do you agree or disagree with the following statements about climate change (1=strongly disagree to 7=strongly agree)?

1. I believe my actions can have a beneficial influence on global warming and climate change.
2. My actions to reduce the effects of global warming and climate change in my community will encourage others to reduce the effects of global warming through their own actions.
3. Actions I take personally can help reduce the effects of climate change.
4. Climate change can be averted by mobilising collective effort
5. If we act collectively, we will be able to minimise the consequences of climate change

Measure of attitude (Spence & Pidgeon, 2010).

How do you feel about climate change mitigation (1=strongly negative to 7=strongly positive)?

1. Overall how do you feel about climate change mitigation?
2. In terms of personal considerations only, do you feel overall positive or negative about climate change mitigation?
3. Thinking about climate change mitigation in social terms, i.e. with regard to being a member of society, do you think that climate change mitigation is overall a positive or a negative thing?

Measures of behavioral intent.

Support for government action on climate mitigation (Hart & Nisbet, 2012).

To what extent do you agree or disagree with the following statements about climate change (1=strongly disagree to 7=strongly agree)?

1. We should immediately increase government regulation on industries and businesses that produce a great deal of greenhouse emissions
2. We should immediately increase taxes on industries and businesses that produce a great deal of greenhouse emissions
3. Concern about global climate change is unwarranted and no action is needed (reverse coded).
4. The government should offer economic incentives so that businesses and industries voluntarily reduce greenhouse emissions.
5. The government should enact economic policies that will encourage to reduce greenhouse gas emissions.

Sustainable behavior (Gifford & Comeau, 2011).

To what extent you are likely to do the behaviors listed below in the future (1=definitely, 2=probably, 3=probably not, I already do this, does not apply to me)?

1. Switch off lights when not in use
2. Set thermostat at 68°F or lower in winter
3. Buy local foods when possible
4. Eat vegetarian meals
5. Wash and dry only full loads
6. Recycle more
7. Compost

Participation in activism for climate change (Dono, Webb, & Richardson, 2010; Roser-Renouf & Nisbet, 2008; Valenzuela, 2013).

To what extent you are likely to do the behaviors listed below in the future ((1=definitely, 2=probably, 3=probably not, I already do this, does not apply to me)?

1. Participate in events organized by environmental groups working for climate change mitigation.
2. Give financial support to environmental groups working for climate control.
3. Circulate petitions demanding an improvement of government policies regarding climate change mitigation.
4. Participate in protests for mitigating climate change.
5. Punish companies that deny the causes of climate change by not buying their products.
6. Write posts on social media to urge people to take an action for climate change.
7. Join or follow groups or pages on social media that are related to the activism or movement for climate change mitigation.
8. Share information or links on social media that are related to climate change.

Measure of PSI (Rubin & Perse, 1987).

To what extent do you agree or disagree with the following statements about Leonardo DiCaprio/Pharrell Williams (1=strongly disagree to 7=strongly agree)?

1. I feel he is like a friend
2. I see him as a natural, down-to-earth person.
3. I look forward to seeing him on any media.
4. If he appeared on any media, I would want to watch it.
5. He seems to understand the kinds of things I want to know.

6. If I saw a story about him in a newspaper or magazine, I would want to read it.
7. I would miss him if I could not see him on any media for a while.
8. If I could, I would like to meet him in person.
9. I would feel sorry for him if he made a mistake.
10. I find him to be attractive.

Measures of Belief.

Belief in the existence of climate change (American Life Panel, 2006).

You may have heard about the idea that the world's temperature may have been going up over the past 100 years, a phenomenon sometimes called 'climate change' or 'global warming'.

Please indicate to what extent you agree or disagree that this has been happening (1=strongly disagree to 7=strongly agree):

Belief in human contributions to climate change (Hart & Nisbet, 2012).

Please indicate to what extent you agree or disagree with the statement: "global climate change is occurring and we humans are the primary cause" (1=strongly disagree to 7=strongly agree):

Measure of knowledge of climate change (Hart & Nisbet, 2012; Braten, Strømsø & Samuelstuen, 2008).

Please indicate which you think the following statements on climate change are True or False:

1. The hole in the ozone layer is the main cause of global climate change. (F)
2. The average temperature of the earth has increased over the past 100 years. (T)
3. The greenhouse effect is due to Streams of heat that do not get out of the atmosphere. (T)

4. In 2015, a deal was made to limit the rise in global temperatures to less than 2 degrees C has been agreed at the climate change summit in Paris. (T)
5. Obama opposed the global climate change agreement at the 2015 climate change summit in Paris, because he felt it was impractical. (F)
6. The People's Climate March in September 2014 included rallies worldwide to advocate for global action against climate change. (T)

Measure of perception of celebrity involvement in climate advocacy.

To what extent you think Leonardo DiCaprio/Pharrell Williams is involved in climate change mitigation (1=strongly disagree to 7=strongly disagree)?

1. I think Leonardo DiCaprio/Pharrell Williams is deeply involved in climate change mitigation.
2. I think Leonardo DiCaprio/Pharrell Williams is heavily engaged in activities for resolving the climate change issue.
3. I think Leonardo DiCaprio/Pharrell Williams makes extensive personal efforts to address the climate change issue.

Sociodemographics.

1. What is your gender?

Male

Female

Other (please specify)

2. How old are you?

3. What is your ethnicity? Please mark all that apply.

Asian/Pacific Islander

Black/African American

Hispanic/Latina(o)

Native American

White/Caucasian

Other (please specify)

4. What is the highest level of education completed by your father?

Did Not Complete High School

High School

Some College

Bachelor's Degree

Master's Degree

Advanced Graduate work or Ph.D.

Not Sure

5. What is the highest level of education completed by your mother?

Did Not Complete High School

High School

Some College

Bachelor's Degree

Master's Degree

Advanced Graduate work or Ph.D.

Not Sure

6. What is your approximate average household annual income?

Under \$25,000

\$25,000 - \$39,999

\$40,000 - \$49,999

\$50,000 - \$74,999

\$75,000 - \$99,999

Over \$100,000

7. Please indicate your political ideology (1=very liberal to 7=very conservative):

8. Do you have a Facebook account?

Yes

No

9. How many days a week do you use Facebook?

10. On the days you use Facebook, how much time do you spend using Facebook in hours and minutes.

11. Do you have an Instagram account?

Yes

No

12. How many days a week do you use Instagram?

13. On the days you use Instagram, how much time do you spend using Instagram in hours and minutes.

14. Do you have a Twitter account?

___ Yes

___ No

15. How many days a week do you use Twitter?

16. On the days you use Twitter, how much time do you spend using Twitter in hours and minutes.

17. How many followers do you have on Twitter?

___ 1 to 50 followers

___ 51 to 100 followers

___ 101 to 150 followers

___ 151 to 200 followers

___ 201 or more

18. How many people do you follow on Twitter?

___ 1 to 50 followers

___ 51 to 100 followers

___ 101 to 150 followers

___ 151 to 200 followers

___ 200 or more

19. How familiar are you with Leonardo DiCaprio/Pharrell Williams (1=not at all familiar to 7=extremely familiar)?

20. Prior to reading tweets of Leonardo DiCaprio/Pharrell Williams, how aware were you of his efforts for supporting climate change mitigation (1=not at all aware to 7=extremely aware)?

21. To what extent do you agree or disagree with the following statements about Leonardo DiCaprio's/Pharrell Williams' climate advocacy (1=strongly disagree to 7=strongly agree)?

1. I think Leonardo DiCaprio/Pharrell Williams advocates climate change mitigation primarily to promote his own image. _____
2. I think Leonardo DiCaprio/Pharrell Williams advocates climate change mitigation primarily to help the environment. _____

22. Please indicate whether you would be likely to retweet this tweet:

PRESENT TWEET #1

___No

___Maybe

___Yes

23. Please indicate whether you would be likely to reply to this tweet:

PRESENT TWEET #1

___No

___ Maybe

___Yes (Briefly describe how you would reply to this tweet: _____)

24. Please indicate whether you would be likely to retweet this tweet:

PRESENT TWEET #2

No

Maybe

Yes

25. Please indicate whether you would be likely to reply to this tweet:

PRESENT TWEET #2

No

Maybe

Yes (Briefly describe how you will reply to this tweet: _____)

26. Please indicate whether you would be likely to retweet this tweet:

PRESENT TWEET #3

No

Maybe

Yes

27. Please indicate whether you would be likely to reply to this tweet:

PRESENT TWEET #3

No

Maybe

Yes (Briefly describe how you would reply to this tweet: _____)

28. Please indicate whether you would be likely to retweet this tweet:

PRESENT TWEET #4

No

Maybe

Yes

29. Please indicate whether you would be likely to reply to this tweet:

PRESENT TWEET #4

No

Maybe

Yes (Briefly describe how you would reply to this tweet: _____)

30. How often have you read postings on social media that are related to environmental issues?

Never

Rarely

Sometimes

Often

Very often

31. How often have you posted or shared anything on social media that are related to environmental issues?

Never

Rarely

Sometimes

Often

Very often

32. How often have you been involved in any online activism related to environmental issues?

Never

Rarely

Sometimes

Often

Very often

33. How often have you been involved in any offline activism related to environmental issues?

Never

Rarely

Sometimes

Often

Very often

34. How often have you signed in petition related to environmental issues?

Never

Rarely

Sometimes

Often

Very often

35. How often have you donated money to environmental issues?

Never

Rarely

Sometimes

Often

Very often

Manipulation Checks.

Please rate the extent to which the tweets you read conveyed the following emotions (1=none of

this feeling to 7=a lot of this feeling):

The tweets I read conveyed feelings of:

1. Fear for the negative future consequences of climate change if we do not make efforts for coping with the climate crisis.
2. Worry about what might happen without mitigating climate change.
3. Hope that we can prevent the negative consequences of the climate crisis by mitigating climate change.
4. Optimism about combating the climate crisis if we make efforts.

Please rate the extent to which the tweets you read conveyed the following information (1=strongly disagree to 7=strongly agree).

The tweets I read indicated that:

1. Leonardo DiCaprio/Pharrell Williams is deeply involved in climate change mitigation.
2. Leonardo DiCaprio/Pharrell Williams makes extensive personal efforts to address the climate change issue.
3. Many people are involved in climate change mitigation.
4. Many people make efforts to address the climate change issue.

Appendix I. Debriefing Message

Thank you for your participation in this study. Social scientists are interested in understanding the effects of celebrities' messages related to environmental issues on people's attitudes and behaviors. Some studies have indicated that how people frame advocacy messages will differently influence peoples' attitudes and behaviors. This is a relatively new area of research and there is little empirical data.

The experiment today concerned how emotion and reference frame employed by celebrities have different impacts on peoples' attitudes and behaviors for an environmental issue. Thus, we are discovering the role of celebrities and the effects of different message framing strategies for driving eco-friendly attitudes and behaviors as well as the effects of psychological bond between celebrities and people. More specifically, I am investigating the effects of two emotional frames, hope and fear, and reference frame, celebrity involvement and non-person pronouns on responses to messages about climate change. Today you either read tweets using one these frame combinations (fear/FPP; fear/NFPP; hope/FPP; hope/NFPP) or if you were in the control group, you read tweets that were not related to climate change.

In the study, the messages displayed were said to be written by one of two celebrities, Leonardo DiCaprio and Pharrell Williams. In fact, I created the messages by revising celebrity postings about climate change on social media. Some language in celebrities' messages was modified to include the emotions of hope or fear and FPP or NFPP. Images were borrowed from news articles. While the messages displayed were not the same as the celebrities' real postings, the aim of the messages for advocating environmental issues was same as the messages they have actually posted on Twitter. The purpose of changing the wording was to determine the specific message framing effects on people's pro-environmental attitudes and behaviors.

All the information I collected in today's study will be confidential. I will focus on the general patterns that emerge when the data are aggregated together. Your participation today is appreciated and will help social scientists discover the effective ways of promoting pro-environmental behaviors. I ask that you do not discuss the nature of the study with others who may later participate in it, as this could affect the validity of our research conclusions.

If after reading this debriefing, you would like to have your data removed from the study, please contact the Student Principal investigator, Sejung Park at 404-747-2905 and spark74@gsu.edu and she will remove your data from the study.

If you have any questions or concerns, you are welcome to talk with Dr. Cynthia Hoffner at 404-413-5650 and choffner@gsu.edu or Sejung Park at 404-747-2905 and spark74@gsu.edu. If you have any questions about subjects' rights, you may contact Susan Vogtner, the GSU IRB Compliance Officer, at 404-413-3513 or svogtner1@gsu.edu. If your participation in this study has caused you concerns, anxiety, or otherwise distressed you, you may contact the GSU Counseling Center at 404-413-1640.