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Promoting Waterbird Conservation Behavior: The Effects of Internet Memes and Co-Creation Engagement on Biodiversity-Led Sustainability

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Abstract: Waterbird plays a vital role in maintaining ecosystem services and serves as a bioindicator of ecological conditions. However, people are not fully aware of the benefits waterbirds bring to ecosystem and how biodiversity conservation contributes to sustainability. This study aims to promote waterbird conservation behavior by using participatory internet memes. The internet memes feature humor and participatory culture, and they have been used to promote environmental campaigns. This study explores how co-creation engagement interacts with different types of memes regarding the online civic engagement in an animal conservation campaign and the underlying mechanisms in that process. A 3 (meme types: high humor meme without text vs. low humor meme without text vs. typical high humor meme with text) X 2 (engagement: co-creation engagement vs. non-co-creation engagement) between subject online experiment was used in this study. The results showed three causal routes—absorption, perceived humor, and perceived cuteness—that mediated the effect between high humor memes and online civic engagement. Furthermore, this study revealed under what circumstance low humor memes are effective in promoting civic engagement in environmental communication.

Keywords: internet memes; co-creation engagement; humor; cuteness; civic engagement; biodiversity-led sustainability



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1. Introduction

Biodiversity conservation of wildlife and its habitat is a major component of sustainability [1]. One of the most pressing environmental issues jeopardizing sustainability is the loss of biodiversity. Animals play a crucial role in maintaining biodiversity. Among all the animal species, waterbirds are known as an indicator to assess the status of biodiversity [2]. Considering the rich information provided by waterbirds such as wetland ecosystem and animal's migratory status, waterbird protection allows people to sustain the biodiversity more effectively and ameliorate sustainability. Hence, this study utilizes the most prevalent media tool—social media—to motivate people to protect waterbirds and in turn facilitate biodiversity-led sustainability. Social media is inundated with memes, which convey various beliefs and enable online participation and creation [3]. Internet memes have been defined as “the propagation of content such as jokes, rumor, videos, or websites from one person to others via the Internet” [4] (p. 362). Hence, humor is one of the most salient features of internet memes and internet memes can be viewed as a way for entertainment and establishing social bond [5]. Due to the humorous feature of Internet memes, they have been used to promote dry topics, such as improving scientific literacy [6] and climate change [7]. Considering memes can be applied to various topics to raise awareness, this study primarily concentrates on exploring the communication power of memes in the field of environmental protection. As for another feature of the internet memes—online participation and creation, according to a previous study [8] memes are user generated texts, videos, or images that share content and communicative stance. Therefore, internet

memes are participatory public discourses and characterized by user generated content. Because of the participatory practice, social media users have the agency to create and circulate their own memes [9]. Since co-creation experience can promote engagement [10], given the participatory feature of internet memes, the co-created characteristic of internet memes resonates with co-creation engagement. When it comes to an online environmental campaign, online civic engagement, which reflects people's intention to donate money to the campaign and share related information of the environmental issue, is crucial in environmental communication [7]. Due to the attribute of internet memes and the importance of online civic engagement in an online environmental campaign, understanding how the participatory feature of internet memes influences people's online civic engagement will contribute to environmental communication.

Despite the participatory feature of internet memes, previous studies mainly focused on examining the message features of the meme. For example, a prior study [11] investigated the media frames of the memes and how the interaction between common media frames and different logics of memes promotes social participation in online community. Previous researchers [7] empirically examined how humorous memes increase online civic engagement on climate change. Few research has explored the effects of the combination of humorous and participatory features of memes on environmental issues. Despite previous studies examining the impact of memes on climate change [7], few studies examined how to change people's protective behavior in terms of waterbird conservation to promote biodiversity-led sustainability.

To fill this gap, this study aims to examine how humorous co-created memes influence people's online civic engagement in waterbird conservation campaign via a 3 (meme types: high humor meme without text vs. low humor meme without text vs. typical high humor meme with text) X 2 (engagement: co-creation engagement vs. non-co-creation engagement) between subject experimental design. Since this study uses waterbird-related memes to promote waterbird conservation behavior, this study aims to test if the interaction of co-creation engagement and waterbird-featured memes influences the online civic engagement in waterbird conservation campaign and if that interaction effect impacts the absorption of the meme, the perceived humor of the meme, and the perceived cuteness of the waterbird. Considering the humorous and participatory features of internet memes, the effectiveness of internet memes in various fields can be ascribed to the perceived humor, and the deep involvement with the internet memes can be attributed to co-engagement triggered absorption. Hence, the perceived humor and absorption are two possible mechanisms explaining the effectiveness of internet memes. Furthermore, given that the context of this study is waterbird protection, animal-featured memes indicating human-like features allow people to relate to the animals and perceive the animals as cuter. The humorous co-created memes tend to elicit more perceived cuteness of the animal through people's interaction with the memes. Therefore, this study also examines if perceived humor, absorption, and perceived cuteness mediate the relationship between the interplay of co-creation engagement and different types of memes regarding online civic engagement in a waterbird conservation campaign.

1.1. Internet Memes and Humor

The term meme was coined by an evolutionary biologist Richard Dawkins [12] which depicts how cultural units resembling the replication genetic material spread from person to person. There are diverse genres of memes, such as reaction photoshops, flash mobs and stock character macros (e.g., advice dog) [4]. Since the format of internet memes varies from images to videos, internet memes are multimodal user-generated contents [13]. Among the assorted formats, one of the most prevalent memes is image macro, which consists of image and a superimposed text [14]. One of the image macros is advice animals, which shows certain type of animals with or without humans and a captioned witty text [5]. As this study focuses on using memes to promote animal preservation campaigns, image macro, especially advice animals will be examined. Due to the different features of the memes, this

study focuses on three common types of memes: high humor image memes without text, low humor image memes without text, which is just an animal image, and typical high humor image memes with text. The reason this study does not include low humor image memes with text is because a witty text tends to turn a low humor image meme to a high humor meme. Therefore, to avoid potential confusion, this study mainly focuses on the aforementioned three types of memes.

Although a common feature of internet memes is humor [14], Shifman [15] discovered that animals as a globally oriented topic are more likely to induce humor than locally oriented topics such as politics. In general, the humorous feature of internet memes can be ascribed to three attributes: playfulness, incongruity, and superiority [4]. Playfulness is achieved by emphasizing participation and creativity. Incongruity can be explained by the incongruity theory of humor which asserts that an unexpected cognitive encounter between two incongruent elements are the keys of comedy, such as a man in women's clothing. Superiority indicates that people enjoy demonstrating their own superiority publicly and showing an unintentionally funny aspect of themselves. When it comes to advice animals, incongruity plays a cardinal role in inducing humor. The incongruity of advice animals either derives from the images or texts [5]. The incongruous image can result from an uncannily human-like expression, such as grumpy cat. The incongruous text violates people's original inference and makes them appreciate an alternative conclusion (e.g., at the top of the grumpy cat meme: Why don't you slip into something more comfortable; at the bottom of grumpy cat meme: Like a coma). Hence, the humor of advice animal memes results from image inspired creative captions.

1.2. Internet Memes and Environmental Issues

Internet memes, by virtue of humor and participatory features, have been used to engage people in promoting environmental campaigns [7,11]. Ross and Rivers found that internet memes combined either with a humorous or ironic message are effective in motivating socio-political participation in the online community. Zhang and Pinto [7] discovered that climate change memes increase people's intentions of online civic engagement in climate change. Furthermore, Lenda et al. [16] also revealed that amusing memes are positively correlated with people's donation behavior towards unappealing animal species. Thus, internet memes, especially humorous loaded memes, are effective in changing people's perception and behavioral intention regarding environment-related issues ranging from climate change to animal protection.

In terms of animal conservation campaigns, both the animal and the following ecosystem benefits brought by the animal should be examined. Under the umbrella of animal conservation, waterbird (e.g., seabirds, coastal waterbirds, wading birds, and marshbirds) plays a vital role in maintaining the diversity of other organisms in ecosystem and serve as bioindicators of ecological conditions and potential disease outbreaks [17]. Given the benefits waterbird brings to the ecosystem and human beings and the harsh reality that one third of waterbirds are suffering serious population loss, this study focuses on animal conservation—waterbird protection campaign. Because of the unique charisma of waterbird, there are plenty of waterbird-featured humorous memes on internet. Therefore, this study proposes following hypothesis:

H1: *High humor memes generate more civic engagement in online waterbird conservation campaign than low humor memes.*

1.3. Co-Creation Engagement and Absorption

Aside from humor, participation is another notable feature of internet memes. Internet memes are a type of participatory new media and fueled by internet users' creative contribution [5]. The participatory feature of internet memes promotes user generated content via co-creation engagement, which contributes to the reproduction and dissemination of internet memes. Co-creation engagement allows people to be engrossed in the memes

they are interacting with. The fully involved process reflects flow experience proposed by Csikszentmihalyi [18]. Flow is characterized by a deep concentration, a sense of control, and a loss of self-consciousness and sense of time due to the immersed enjoyment of the activity. According to Agarwal and Karahanna [19], absorption is a deep involvement deriving from Csikszentmihalyi's flow theory [18].

The five dimensions of cognitive absorption include the inability to sense the loss of time during the interaction, concentrated immersion, elevated enjoyment, a sense of control, and enhanced curiosity [19]. Hsieh and Chang [20] also discovered that one of the psychological mechanisms of brand co-creation is absorption and that absorption is positively associated with behavior change. Hence, this study proposes that co-created memes will generate more absorption than non-co-created memes. Also, this study investigates whether co-creation engagement moderates different types of memes regarding absorption and whether absorption mediates the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation campaign. Furthermore, as the co-creation engagement requires people to be immersed in the memes to come up with a catchphrase, this study explores how co-creation engagement affects the perceived humor of different types of memes and if the perceived humor mediates the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation campaign.

H2: *Co-created memes generate more absorption than non-co-created memes in online waterbird conservation campaign.*

RQ1: Will co-creation engagement moderate different types of memes (high humor memes without text vs. low humor meme without text vs. typical high humor meme with text) regarding absorption in online waterbird conservation campaign?

RQ2: Will absorption mediate the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation campaign?

RQ3: How does co-creation engagement affect the perceived humor of different types of memes (high humor memes without text vs. low humor meme without text vs. typical humor meme with text) in online waterbird conservation campaign?

RQ4: Will the perceived humor mediate the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation campaign?

1.4. Perceived Cuteness

Cuteness is a subjective perception influenced by various visual features and considered as a special type of attractiveness [21]. There are two dimensions of cuteness: kindchenschema (baby schema) and whimsical cuteness. The kindchenschema dimension of cuteness focuses on the cute features in newborns, such as large round eyes and round chubby cheeks [22]. These features are applied to both humans and animals. Since these features relate to the vulnerable characteristics of newborns, baby schema induces carefulness and caretaking behavior [23]. As for whimsical cuteness, instead of associating with the vulnerable natures of an infant, it is characterized with fun and playfulness. Hence, considering the features of internet memes, instead of emphasizing the kindchenschema, the animal-featured memes used in this study embody whimsical cuteness.

The psychological mechanism of whimsical cuteness can be explained through anthropomorphism, which is defined as "the tendency to attribute human characteristics to inanimate objects, animals, and others" [24] (p. 180). People tend to attribute human-like features to non-human entities to create a connection [25–27]. Hence, the animal-featured internet memes, especially when the animal memes present human-like expressions and behaviors, motivate people to relate to the animal and help the animal. Therefore, this study proposes that high humor memes generate more perceived cuteness than low humor memes. Since co-creation engagement motivates people to further interact with the anthropomorphic features of the memes, this study also hypothesizes that co-created memes

induce more perceived cuteness than non-co-created memes. As people tend to have a more positive evaluation and behavior change toward anthropomorphic cuteness entities [26] (p. 19), this study examines if perceived cuteness mediates the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation campaign.

H3: *High humor memes induce more perceived cuteness than low humor memes in online waterbird conservation campaign.*

H4: *Co-created memes induce more perceived cuteness than non-co-created memes in online waterbird conservation campaign.*

RQ: *Will the perceived cuteness mediate the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation campaign?*

2. Materials and Methods

2.1. Experimental Design and Procedure

A 3 (high humor meme without text vs. low humor meme without text vs. typical high humor meme with text) X 2 (co-created engagement vs. non-co-created engagement) between subject online experiment was conducted. In co-created condition, participants were asked to come up with a text to make it a new meme. In non-co-created condition, participants were asked to click next to move on. Hence, participants were randomly assigned to one of the following six conditions: high humor memes without text along with a requirement of co-created engagement, high humor memes without text and non-co-created engagement requirement, low humor memes without text along with a requirement of co-created engagement, low humor memes without text and non-co-created engagement requirement, high humor memes with a text along with a requirement of co-created engagement, and high humor memes with a text and non-co-created engagement requirement. After interacting with different types of memes along with either a co-created condition or a non-co-created condition, participants were asked to read a piece of message regarding waterbird protection and then fill out a survey of the perceived humor, perceived cuteness, absorption, and engagement in online waterbird protection campaigns.

2.2. Participants

A total of 362 participants who live in the U.S. were recruited from Turk Prime with USD 1 as compensation. After deleting 1 incomplete questionnaire, 361 valid participants were contained. There were 154 female participants (42.7%), 203 male participants (56.2%), and 4 non-binary participants (1.1%). The minimum age of the participant is 20 and the maximum age is 78. The average age of participants was 41.47. A total of 275 participants were Caucasians, 42 participants were African Americans, 20 participants were Latinos/Hispanics, 30 participants were Asians/Asian Americans, 1 participant was American Indians or Alaska Natives, and 4 participants were Native Hawaiian or Pacific Islander, and among them, 3 participants had more than one ethnicity. Among all participants, 3 participants had less than a high school degree, 42 participants had a high school degree, 53 participants had some college education but no degree, 49 participants had an associate degree in college, 167 participants had a bachelor's degree in college, 41 participants had a master's degree, 4 participants had a doctoral degree, and 2 participants had a professional degree.

2.3. Stimuli and Pretest

The participants were exposed to five memes featuring waterbird in each condition. Each meme lasted for 10 s. After 10 s, the participants could click to view the next one. All memes were selected from the internet. After pretesting the humor level of these memes, the final selected stimuli were presented in Appendix A. To examine the humor level of

the memes, this study pretested the humor level among five memes within each category and the humor level of memes between different categories (1 = not humorous at all; 7 = extremely humorous). To examine if all the five memes in high humor without text category generate similar level of humor, 125 participants who lived in United States were recruited from Turk Prime with USD 0.3 as compensation. One-way ANOVA results showed that all five memes in high humor without text category generated similar level of humor, $F(4, 120) = 0.62, p = 0.65$. The mean of all five memes in high humor without text category is 4.39. To examine if all the five memes in low humor without text category generate a similar level of humor, 175 participants who lived in United States were recruited from Turk Prime with USD 0.3 as compensation. One-way ANOVA results showed that all five memes in low humor without text category generated a similar level of humor, $F(4, 170) = 0.19, p = 0.95$. The mean of all five memes in humor without text category is 3.11. To examine if all the five memes in high humor with text category generate similar level of humor, 177 participants who lived in United States were recruited from Turk Prime with USD 0.3 as compensation. One-way ANOVA results showed that all five memes in high humor with text category generated a similar level of humor, $F(4, 172) = 1.61, p = 0.17$. The mean of all five memes in humor with text category is 4.47.

An independent *t*-test was used to examine the difference between each category. The *t*-test results showed that high humor without text category ($M = 4.39, SD = 1.65$) generated a significantly higher level of humor than low humor without text category ($M = 3.11, SD = 2.04$), $t(298) = 5.81, p < 0.001$. High humor with text category ($M = 4.47, SD = 1.73$) also generated a significantly higher level of humor than low humor without text category ($M = 3.11, SD = 2.04$), $t(350) = 6.79, p < 0.001$. There is no significant difference in humor level between high humor without text category ($M = 4.39, SD = 1.65$) and high humor with text category ($M = 4.47, SD = 1.73$), $t(300) = -0.42, p = 0.68$. Furthermore, since this study focuses on animal focused meme, to avoid different levels of cuteness induced by the memes to confound the results, cuteness was examined in each category to ensure the cuteness of each category is similar. The cuteness was measured by asking participants if they agree or disagree that the waterbirds depicted in the memes were cute (1 = strongly disagree to 7 = strongly agree). A total of 90 participants were recruited from Turk Prime. One-way ANOVA results showed that high humor without text category ($M = 5.61, SD = 1.37$), low humor without text category ($M = 5.13, SD = 1.86$), and high humor with text category ($M = 5.77, SD = 1.18$) generated similar level of cuteness, $F(2, 97) = 1.52, p = 0.22$. Therefore, the selection and categorization of the memes were successful.

2.4. Measurement

Perceived humor was measured by asking participants to evaluate the humor level of the meme (1 = not humorous at all; 7 = extremely humorous). Perceived cuteness was measured by asking participants to evaluate if they thought the waterbirds in the memes were cute (1 = strongly disagree to 7 = strongly agree). The measurement of absorption was adapted from Hsieh and Chang [18]. The absorption was measured by four items (e.g., when I am interacting with the meme, I forget everything else around me) ($\alpha = 0.92$). The measurement of civic engagement in waterbird conservation campaign was adapted from Zhang and Pinto [7]. Civic engagement in waterbird conservation campaign was measured by four items (e.g., I would like to contribute money online to waterbird protection campaign; I would like to start or join a waterbird protection campaign group on a social networking site; I would like to share photos, videos, or audio files online that related to waterbird protection; I would like to post comments, queries, or information about waterbird protection in an online discussion forum, blog, social networking site or website of any kind) ($\alpha = 0.93$). Both the absorption and civic engagement in waterbird conservation campaign were measured in a 7-point scale (1 = strongly disagree to 7 = strongly agree).

3. Results

The results showed that although there were no significant main effects between independent variables (e.g., humorous memes and co-created engagement) and dependent variables (e.g., online civic engagement and absorption), pairwise comparison results showed that high humor meme with text generated a significantly higher level of perceived cuteness than high humor meme without text. Furthermore, there were significant interaction and mediation effects. There were significant interaction effects that occurred between co-creation engagement and different types of memes in terms of absorption, perceived humor, and online civic engagement. As for significant mediation effects, both absorption and cuteness mediated the effect between non-co-created high humor memes and online civic engagement. Another significant mediator is perceived humor. The result showed that perceived humor mediated the effect between high humor memes and civic engagement regardless of the co-creation condition. Considering absorption, perceived humor, and perceived cuteness is positively associated with online civic engagement, after controlling for those three mediators, a significant interaction effect emerged between co-creation engagement and different types of memes.

3.1. Hypotheses Testing

H1 proposed that high humor memes generated more civic engagement in waterbird conservation campaign. ANOVA (univariate analysis of variance) results showed that there was no significant difference among high humor without text ($M = 3.61$, $SD = 1.82$), low humor without text ($M = 3.74$, $SD = 1.80$) and high humor with text ($M = 3.79$, $SD = 1.81$), $F(2, 357) = 0.31$, $p = 0.73$. All types of memes generated a similar level of online civic engagement. Hence, H1 was not supported. H2 proposed that co-created memes generate more absorption than non-co-created memes. ANOVA results showed that there was no significant difference of absorption between co-created memes ($M = 4.19$, $SE = 0.14$) and non-co-created memes ($M = 3.97$, $SE = 0.12$), $F(1, 353) = 1.55$, $p = 0.21$. Hence, H2 was not supported. H3 proposed that high humor memes induce more perceived cuteness than low humor memes. ANOVA results showed that different levels of humorous memes exerted a significant impact on perceived cuteness, $F(2, 355) = 4.01$, $p = 0.019$, $\eta_p^2 = 0.022$. Pairwise comparison results showed that the significant difference of perceived cuteness resulting from the difference between high humor meme with text ($M = 5.47$, $SE = 0.14$) and high humor meme without text ($M = 4.91$, $SE = 0.15$). However, there were no significant difference between high humor meme without text ($M = 4.91$, $SE = 0.15$) and low humor meme without text ($M = 5.18$, $SE = 0.15$), and high humor meme with text ($M = 5.47$, $SE = 0.14$) and low humor meme without text ($M = 5.18$, $SE = 0.15$). Hence, H3 was not supported. H4 proposed that co-created memes induce more perceived cuteness than non-co-created memes. ANOVA results showed that both co-created memes ($M = 5.19$, $SE = 0.12$) and non-co-created memes ($M = 5.18$, $SE = 0.11$) generated similar level of perceived cuteness, $F(1, 355) = 0.05$, $p = 0.96$, $\eta_p^2 < 0.001$. Hence, H4 was not supported.

3.2. Research Questions

RQ1 asked if co-creation engagement moderates different types of memes (high humor meme without text vs. low humor meme without text vs. typical high humor meme with text) regarding absorption. ANOVA was performed to answer this question. The ANOVA results showed that there was a significant interaction effect between co-creation engagement and different types of memes in terms of absorption, $F(2, 353) = 3.06$, $p = 0.048$, $\eta_p^2 = 0.017$ (see Figure 1). The pairwise comparison results showed that under non-co-created condition, high humor meme with text ($M = 4.49$, $SE = 0.21$) generated a significantly higher level of absorption than both high humor meme without text ($M = 3.81$, $SE = 0.21$), $p = 0.019$, and low humor meme without text ($M = 3.61$, $SE = 0.21$), $p = 0.003$, $F(2, 353) = 5.06$, $p = 0.007$, $\eta_p^2 = 0.028$. Under co-created condition, there were no significant differences across different types of memes, $F(2, 353) = 0.25$, $p = 0.78$. However, when it comes to low humor meme without text, co-created engagement generated a higher level of absorption

than non-co-created activity in a marginally significant level, $F(1, 353) = 3.11, p = 0.079, \eta_p^2 = 0.009$. Therefore, to answer RQ 1, co-creation engagement moderates the effect of different types of memes regarding absorption. Under non-co-created condition, high humor meme with text induces the highest level of absorption. Under co-created condition, low humor meme without text produces more absorption than no-co-created condition.

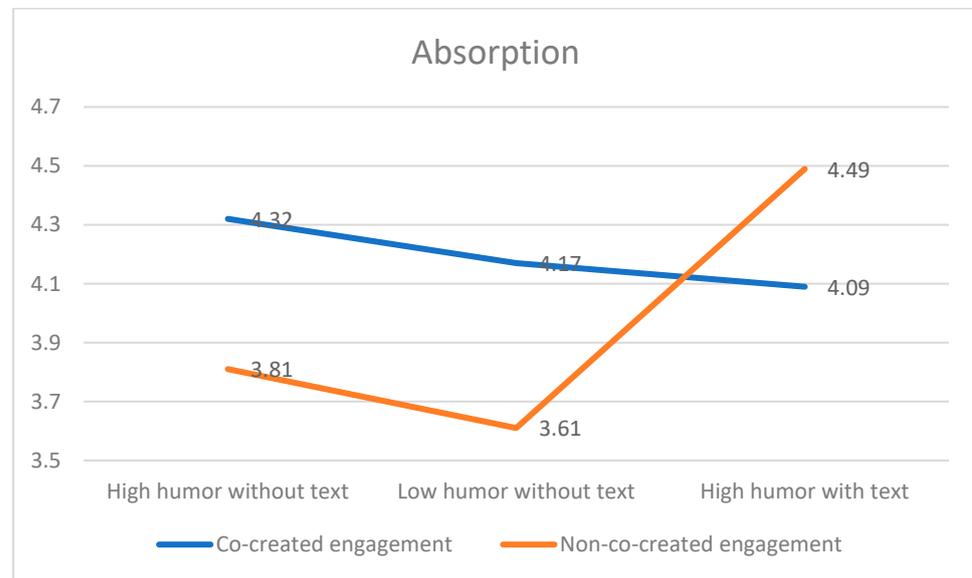


Figure 1. Interaction effect between co-creation engagement and different types of memes in terms of absorption.

RQ2 asks if absorption mediates the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation campaign. Hayes' [28] PROCESS Model 8 was employed to answer this question. Bootstrapping technique with 5000 resamples at 95% confidence interval was used to analyze the entire model. Since the independent variable meme type has three levels—high humor without text, low humor without text, and high humor with text, this study also selected multicategorical indicator coding system in data analysis. The reference group is high humor without text. The following moderated mediation analysis used the same procedure. The results showed that there was a significant moderated mediation effect under non-co-created condition, $B = 0.27, SE = 0.15, \text{BootCI} = [0.001, 0.576]$. Under non-co-created condition, the difference between high humor meme with text and high humor meme without text significantly impacted the online civic engagement in waterbird protection via the mediator—absorption, $B = 0.20, SE = 0.10, \text{BootCI} = [0.034, 0.412]$. According to the ANOVA result, under non-co-created condition, high humor meme with text generated a higher level of absorption than other types of memes. According to the moderated mediation result, there was no significant interaction effect between non-co-creation and high humor meme with text regarding online civic engagement, $B = -0.29, SE = 0.25, \text{BootCI} = [-0.771, 0.199]$. To answer RQ 2, the results showed that under non-co-created condition, high humor meme with text was fully mediated by absorption in terms of civic online engagement (see Figure 2).

RQ3 asked how co-creation engagement affects the perceived humor of different types of memes (humorous memes without text vs. non-humorous meme without text vs. typical humorous meme with text). ANOVA results showed that there was a significant interaction effect between co-creation engagement and different types of memes in terms of perceived humor, $F(2, 355) = 12.23, p < 0.001, \eta_p^2 = 0.064$. The simple effect results showed that for low humor meme without text, co-created engagement ($M = 3.41, SE = 0.24$) generated more perceived humor than non-co-created engagement ($M = 2.18, SE = 0.21$), $F(1, 355) = 15.00, p < 0.001, \eta_p^2 = 0.041$. For high humor meme with text, non-co-created condition

($M = 5.16, SE = 0.20$) generated more perceived humor than co-created condition ($M = 4.24, SE = 0.22$), $F(1, 355) = 0.922, p = 0.003, \eta_p^2 = 0.025$. To answer RQ 3, the ANOVA results showed that co-creation engagement moderates the effect of perceived humor under low humor meme without text and high humor meme with text (see Figure 3).

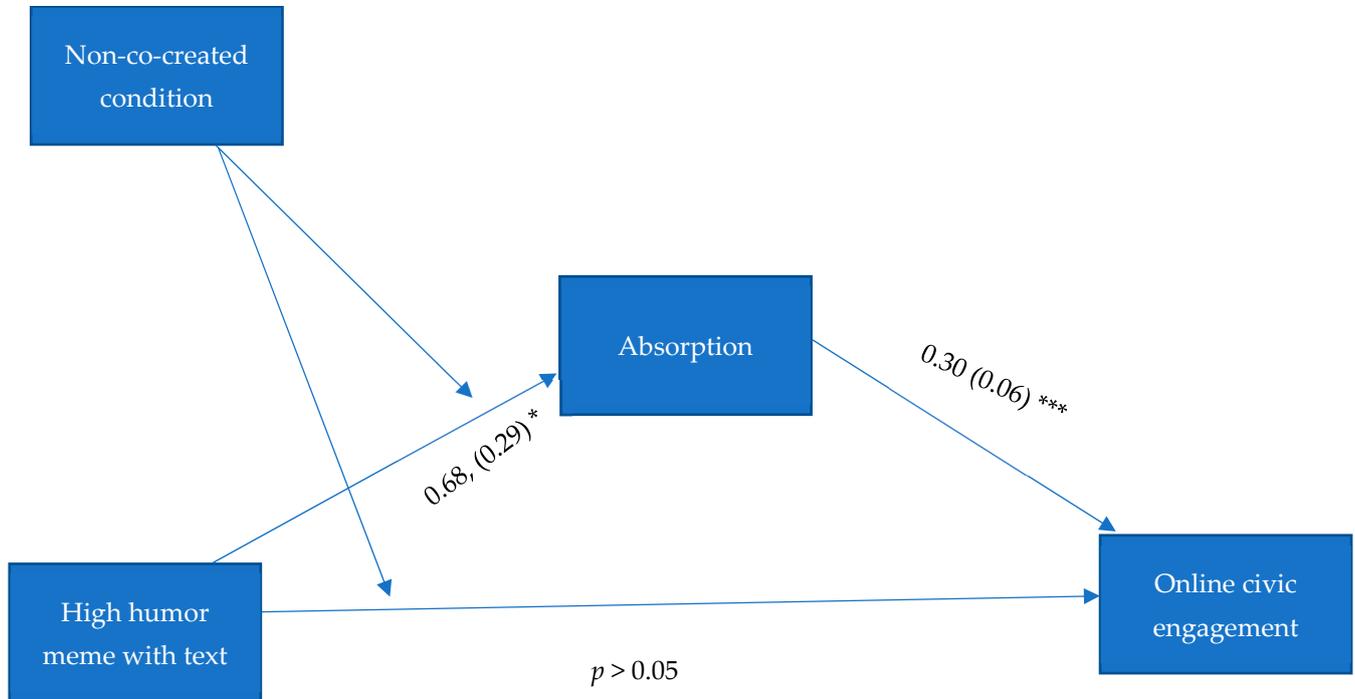


Figure 2. The interaction of non-co-created condition and high humor meme with text was fully mediated by absorption in terms of civic online engagement. Unstandardized estimates are listed, followed by standardized error in parentheses. Note: * $p < 0.05$. *** $p < 0.001$.

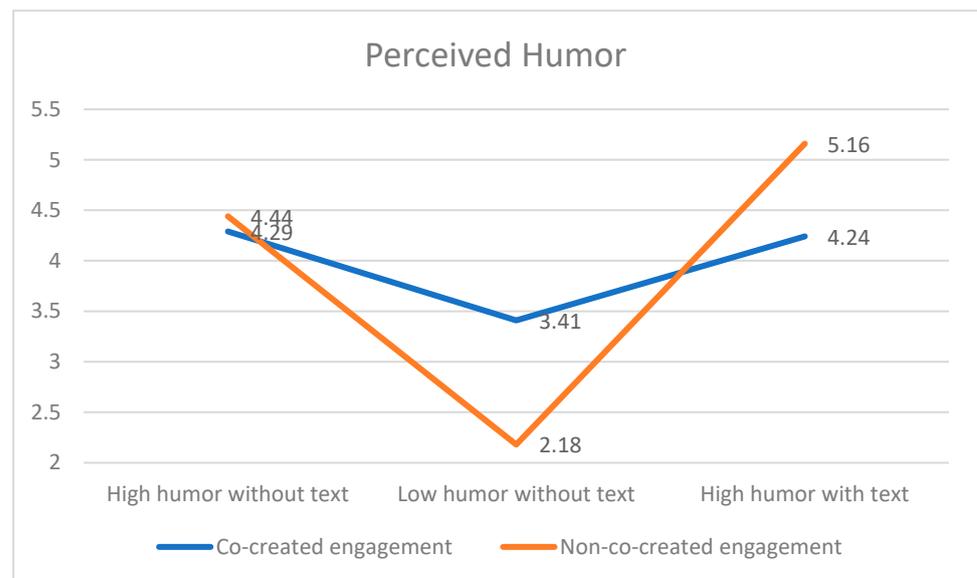


Figure 3. Co-creation engagement moderates the effect of perceived humor under low humor meme without text and high humor meme with text.

RQ 4 asked if the perceived humor mediates the interplay of different types of memes and co-creation engagement regarding civic engagement in online waterbird conservation

campaign. Hayes' [26] PROCESS Model 8 results showed that there was a significant moderated mediation effect on the difference between high humor without text and low humor without text, $B = -0.32$, $SE = 0.13$, $BootCI = [-0.619, -0.088]$. The indirect effect showed that under both co-created, $B = -0.21$, $SE = 0.10$, $BootCI = [-0.419, -0.027]$, and non-co-created conditions, $B = -0.52$, $SE = 0.15$, $BootCI = [-0.825, -0.255]$, the difference between high humor meme without text and low humor meme without text significantly impacted the online civic engagement in waterbird protection via the mediator—perceived humor. According to ANOVA results, under co-created condition, both high humor meme without text ($M = 4.38$, $SD = 1.72$) and high humor meme with text ($M = 4.74$, $SD = 1.57$) produced significantly higher perceived humor than low humor meme without text ($M = 2.69$, $SD = 1.95$), $F(2, 355) = 42.16$, $p < 0.001$, $\eta_p^2 = 0.192$. Furthermore, there was no significant interaction effect between co-creation and the different types of memes regarding online civic engagement, $p > 0.05$. There was also no significant interaction effect between non-co-created condition and the difference between high humor meme with or without text category, $p > 0.05$. Therefore, under both co-created and non-co-created engagement, either high humor meme with or without text was fully mediated by perceived humor in terms of civic online engagement. To answer RQ 4, the results showed that under either co-created or no-co-created condition, either high humor meme with or without text was fully mediated by perceived humor in terms of civic online engagement (see Figure 4).

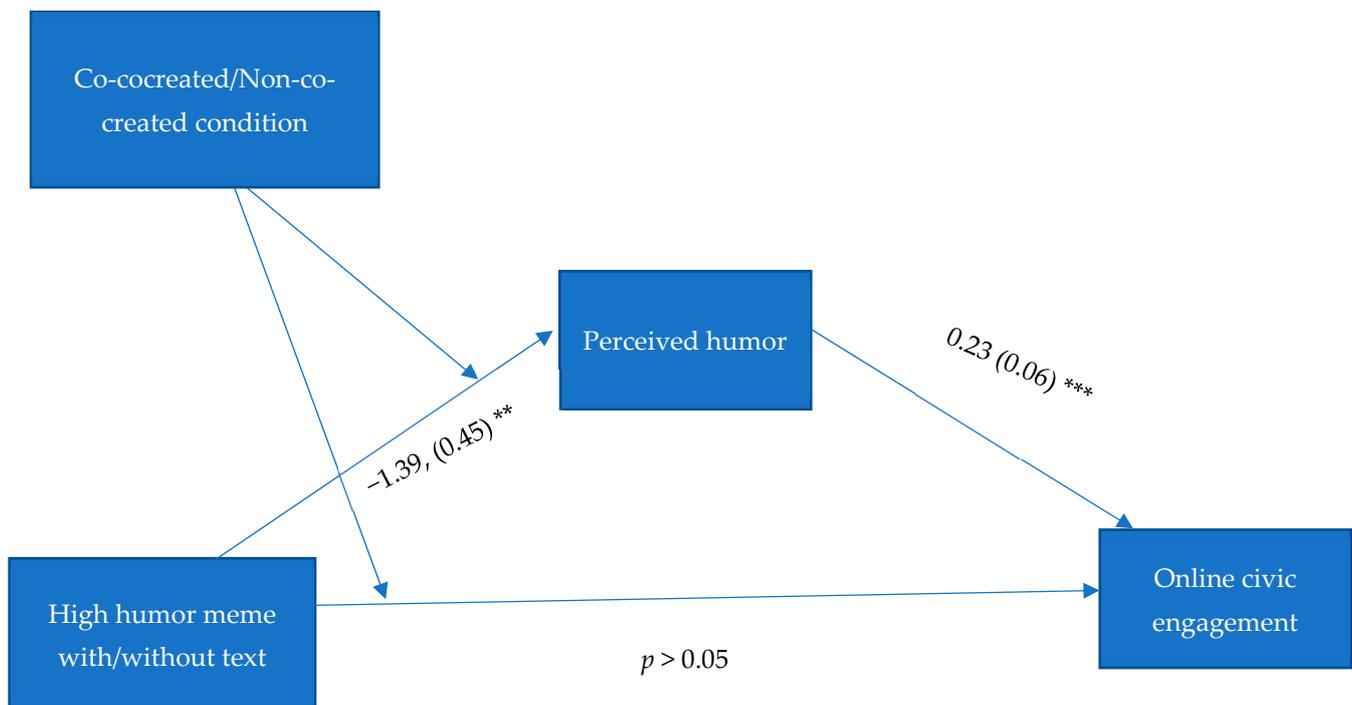


Figure 4. The interaction of co-created/non-co-created condition and high humor meme with/without text was fully mediated by perceived humor in terms of civic online engagement. Unstandardized estimates are listed, followed by standardized error in parentheses. Note: ** $p < 0.01$. *** $p < 0.001$.

RQ 5 asked if the perceived cuteness mediates the interplay of different types of memes and co-creation activity regarding civic engagement in online waterbird conservation campaign. Hayes' [26] PROCESS Model results showed that there was no significant moderated mediation on either the difference between high humor meme without text and low humor meme without text, $B = -0.42$, $SE = 0.15$, $BootCI = [-0.357, 0.253]$, or the difference between high humor meme without text or high humor meme with text, $B = -0.05$, $SE = 0.14$, $BootCI = [-0.339, 0.216]$. However, according to ANOVA results, high humor meme with text ($M = 5.47$, $SD = 1.33$) generated a higher level of perceived

cuteness than high humor meme without text ($M = 4.91$, $SD = 1.67$) and low humor meme without text ($M = 5.17$, $SD = 1.61$), $F(2, 355) = 4.01$, $p = 0.019$, $\eta_p^2 = 0.022$. The moderated mediation results also showed that under co-created condition, the difference between high humor meme with text and high humor meme without text significantly impacts online civic engagement via perceived cuteness, $B = 0.23$, $SE = 0.11$, $BootCI = [0.022, 0.457]$. To answer RQ 5, the results showed that under co-created condition, perceived cuteness mediated the effect between high humor meme with text and online civic engagement (see Figure 5).

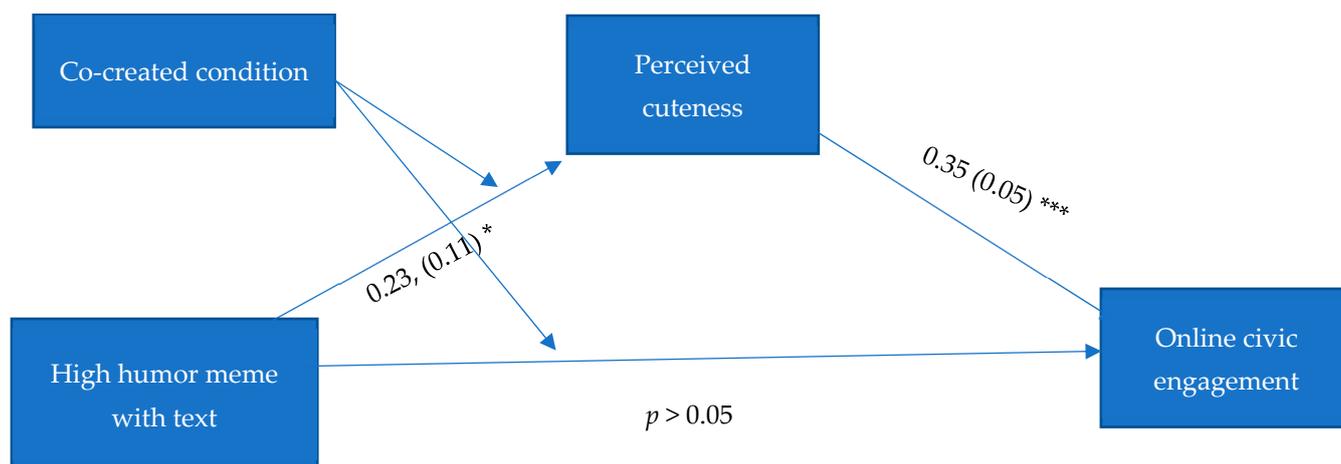


Figure 5. Under co-created condition, perceived cuteness mediated the effect between high humor meme with text and online civic engagement. Unstandardized estimates are listed, followed by standardized error in parentheses. Note: * $p < 0.05$. *** $p < 0.001$.

Since absorption, perceived humor, and perceived cuteness is positively associated with online civic engagement, this study conducted ANCOVA to examine the interaction effect between co-creation activity and different types of memes by controlling the three mediators. The ANCOVA results showed that when controlling the mediators, there was a main effect of different types of memes on online civic engagement, $F(2, 349) = 4.55$, $p = 0.011$, $\eta_p^2 = 0.025$. The results showed that low humor meme without a text ($M = 4.04$, $SE = 0.15$) generated a higher level of online civic engagement than both high humor meme without text ($M = 3.63$, $SE = 0.14$), $p = 0.044$, and high humor meme with text ($M = 3.43$, $SE = 0.13$), $p = 0.003$. There was also a significant interaction effect between co-creation engagement and different types of memes, $F(2, 349) = 3.24$, $p = 0.04$, $\eta_p^2 = .018$. When participants were exposed to low humor meme without a text, no-co-creation activity ($M = 4.37$, $SE = 0.19$) generated a significantly higher level of online civic engagement than co-created activity ($M = 3.72$, $SE = 0.21$), $F(1, 349) = 5.81$, $p = 0.016$, $\eta_p^2 = 0.016$. (see Figure 6).

This study also examined how demographic factors, such as ethnicity and academic background influence perceived cuteness, absorption, and humor via a series of ANOVAs. The ANOVA results showed that there were no significant differences among different ethnicities on perceived cuteness, $F(5, 353) = 1.79$, $p = 0.115$, and humor, $F(5, 353) = 1.53$, $p = 0.181$. There was a significant impact between ethnicity and absorption, $F(5, 353) = 2.64$, $p = 0.023$, $\eta_p^2 = 0.036$. The post hoc tests showed that the significant result only occurred between Caucasians ($M = 4.19$, $SD = 1.62$) and Asians ($M = 2.90$, $SD = 2.04$), $p = 0.008$. However, the number of Caucasian participants was 275 and the number of Asian participants was 30. Due to the huge discrepancy among the number of participants across different ethnicity, even though there was a significant difference between Caucasians and Asians regarding absorption, it needs a more balanced sample to inform a campaign strategy. As for the academic grounds, the ANOVA results showed that there were no significant differences between academic background and perceived cuteness, $F(7, 353) = 0.44$, $p = 0.880$,

and absorption, $F(7, 353) = 1.14, p = 0.338$. There was a significant result between academic backgrounds and humor, $F(7, 353) = 2.21, p = 0.033, \eta_p^2 = 0.042$. The post doc tests showed that participants with a master's degree perceive the memes with a significantly higher level of humor ($M = 4.76, SD = 1.73$) than participants who have attended some college but no degree ($M = 3.57, SD = 1.95$), $p = 0.065$. Since the number of participants with a master's degree ($N = 41$) is similar to the number of participants who have attended some college with no degree ($N = 53$), $p = 0.065$, this finding can inform strategy development in an environmental campaign.

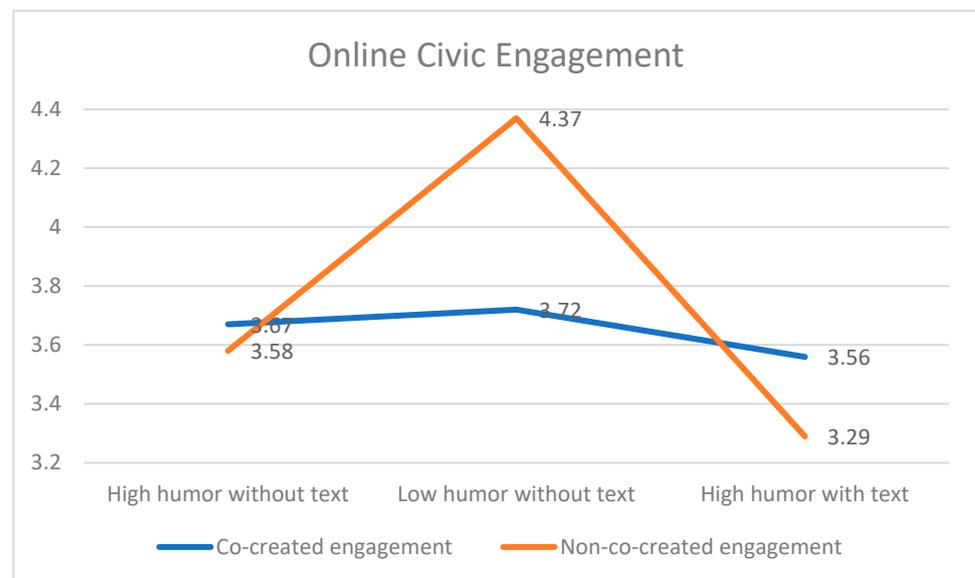


Figure 6. Interaction effect between co-creation engagement and different types of memes.

4. Discussion

This study contributes to waterbird protection behavior, thereby benefiting biodiversity-led sustainability. This study discovered the underlying mechanisms between the humorous memes and online civic engagement and the interaction effect between co-creation engagement and different types of memes on online civic engagement when all mediators are controlled. The significant mediation results suggest that there are three causal routes—absorption, perceived humor, and perceived cuteness—which drive the effect of high humor memes to promote online civic engagement in waterbird protection campaign. One causal route shows that when there is no co-creation engagement with internet memes, the typical memes (high humor meme with text) can significantly influence online civic engagement via increased absorption. The finding of enhanced absorption resulting from non-engaged typical high humor memes corresponds with the features of absorption, such as enjoyment and immersion [19]. Contrary to prediction, co-creation engagement did not improve absorption. The contradicted finding can be explained by the nature of co-creation activity. A previous study examined brand co-creation engagement regarding problem solving [20]. Thus, the absorption derives from the problem-solving process rather than problem reading process. However, in this study, when participants were already immersed in a series of high humor memes, the co-creation activity asking them to come up with a text disrupted the flow experience, which led to lower level of absorption.

The second causal route suggests that under both co-created and non-co-created conditions, high humor memes in general (high humor meme without text and high humor meme with text) contribute to more online civic engagement via perceived humor. It indicated that the effect of high humor memes on civic engagement depends on a mediator. This finding corresponds with previous studies that high humor memes could not directly exert an impact on civic engagement [7] and to exert an impact on behavior change, humorousness mediates the effect between humor appeal and behavior intention [29].

Although humor is an effective strategy to engage people, when it comes to internet memes, people tend to take the humorous feature as granted. Therefore, asking people to make a reflection of the high humor meme amplifies the humorous effect. Furthermore, this study also found that co-creation engagement moderates the effect of low humor meme without text and high humor meme with text regarding the perceived humor. This finding can be explained by flow experience [18]. Since flow experience is characterized by a deep concentration and enjoyment, the co-creation engagement with low humor meme allows people to be deeply involved in meme creation activity. The immersion in meme recreation process escalates the perceived humor of the original low humor image. In contrast, as for high humor memes with text, the co-creation engagement breaks the original flow experience, which induces lower perceived humor compared with non-co-creation engagement condition.

The third causal route indicates that enhanced perceived cuteness can promote online civic engagement. This study found that regardless of co-creation engagement, typical memes—high humor meme with text—produced the highest level of perceived cuteness. That finding can be explained by a feature of internet memes [4] which is whimsical cuteness [21]. The humor of internet memes originates from three aspects: playfulness, incongruity, and superiority [4]. In animal-featured memes, humor primarily emanates from incongruity, such as human-like expression and behavior. Whimsical cuteness emphasizes fun and playfulness. Co-creation engagement further intensifies the playfulness through participation and creativity. Therefore, the co-creation engagement with typical high humor meme making participants experience more fun and playfulness generates more whimsical cuteness. Thus, under co-created condition, the typical humor memes boost online civic engagement via increased cuteness. The cuteness-caused behavior change also corresponds with a previous study. Nenkov and Scott [19] found that whimsical cuteness featured by fun and playfulness induced more behavior change compared with neutral condition.

Finally, this study also discovered when controlling the underlying mechanisms, such as absorption, perceived humor, and perceived cuteness, low humor meme without a text induced highest level of online civic engagement under non-co-created condition. The boomerang effect of humorous memes can be explained by resource allocation hypothesis [30]. According to that hypothesis, humor shifts people's attention from the task and in turn, decreases people's ability to systematically process information. Hence, when absorption, perceived humor, and perceived cuteness were controlled, instead of relying on humor as a peripheral cue to process information, participants scrutinize the argument carefully.

5. Conclusions

5.1. Theoretical Implication

This study contributes to current animal conservation campaigns, especially the less focused waterbird protection campaign by examining the interplay of co-creation engagement and different types of memes and its underlying mechanisms regarding online civic engagement. The findings of this study can further advance biodiversity-led sustainability. First, this study fills the research gap by introducing co-creation engagement in a meme-driven environmental campaign. Although participatory feature is an innate trait of internet memes, previous studies mainly focused on using the inalterable memes to promote environmental campaign [7]. This study discovered how the co-creation engagement enhances participants' interaction experience with memes, such as increased perceived humor of the original less humorous memes. Integrating co-creation activity imitates participants' real life meme usage and improves the ecological validity of the study. Second, this study contributes to humor-focused environmental communication studies by discovering new patterns—absorption, perceived humor, and perceived cuteness. A previous study found that empathetic feeling [7] and humorousness [29] mediated the effect between climate change memes and online civic engagement. This study discovered different patterns between humorous memes and civic engagement. Given the features of internet memes, absorption, perceived humor, and perceived cuteness further help explain how

humorous memes promote online civic engagement. Third, this study complements current environmental communication studies by revealing under what circumstance low humor memes are effective in promoting civic engagement in environmental communication. Prior studies in humor-focused environmental communication tended to ignore the value of low humor appeals. This study discovered how co-creation engagement moderates and how the humor-associated mediators influence the effect of low humor memes in an animal conservation campaign.

5.2. Practical Implication

This study has several practical implications that can advance animal protection campaigns. First, under non-co-creation condition, absorption mediated the effect between typical high humor meme and online civic engagement. Hence, when an environmental campaign is launched on a media platform which emphasizes less user-generated content, it can use typical high humor memes along with enough ruminating time so that people can immerse themselves in high humor memes and in turn produce more civic engagement. Second, under either non-co-creation or co-creation condition, perceived humor mediated the effect between high humor memes in general and online civic engagement. An environmental campaign can adopt either typical high humor memes with text or just high humor memes without text along with a humorous interaction with publics to remind them the humor embodied in the memes to induce more civic engagement. Third, under co-created condition, perceived cuteness mediated the effect between typical high humor meme and online civic engagement. Therefore, when an environmental campaign is conducted on social media, it should motivate users to participate in typical high humor meme co-creation and promote the social media users' creativity to enhance online civic engagement. Fourth, as co-creation engagement can promote the perceived humor of original low humor memes, environmental campaign can use educational and informative images which are low in humor and pair it with co-creation engagement to attract people's attention to animal protection issues. Fifth, this study also reveals under non-co-creation condition, when controlling all mediators, low humor memes are more effective in generating online civic engagement. Thus, if an environmental campaign is performed on traditional less interactive media, and it aims to let publics scrutinize information carefully, it can use low humor memes. Sixth, since participants who have a master's degree tend to perceive the memes with more humor than participants who have a lower education degree, this finding informs the practitioners to develop either customized or targeted strategies to take advantage of memes in an environmental campaign.

5.3. Limitation and Future Research

There are several limitations of this study. First, this study mainly used waterbird-featured memes to examine people's online civic engagement in animal preservation campaign. In addition to waterbird-related memes, there are also other animal-featured memes. Future studies can examine other animal-featured memes to examine the interaction effect between co-creation engagement and different types of memes. Second, this study focuses on the humorous memes and whimsical cuteness feature of animals which highlights fun and playfulness. However, in addition to whimsical cuteness, animal-featured memes could also reflect baby schema, such as large round eyes and round chubby cheeks [20]. Aside from examining how whimsical cuteness influences online civic engagement, future studies can also examine the baby schema cuteness in animal feature memes and investigate how that type of cuteness impacts online civic engagement. Third, this study mainly explores humor-related mediators. Since humor can also trigger emotions and affect mood, future studies can examine if emotion and mood could be potential mediators. Fourth, this study mainly used analysis of variance and Hayes' [28] PROCESS Model to examine the correlation among different variables. Future studies can adopt multiple methods such as SEM (structural equation model) to test the model. Fifth, although this study primarily focused on how to motivate people to donate and promote online environmental

campaigns, it did not emphasize the practical actions, such as how to change people's behavior to protect waterbird nesting and wetlands. In addition to persuading people to advocate for online waterbird protection campaign, future studies can incorporate more information regarding practical actions to promote offline waterbird protection behavior.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data of this study are available on request from the corresponding author.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Appendix A.1



Figure A1. High Humor Meme without Text.

Appendix A.2



Figure A2. Low Humor Meme without Text.

Appendix A.3



Figure A3. Typical High Humor Meme with Text.

Appendix A.4 Campaign Message

Join our Waterbird Protection Campaign and make a world of difference! Waterbirds, like swans and ducks, are crucial indicators of wetland health, controlling pests and maintaining water quality. Supporting waterbird conservation safeguards our planet's delicate ecosystems, ensuring a balanced environment for generations. Be a part of this vital mission—protect waterbirds, preserve the planet!

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