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Motivators of Pro-environmental Behavior: Examining the Underlying Processes in the Influence of Presumed Media Influence Model

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Motivators of Pro-environmental Behavior: Examining the Underlying Processes in the Influence of Presumed Media Influence Model

Abstract

Extending the influence of presumed media influence model, this study examined direct and indirect media influences on pro-environmental behavioral intentions. We empirically tested perceived media influence on others as a distinct and independent mediator between perceived media exposure of others and perceived social norms, using a nationally representative sample of 1,144 Singaporeans. Using structural equation modeling, influence of presumed media influence accounted for direct and indirect media effects on attitudes, social norms, and pro-environmental behavioral intentions. Perceived media influence on others was associated with behavioral intentions. Attitudes, descriptive, and subjective norms accounted further for this relationship. Theoretical and practical implications were discussed.

Keywords: influence of presumed media influence; environmental communication; descriptive norms; subjective norms; injunctive norms; pro-environmental behavior

Motivators of Pro-environmental Behavior: Examining the Underlying Processes in the Influence of Presumed Media Influence Model

Environmental sustainability continues to be a global issue of interest to governments, scientists, international organizations, and the general public. The role of human contribution to environmental degradation makes it important to change individuals' behaviors to conserve natural resources and achieve more sustainable patterns of consumption and economic development (Vlek & Steg, 2007). Anthropogenic climate change in particular represents a significant and pressing problem that requires prompt and decisive action to attenuate its negative impact on the environment. Hence, it is necessary to understand ways to motivate environmentally responsible behaviors (Stern, 2000).

Scholars have found that the mass media can enhance people's environmental awareness and mobilize their engagement in pro-environmental behaviors (Arlt, Hoppe & Wolling, 2011; Ockwell, Whitmarsh & O'Neill, 2009). While studies have investigated the direct effects of mass media on people's environmental attitudes and behaviors (e.g., Lowe et al., 2006), few have investigated how media use may indirectly shape individuals' intentions to engage in pro-environmental behavior, through their perceptions of media influence on others, attitudes and perceptions of prevailing social norms.

To address this research gap, this study applies the influence of presumed media influence (IPMI) model (Gunther & Storey, 2003) as the theoretical framework to examine both the direct and indirect effects of mass media on *people's intentions to adopt pro-environmental behavior*. Specifically, this study aims to extend the IPMI model by empirically testing the mediating role of *perceived media influence on others* between *perceived media exposure of others* and *perceived social norms*.

Gunther and Storey (2003) postulated that people's perceptions of media influence on others might bring about changes in their attitudes and behaviors. The IPMI model proposes that people pay attention to media messages and make judgments about the nature and direction of the content. People also tend to assume that others are exposed to and influenced by the same media content, which in turn predicts their perceptions of public opinion and attitudes. Nonetheless, with few exceptions (e.g., Cho & Choi, 2011), many IPMI studies have not examined how perceived media influence on others functions as a distinct and independent mediating variable within their model, particularly between people's perceptions of others' media exposure and their perceptions of social norms. Ho, Poorisat, Neo, and Detenber (2014) had integrated three types of perceived social norms–descriptive, subjective, and injunctive norms–as mediating variables within the model to explain adolescents' attention to pro- and antidrinking media messages and their intentions to drink. However, the study did not empirically test the specific association between perceived media influence on others and perceived social norms.

In other words, despite the proposed integration of perceived social norms within the IPMI model, there remains a lack of empirical support to account for the association between people's perceptions of others' media exposure and their perceptions of social norms (e.g., Chia, 2010; Gunther, Bolt, Borzekowski, Liebhart, & Dillard, 2006; Paek, 2009). Hence, our study seeks to consider and illustrate how this relationship can be mediated by the variable of perceived media influence on others. We also empirically test the association between perceived media influence on others and the three types of perceived social norms within the model in the context of environmental behavior to demonstrate the importance of this distinct variable.

Researchers have applied the IPMI model to explain media influence on behaviors in personal contexts such as smoking (e.g., Gunther et al., 2006) and materialism (e.g., Jiang & Chia, 2009). However, people tend to perceive environmental issues such as climate change as an impersonal risk that affects distant others (Leiserowitz, 2005). Hence, it would be worthwhile to

validate the model within an impersonal context and examine how the media may influence people's behaviors in response to an impersonal risk such as environmental problems. Existing studies on environmental behavior have primarily been conducted in Western countries such as the United States. Although governments and environmental advocates have stepped up efforts to promote pro-environmental behavior in Asia, studies of public opinion toward pro-environmental behavior in a non-Western context remain scant. Hence, our study seeks to examine the applicability of the IPMI model in Singapore, a city-state in Southeast Asia. Results of our study will inform future research in other Asian contexts and offer useful suggestions for policy makers and communicators to address environmental issues.

Media Attention and Pro-Environmental Attitude and Behavior

Research on environmental communication has demonstrated the role of the mass media in shaping public attitudes toward the issue of climate change and pro-environmental behaviors (Hansen, 2011). News framing affects how people perceive and feel about climate change, which in turn influences how they act and respond to the issue (Nisbet, 2009). For example, Hart (2010) found that participants who were exposed to thematic news framing as compared to episodic news framing indicated more support for governmental policies that address climate change, as the former attributed bigger responsibility to the government for the environmental problem. Holbert, Kwak, and Shah (2003) found that fact-based television programming such as documentaries has a direct influence on people's pro-environmental behaviors including recycling and using energy-efficient products. Ho, Liao, and Rosenthal (2015) demonstrated that people with a high level of media dependency tend to engage in pro-environmental behaviors such as green-buying and environmental civic engagement. As such, we propose that attention to pro-environmental media messages is positively associated with pro-environmental behavioral intentions (Hypothesis 1 [H1]), and attitude toward pro-environmental behavior (H2).

Influence of Presumed Media Influence

We adapted the IPMI model to examine how the media may also have an indirect association with people's pro-environmental attitude and behavior. IPMI was intended as a more inclusive indirect effects model than the third-person effect (TPE) hypothesis (Davison, 1983). Third person perceptions refer to people's tendency to overestimate the influence of undesirable media messages on others and underestimate media effects on themselves (Eveland, Nathanson, Detenber, & McLeod, 1999; Ho, Detenber, Malik, & Neo, 2012). People are motivated to maintain a positive self-image, which leads them to engage in social comparisons with others that favor themselves (Hoffner et al., 2001). Hence, people tend to perceive that others are more vulnerable to persuasive media effects than themselves, and they show greater support for the restriction of harmful media content such as violent video games or sexually explicit movies (Sun, Shen, & Pan, 2008). Scholars observed that the reverse tends to occur with regard to desirable media messages, where people perceive themselves to be more influenced than others (e.g., Gunther & Thorson, 1992). In general, people respond to and act upon their perception of media influence on others, regardless of its accuracy.

TPE literature has revealed people's tendency to estimate media effects on others based on their own exposure (Jensen & Hurley, 2005). Tal-Or, Tsfati, and Gunther (2009) stated that motivational factors such as self-enhancement and unrealistic optimism affect people's estimation of media impact on themselves, yet cognitive mechanisms are at play when people make judgments about the impact of media on others. Consequently, people tend to make generalized judgments of public attitudes based on these assumptions (Gunther, Christen, Liebhart & Chia, 2001). However, while TPE emphasizes the self-other difference as the catalyst of attitudinal and behavioral change, IPMI proposes that the perception of any media influence on others is sufficient to predict changes in people's attitudes and behaviors. Unlike TPE, IPMI does not test for perceived media influence on self, focusing instead on how different levels of perceived influence on others may influence people's attitudes and perceived social norms.

The first stage of the IPMI model posits that people deduce the influence of media messages on other people based on their own exposure to these messages (Chia, 2010; Paek & Gunther, 2007). The concept of persuasive press inference (Gunther, 1998) can account for this association between personal exposure to media messages and perceptions of others' exposure to media messages. Based on this concept, people draw conclusions about the valence and direction of media messages. The more people attend to media messages, the more likely they are to assume that others are also exposed to and influenced by these messages (Gunther et al., 2006).

Existing studies adopting the IPMI model as a theoretical framework have demonstrated support for this proposition (e.g., Ho et al., 2014; Paek & Gunther, 2007). Thus, we posit that attention to pro-environmental media messages is positively associated with perceived others' attention to pro-environmental media messages (H3) and with perceived influence of pro-environmental media messages on others (H4). We also propose that perceived others' attention to pro-environmental media messages is positively associated with perceived influence of pro-environmental media messages on others (H5).

The second stage of the model posits that people's perceptions of media influence on others will be associated with their attitudes, beliefs, and behaviors (Gunther & Storey, 2003). Jiang and Chia (2009) found both direct and indirect effects of advertising on college students' materialism. College students formed perceptions of advertising influence on their peers based on their own exposure, which were positively correlated with their perceptions of peers' materialistic attitudes. The students, in turn, adjusted their own materialistic attitudes to match up with their perceptions of peers' materialism. Researchers have produced similar results across various behavioral contexts such as support for censorship (Tal-Or, Cohen, Tsfati, & Gunther, 2010), political behavior (Cohen & Tsfati, 2009), adolescent drinking (Ho et al., 2014), smoking behavior (Gunther et al., 2006), and leading a healthy lifestyle (Ho, Lee, Ng, Leong, & Tham, forthcoming). Hence, we expect people who perceive others to be influenced by pro-environmental media messages to hold positive attitudes

toward pro-environmental behavior, which will in turn be associated with their intentions to engage in pro-environmental behavior. We posit that perceived influence of pro-environmental messages on others is positively associated with pro-environmental behavioral intentions (H6), and attitude toward pro-environmental behavior will mediate the relationship between perceived influence of pro-environmental messages on others and pro-environmental behavioral intentions (H7).

The Mediating Role of Perceived Norms

Beyond attitudes, social influence also shapes people's behavioral intentions. Normative beliefs provide motivation for people to act, out of fear of social rejection (Bamberg, Hunecke, & Blöbaum, 2007). When norms are made salient, people are more inclined to engage in behaviors that are consistent with the norms (Cialdini, Reno, & Kallgren, 1990). Researchers have distinguished three types of social norms. Descriptive norms represent individuals' perceptions of what most people in the social group are doing, and provide information about what is the most common course of action taken by others regarding an issue (Cialdini et al., 1990). Subjective norms refer to the social expectations that others have toward an individual in a given situation (Ajzen & Fishbein, 1980). Injunctive norms are the social rules within a group that motivate people to engage in a behavior based on promises of social approval or sanctions (Cialdini, Kallgren, & Reno, 1991).

Social norms are shaped by communication with others, when people understand events and behaviors with which they may not have first-hand encounters with (Eveland & Glynn, 2008). Consequently, information acquired from interpersonal communication or exposure to media messages shapes social norms (Paek, 2008). Mass media facilitates social learning, and people tend to perceive media representations as a reflection of social boundaries or what is acceptable or unacceptable in society (Eveland & Glynn, 2008). Hence, the audience may regard pro-environmental media messages as portrayals of the values held by others in the society, which may shape their perceived norms on pro-environmental behaviors.

Recent environmental campaigns in Singapore have focused on normative influences on the public, such as by fostering a social norm of intolerance toward littering (National Environment Agency [NEA], 2010). Given the pervasiveness of environmental conservation campaigns and television programs on environmental awareness in Singapore, people who pay attention to these messages are likely to gather cues regarding the social norms toward pro-environmental behaviors from these media sources. Hence, we hypothesize that attention to pro-environmental media messages is positively associated with an individual's perception that other people will engage in pro-environmental behaviors (descriptive; H8), they are expected to engage in pro-environmental behaviors (subjective; H9), and others approve of pro-environmental behaviors (injunctive; H10).

However, existing literature offers limited understanding of the processes behind the indirect effects of media attention on behavior, as mediated by social norms. In particular, extant IPMI studies have not clarified the specific association between perceived media influence on others and social norms. While Ho et al. (2014) proposed the integration of social norms within the IPMI model to examine adolescents' drinking behavior, their study had assumed that adolescents deduce prevailing social norms from their perceptions of peer exposure to similar media messages to which they personally have been exposed to. Hence, this study addresses the conceptual gap by empirically testing perceived media influence on others as a mediating variable between perceived media exposure of others and perceived social norms. Additionally, we propose that pro-environmental attitude and perceived social norms may act as concurrent mediating variables between people's perceived media influence on others and their own pro-environmental behaviors.

In our study, we define pro-environmental messages as content with positive persuasive intent. Hence, Singaporeans' perceptions that others will be influenced by persuasive pro-environmental messages may shape their normative beliefs about others' environmental attitudes and behaviors. This may be in terms of what others are doing for the environment (descriptive norms), as well as the social expectations (subjective norms) and approval (injunctive norms) with regard to

their own behavior. Cialdini (2003) found exposure to public service announcements conveying the prevalence of recycling to be highly correlated with participants' intentions to recycle. White, Smith, Terry, Greenslade, and McKimmie's (2009) study on recycling supported this finding. Hence, people may perceive pro-environmental behaviors to be prevalent based on their perceptions of media influence on others.

Similarly, presumed media influence on others may be associated with people's perceptions of social expectations (i.e., subjective norms) and the pressure to perform a behavior that may be attributed to possible rewards and sanctions such as social approval received upon performing or not performing the behavior (Cialdini et al., 1990). Consequently, these perceptions could encourage people to adopt the behaviors themselves, as proposed in the following hypotheses: Descriptive norms (H11a*)*, subjective norms (H11b*)*, and injunctive norms (H11c*)* will positively mediate the association between perceived influence of pro-environmental media messages on others and pro-environmental behavioral intentions.

Tal-Or et al. (2009) described three categories of behavioral outcomes relating to IPMI: prevention, coordination and normative influence. Prevention pertains to behaviors seeking to limit the dissemination of messages perceived to be harmful, while coordination refers to actions people undertake in response to their perceptions of others' behaviors in order to achieve their own goals. As a form of prosocial action, pro-environmental behavior reflects normative influence related to people's acceptance or defiance of social norms. Therefore, our extended model, which considers perceived media influence as an important mediating variable between people's perceptions of others' media exposure and three different types of social norms, may manifest more prominently in the context of pro-environmental behaviors.

Context of Study

Singapore, a city-state in Southeast Asia, has been proactive in environmental conservation efforts. To mitigate climate change, the country has adopted long-term policies to attain energy

efficiency and has encouraged its citizens to participate in recycling efforts to minimize waste production (Chua, 2011). In addition to pro-environmental messages from environmental agencies and nongovernmental organizations such as the World Wildlife Fund, local media broadcasters have produced media programs to highlight the issue of global warming and the need to adopt environmentally friendly actions (NEA, 2010)[1]. Given that most research on environmental communication has been conducted in Western countries such as the United States, this study will offer a unique communication perspective to Asia.

Method

Using a nationwide random-digit-dialing procedure, we collected data for this study via a computer-assisted telephone interview survey. The survey was administered from January 5 to January 12 January, 2011, to a random sample of Singapore citizens and permanent residents aged 18 years and above. The survey was conducted in English, Mandarin, and Malay, the most frequently spoken languages in Singapore (Singapore Department of Statistics, 2011), to ensure that a majority of Singaporeans' opinions was captured. The interviewers were trained undergraduates from a large public university in Singapore. To ensure that a representative sample was obtained, interviewers asked to speak to the youngest male aged 18 years or above who was at home. If there were no eligible male at home at the time of the call, interviewers would ask to speak to the oldest female at home. This technique has been effective in yielding representative samples in Singapore (e.g., Ho et al., 2012; Ho, Peh, & Soh, 2013). A total of 1,144 respondents completed the survey. The final response rate, calculated based on American Association of Public Opinion Research Formula 3, was 33.4%, with a margin of error of ±3% at the 95% confidence level.

[1] Singaporeans are exposed to a wide range of pro-environmental messages on a regular basis, including government campaign advertising disseminated through the print and broadcast media (e.g., Energy Efficient Singapore Campaign; NEA, 2015) and media content such as the annual Saving Gaia documentary series produced by local broadcasters (MediaCorp, 2014).

Participants

Participants ranged in age from 18 to 81 years (*M = 39.34, SD* = 14.25)[2]. Females made up 57.1% of the sample. Religious guidance was measured by asking respondents on a 7-point Likert-type scale how much guidance religion plays in their everyday life (1 = *no guidance at all*, 7 = *a great deal of guidance*; *M* = 4.41, *SD* = 2.16). The median educational attainment[3] of the sample was "A-level," while the median monthly household income was in the range of "S$4,001 to S$5,000."

Measures

All measures, excluding questions on demographics, utilized a 7-point response format. We averaged responses to all the items corresponding to each measure to form a composite index representing each variable.

Attention paid to pro-environmental messages. Respondents indicated how much attention (1 = *no attention at all*, 7 = *very close attention*) they paid to pro-environmental messages in six media channels: television, newspapers, the Internet, magazines, outdoor media, and radio (*M* = 3.72, *SD* = 1.16; Cronbach's α = .75).

Perceived media exposure of others. The items used to measure variables in the influence of presumed influence model were adapted from a study by Gunther et al. (2006). Four items were used to measure the respondents' perception of their family members', friends', colleagues', and the general public's exposure to pro-environmental media messages (1 = *never*, 7 = *all the time*; *M* = 3.90, *SD* = 1.29; Cronbach's α = .84).

Perception of media influence on others. Four items measured the extent to which respondents think pro-environmental media messages influence their families, friends, colleagues, and the general public (1 = *no influence,* 7 = *a lot of* influence; M = 4.14, *SD* = 1.33; Cronbach's α = .88).

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[2] Mean age of males = 37.77 years; mean age of females = 40.52 years.

[3] Formal education was categorized as 1 = *no formal education*, 2 = *primary 6 or below*, 3 = *some secondary education*, 4 = *N-level/Institute of Technical Education*, 5 = *O-level*, 6 = *A-level*, 7 = *diploma*, 8 = *degree*, and 9 = *postgraduate*.

Attitude toward pro-environmental behavior. We adapted four items from Ajzen's (2006) suggestions on questionnaire construction for research application of the theory of planned behavior. Respondents were asked to indicate on a 7-point scale how much they agree that engaging in pro-environmental behaviors is "enjoyable," "beneficial," "important," and "pleasant." A higher average score indicates a more positive attitude toward pro-environmental behaviors (M = 5.08, SD = 1.43; Cronbach's α = .91).

Perceived social norms. We modified items used by H.S. Park and Smith (2007) to measure subjective, descriptive, and injunctive norms. Three items measured each type of norms on a 7-point Likert-type scale (1 = *strongly disagree,* 7 = *strongly agree*). Respondents indicated their agreement with statements that their family, close friends, and the general public engage in pro-environmental behaviors on a regular basis (M = 3.96, SD = 1.27; Cronbach's α = .71), which measured descriptive norms. To measure subjective norms, respondents indicated their level of agreement with statements that their family, close friends, and the general public expect them to engage in pro-environmental behaviors (1 = *strongly disagree,* 7 = *strongly agree*; M = 4.27, SD = 1.46, Cronbach's α = .84). Injunctive norms were measured by having respondents indicate how much they agree that their family, close friends, and the general public would approve of their engagement in pro-environmental behaviors (1 = *strongly disagree,* 7 = *strongly agree*; M = 4.67, SD = 1.36; Cronbach's α = .83).

Pro-environmental behavioral intentions. Our study modified 14 items from the General Ecological Behavior scale (Kaiser, Doka, Hofstetter, & Ranney, 2003) to measure respondents' pro-environmental behavioral intentions across the dimensions of green-buying, energy conservation, recycling, and green civic engagement. Respondents reported on a 7-point scale (1 = *strongly disagree,* 7 = *strongly agree*) their level of agreement with the following statements of behavioral intent in the next 6 months: (a) "buy products in refillable packages," (b) "buy products with green labels," (c) "buy products that come with minimal packaging," (d) "buy paper and plastic products

that are made from recycled materials," (e) "avoid buying products that have potentially harmful environmental effects," (f) "limit the use of water," (g) "use energy-efficient household devices," (h) "reduce the amount of paper I use," (i) "recycle used paper," (j) "bring empty bottles and cans to a recycling bin," (k) "sort my household trash for recycling," (l) "recycle used plastic," (m) "boycott companies known to harm the environment," and (n) "sign a petition in support of promoting the environment." Higher average scores indicated greater pro-environmental intentions (M = 4.86, SD = 1.21; Cronbach's α = .91).

Analytical Approach

We ran confirmatory factor analysis to ensure that items for each construct loaded on their respective factors, before running path analysis to test our hypotheses using Mplus 7. Path analysis allows us to test the links from our exogenous and antecedent endogenous variables to the consequent endogenous variable, and also the relationships among all exogenous and antecedent endogenous variables (Kelloway, 1998). Age, gender, education, religious guidance, and household income level were included as control variables.

We used five model fit indices—the comparative fit index (CFI), Tucker Lewis index (TLI), chi-square, normed chi-square, and the root mean square error of approximation (RMSEA)—to determine the model's goodness-of-fit. For the chi-square value, the *p*-value has to be more than .05 for the model to be considered a good fit (Barrett, 2007). The normed chi-square value should lie between 1 and 5 (Wheaton, Muthen, Alwin, & Summers, 1977). Values more than .90 indicate a good fit for CFI and TLI (Bentler, 1990), while a value lower than .05 indicates a good fit for RMSEA (Bollen & Long, 1993).

Additionally, we ran bootstrapping analysis in SPSS to estimate mediation effects in our model. Following the approach to test mediation effects outlined by Preacher and Hayes (2008), this method yields a more valid estimation by repeatedly drawing bootstrap samples to estimate a percentile-based bootstrap confidence interval. Bootstrapping (N = 1,000) was performed at 95%

confidence intervals. The indirect effect would be considered to be significant if a zero is not included in the 95% confidence interval of the estimates (Preacher & Hayes, 2008).[4]

Result

Based on our confirmatory factor analysis, the items for each construct loaded on their respective factors.[5] All of our composite measures yielded Cronbach's alphas greater than .70, which indicate high reliabiliy (Clark & Watson, 1995). We found our hypothesized model (see Figure 1) to be a good fit to the data, fulfilling the criteria for four of the model fit indices used: the CFI was .99, the TLI was .97, the RMSEA was .04, and χ^2 /degrees of freedom (df) = 2.76. Models based on large sample sizes have a higher tendency to be rejected (Kline, 2005). As the sample size of our study is considerably large (N = 1,144), it is within expectation that the model did not pass the chi-square test ($p < .05$). The squared multiple correlation of the model suggests that it accounts for 30.1% of variance in pro-environmental behavioral intentions. Figure 2 presents the amount of variance explained by the model for each construct. Indirect effects were estimated to test the hypothesized mediation effects in our model.

Figure 2 presents the results of our hypothesized model after taking exogenous variables into account. Attention to pro-environmental media messages was positively associated with pro-environmental behavioral intentions (β = .13), attitude toward pro-environmental behavior (β = .18), and perceived others' attention to pro-environmental media messages (β = .40), which supports H1 to H3. Attention to pro-environmental media messages was also found to be positively associated with the perceived influence these messages have on others (β = .20), thus supporting H4.

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[4] For the purpose of comparison, we also tested mediation effects using Andrew Hayes' PROCESS macro (Hayes, 2013). As the PROCESS macro cannot esti- mate multiple mediation effects simultaneously, we ran the test for each norm construct separately. The paths from attention to pro-environmental behavioral intentions through attitudes (β = .03, CI [.02, .04]), descriptive norms (β = .02, CI [.02, .03]), subjective norms (β = .03, CI [.02, .04]), and injunctive norms (β = .02, CI [.01, .03]) were all significant. Given the substantially similar results, we chose to report results from the bootstrap method, which allows testing of the hypothesized multiple mediation effects simultaneously.

[5] A threshold factor loading of 0.30 is the minimum value for accepting an item as belonging to a factor (Merenda, 1997). The confirmatory factor analysis results in our study showed that the factor loadings of all the constructs ranged from 0.37 to 0.87, with most exceeding 0.60 (χ^2 = 2319.37, df = 702, χ^2/df = 3.30, CFI = .93, TLI = .92, RMSEA = .05).

Perceived others' exposure to pro-environmental media messages was positively associated with perceived influence of pro-environmental messages on others (β = .45), which supports H5. Perceived influence of pro-environmental media messages on others was positively associated with pro-environmental intentions (β = .11), supporting H6. H7 posited that individuals' attitude toward pro-environmental behavior would mediate the impact of perceived influence of pro-environmental messages on others on individuals' pro-environmental intentions. We found significant positive relationships between individuals' perceived influence of pro-environmental messages on others and their attitude toward pro-environmental behavior (β = .21), as well as individuals' attitude toward pro-environmental behavior and pro-environmental behavioral intentions (β = .24). The path coefficient for this mediated relationship was also statistically significant (β = .14), as seen in Table 1. Hence, H7 was supported. Attention to pro-environmental media messages was positively associated with individuals' perceived descriptive norms (β = .13), perceived subjective norms (β = .16), and perceived injunctive norms (β = .10), lending support to H8, H9, and H10.

H11a proposed the mediating influence of descriptive norms on the impact of perceived influence of pro-environmental media messages on others on pro-environmental intentions. Significant results were found for the two intermediate paths of individuals' perceived influence of pro-environmental media messages on others on descriptive norms (β = .41), and descriptive norms on pro-environmental intentions (β = .11), as seen in Figure 2. In addition, there was a significant positive relationship for the specific indirect path between perceived influence of pro-environmental media messages on others and individuals' behavioral intentions as mediated by descriptive norms (β = .04), thus demonstrating support for H11a.

H11b posited that subjective norms would mediate the impact of perceived influence of pro-environmental messages on others on pro-environmental intentions. The paths between perceived influence of pro-environmental messages on others and subjective norms, and between subjective norms and pro-environmental intentions were both significant (β = .37 and β = .10 respectively). As

seen in Table 1, there was a significant positive relationship for the specific mediated path between perceived influence of pro-environmental media messages on others and individuals' pro-environmental intentions as mediated by subjective norms (β = .06), supporting H11b.

Finally, H11c postulated that injunctive norms would mediate the impact of perceived influence of pro-environmental messages on others on pro-environmental intentions. While the association between perceived influence of pro-environmental media messages on others and injunctive norms was statistically significant (β = .33), the relationship between injunctive norms and pro-environmental intentions was not significant (β = .02, *ns*). The mediated path coefficient was not significant as well (β = .01, *ns*). Hence, H11c was not supported in our study.

We also ran post-hoc analysis by reconfiguring the model to test other possible direct and indirect relationships. We found that the rival models yielded poorer fit compared to our original model[6], which allows us to rule out other possibilities.

Discussion

Our study presented an extended IPMI model that addressed an existing conceptual gap, by empirically verifying the association between perceived media influence on others and perceived social norms. Findings support the inclusion of perceived media influence on others as a distinct mediating variable between perceived media exposure of others and perceived social norms. Generally, our extended framework suggests that people's attention to pro-environmental media messages is associated with their attitude toward pro-environmental behavior, perceived social norms, and pro-environmental behavioral intentions both direct and indirectly. Additionally, this study demonstrated the direct and indirect associations between media attention and people's

[6] One potential rival model involves the causal influence of people's preexisting attitudes toward pro-environmental behavior on their attention to pro-environ- mental media messages. However, when we tested this alternative hypothesis by reversing the causal relationship between attitudes and media attention, the model produced a poorer fit in comparison to our original model (χ^2 = 566.26, *df* = 33, $p < .001$, χ^2/df = 17.16, RMSEA = .12, CFI = .87, TLI = .74). It may also be possible that people's perceptions of social norms would affect their perceptions of media influence on others. We tested this alternative explanation by reversing the directions of these factors, but the rival model similarly yielded poorer fit than our original model (χ^2 = 700.38, *df* = 34, $p < .001$, χ^2/df = 20.60, RMSEA = .13, CFI = .85, TLI = .67).Thus, our post hoc analysis does not present evidence supporting these rival causal hypotheses.

attitudes, norms and behaviors in response to an impersonal risk, given that previous studies have yielded similar evidence only in personal behavioral contexts, such as smoking (Gunther et al., 2006) and body image (S. -Y. Park, 2005).

People's pro-environmental intentions should not be attributed simply to their attention to pro-environmental media messages. Rather, attention to pro-environmental messages in the media might be associated with pro-environmental intentions, as a result of perceived social influences derived from people's inferred perceptions of media effects on others (Perloff, 1996). This effect may be an offshoot of people's judgment of the slant of media content following their evaluation of a typically limited amount of media content (Gunther, 1998). Consistent with existing research, we found that people's attention to pro-environmental media messages is simultaneously associated with their perceptions of others' attention to similar media messages, and their belief that others are influenced by these messages. People tend to estimate others' media exposure and presume that others are influenced by media messages (e.g., Tsfati, Cohen & Gunther, 2011). Perceptions of media influence on others consequently affect people's personal intentions to adopt pro-environmental behaviors, mediated simultaneously by attitudes and perceived social norms.

In particular, our study has furnished evidence that people who hold stronger perceptions of perceived media influence on others tend to hold a more positive attitude toward pro-environmental behavior. Our findings also verified the mediating role of perceived media influence between perceived media exposure of others and perceived social norms. Thus, people who perceive greater media influence on others will also tend to perceive others to be pro-environmental, and also perceive that others expect them to carry out pro-environmental behavior. In turn, they tend to exhibit stronger intentions to engage in pro-environmental behavior. Hence, our findings support our hypothesis that attitude toward pro-environmental behavior, as well as subjective and descriptive norms concurrently mediate the indirect influence of pro-environmental media messages on people's pro-environmental behavioral intentions.

However, the hypothesized mediating role of injunctive norms was not supported in our study (see Figure 2). White et al. (2009) have reported similar findings where injunctive norms were not found to be associated with recycling intentions when tested alongside other norms. A plausible explanation for this finding might be a lack of perceived social pressure regarding engagement in pro-environmental behavior, which is often linked to potential rewards or sanctions from performing the action. Given that pro-environmental behavior relates to an impersonal risk for society at large, people may not perceive the receipt of direct benefits or consequences imposed by others to be at stake. Thus, people may not be as motivated by the approval of others to engage in pro-environmental behavior as by their perceptions of others' pro-environmental behavior and expectations of them to similarly perform the behavior.

One limitation of this study is our examination of participants' pro-environmental intentions rather than their actual pro-environmental behaviors. While previous studies have indicated support for the likely translation of pro-environmental behavioral intentions into actual behavior (Ajzen & Fishbein, 2005), researchers can examine the extent to which these pro-environmental intentions translate into actual pro-environmental behavior within the proposed framework. Another limitation is the use of cross-sectional data in this study, which precludes any statement of causality.

Furthermore, it is possible that attitude may predict media attention instead. However, our post-hoc analysis showed that rival models yielded poorer fit compared to our original model, and which allows us to rule out other possibilities. Future studies could use longitudinal designs to verify the direction of the relationships. While our study tested the measurement model separately from the structural path model, future studies could carry out structural equation modeling analysis.

Additionally, the mediating constructs of attitude, descriptive, subjective, and injunctive norms were operationalized to measure pro-environmental behavioral intentions as a whole, rather than the specific dimensions of pro-environmental behavioral intentions measured. Future studies could operationalize these mediating constructs in a way that is specific to each dimension of pro-

environmental behavioral intentions. Researchers can also consider adopting a different conceptualization and operationalization of injunctive norms. For instance, White et al. (2009) differentiated between social and personal injunctive norms. The authors defined social injunctive norms as people's beliefs about others' approval of their behavior, while personal injunctive norms refers to their internalized moral expectations that they should perform a certain behavior.

Future studies may also consider the role of social distance when determining the effects of presumed media influence on others on people's environmental attitudes, perceived social norms, and behavioral intentions. Some studies from the TPE literature have demonstrated that the magnitude of third-person perception increased with greater perceived difference or distance between particular others and the self (e.g., Hoffner et al., 2001; Wu & Koo, 2001). Extending this notion to the IPMI model, it is possible that social distance may play a role in how perceived media influence on others and perceived subjective norms may influence behavioral intentions. While this study did not differentiate between various groups of "others," it may be worthwhile for future studies to examine the influence of social distance or referent group proximity on people's perceptions of media influence on others and social norms. Exploring different groups of "others" may illuminate potential differences in the pattern and strength of the relationships as laid out in this study, and contribute to the understanding of social distance in TPE and IPMI literature.

Our findings yield important practical implications for the design and development of pro-environmental campaign messages. Given the positive association between perceived media influence on others and perceived social norms, it would be worthwhile for communication practitioners to leverage on the indirect influence of pro-environmental media messages or the tendency of people to form perceptions of media influence on others, which in turn affects their perceived social norms regarding pro-environmental behavior. Thus, intervention strategies should prominently propagate the belief that pro-environmental media content can affect referent groups' pro-environmental attitude and behavior. Communicators can incorporate narratives in their

campaigns, through the use of stories that depict how characters learn to integrate pro-environmental behaviors within their daily lives after attending to pro-environmental media messages. The scenarios could resemble people's daily conversations and interactions with their family, friends and coworkers. Cultivating people's perceptions that others will be motivated to take action due to exposure and influence by pro-environmental media messages may be an effective way to motivate pro-environmental behavior. People may engage in more pro-environmental behavior so as to align with their perceptions of the prevalence and social expectations toward such behavior.

Moreover, it might also be beneficial to structure media messages aimed at encouraging pro-environmental behavior in a way that would have a simultaneous effect on people's descriptive and subjective norms. Campaigns should emphasize the prevalence of the behavior in society and foster perceptions of social expectations toward this desirable behavior. For example, pro-environmental media messages can highlight that most Singaporeans are recycling materials, using energy-efficient household devices, and/or limiting their water usage. This may nurture people's perceptions and beliefs that pro-environmental behaviors are commonly practiced and widely accepted by the society and important referent groups.

In conclusion, this study has presented an in-depth examination of the direct and indirect processes through which attention to media messages influences people's attitudes, norms and behavior, in the context of environment behavior. Our proposed model contributes to existing IPMI research by identifying and verifying the mediating role of perceived media influence on others between perceived media exposure of others and perceived social norms, which was often assumed but not accounted for in previous studies. This study also integrated and highlighted the importance of descriptive and subjective norms in explicating how media attention can shape various cognitive processes that lead to an individual's intentions to engage in pro-environmental behavior.

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Table 1

Path Coefficients for Mediated Relationships in Hypothesized Model.

Path	Indirect path coefficient	95% CI	
		LL	UL
Perceived Influence → Attitudes → Pro-environmental Behavioral Intentions	.14	.10	.17
Perceived Influence → Descriptive Norms → Pro-environmental Behavioral Intentions	.04	.004	.07
Perceived Influence → Subjective Norms → Pro-environmental Behavioral Intentions	.06	.03	.11
Perceived Influence → Injunctive Norms → Pro-environmental Behavioral Intentions	-.01	-.04	.02

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

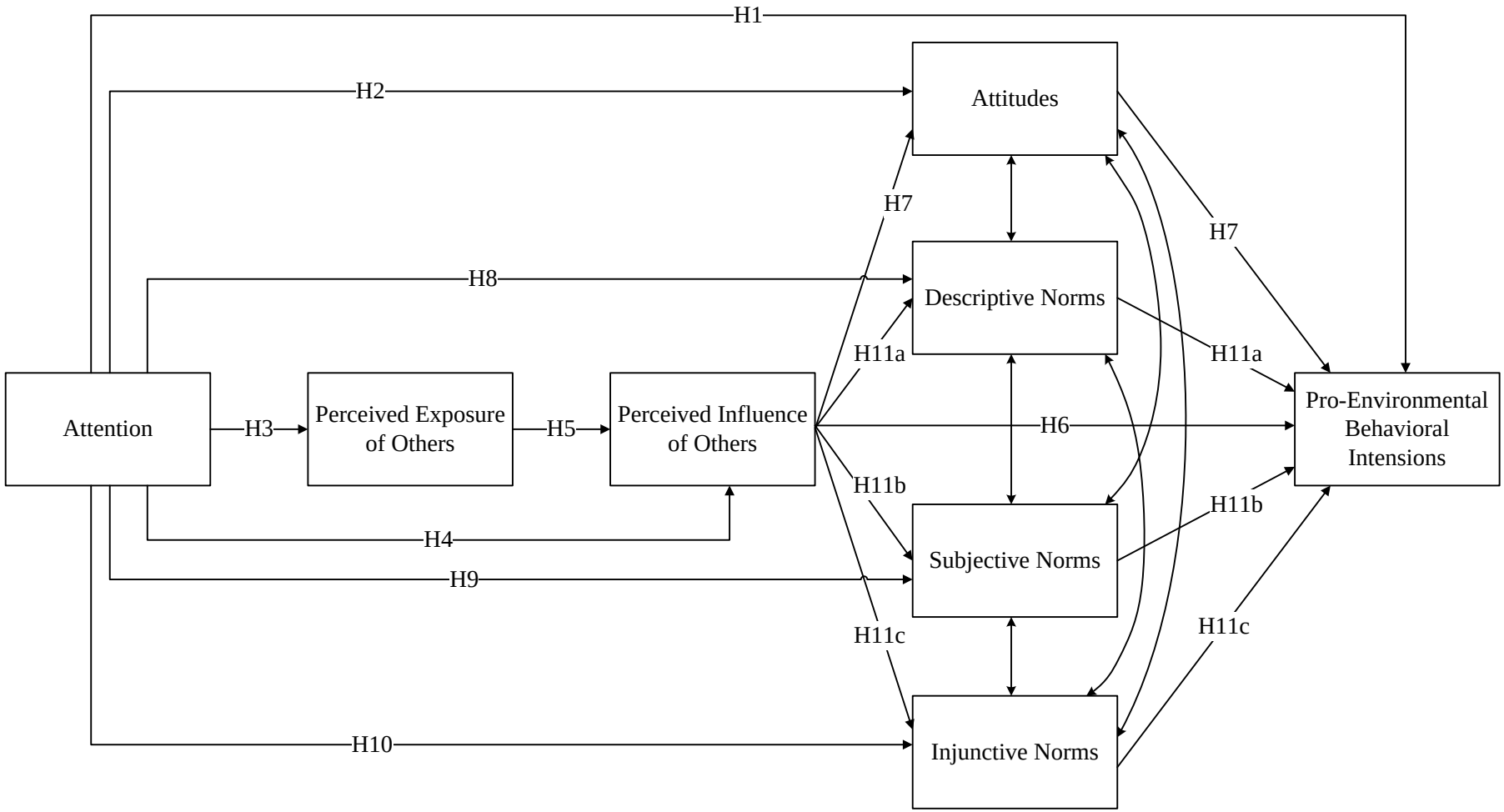

Figure 1. Hypothesized full model.
Note. H = hypothesis.

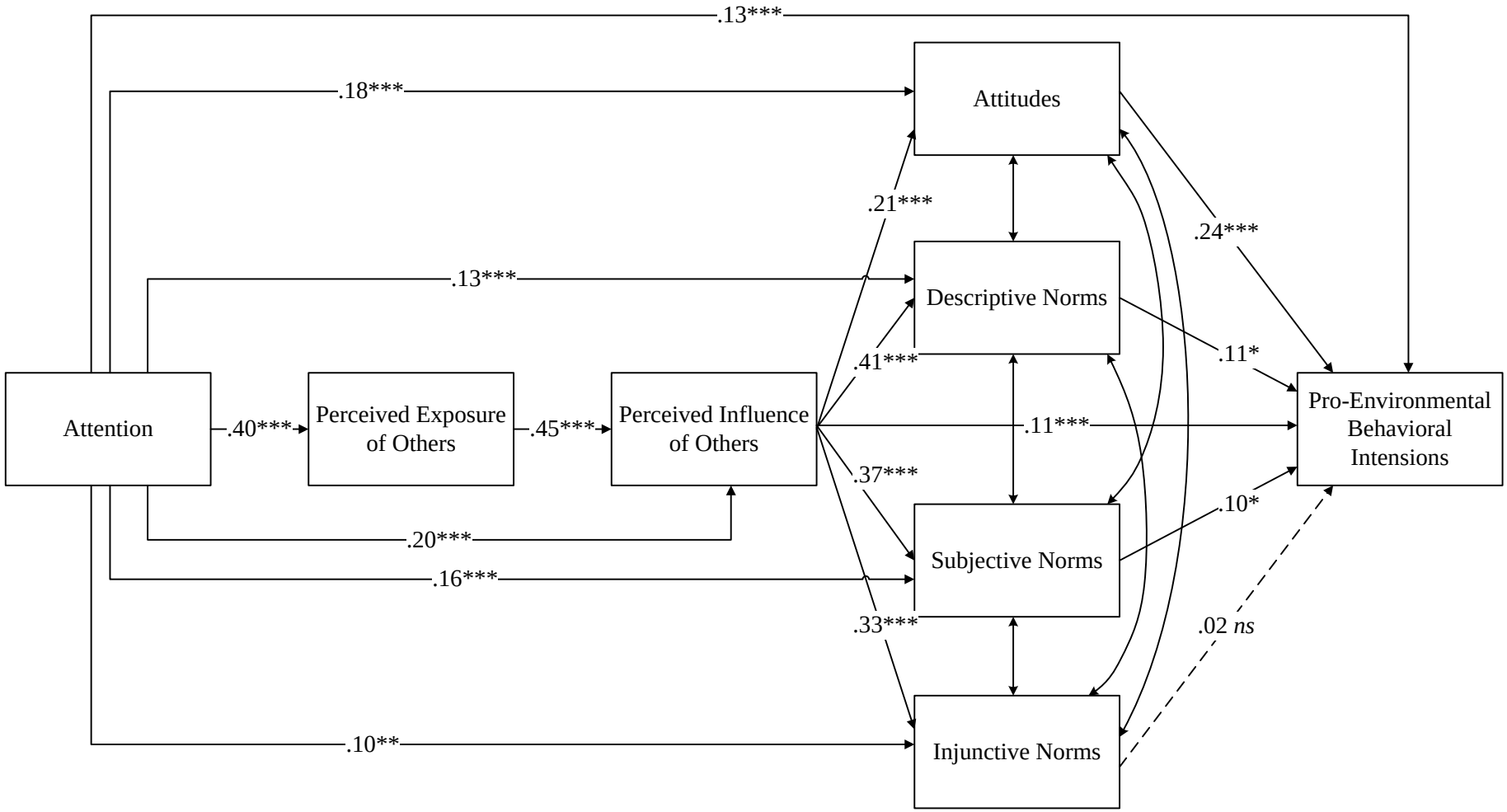

Figure 2. Full model with all norms included.
Note. Figures in parentheses indicate variance explained. Exogenous variables controlled for include age, gender, educational level, religious guidance, and household income. The coefficients in the figure are directional standardized beta coefficients. The relationships among the social norm variables were controlled for by psi coefficient and are not reported here. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.