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# Assessing immediate emotions in the Theory of Planned Behavior can substantially contribute to increases in pro-environmental behavior

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### *Scope Statement*

Our perspective piece, “Adding immediate emotions to the Theory of Planned Behavior: A prospect for augmenting pro-environmental behavioral prediction”, suggests that pro-environmental applications of Ajzen’s Theory of Planned Behavior (TPB) overlook the role of immediate emotions (i.e., the visceral emotions experienced during decision-making) in modulating individual behaviors. Instead, most pro-environmental TPB studies include anticipated emotions (i.e., the emotions a person forecasts they will experience after decision-making) and/or rely on research methods that do not reflect immediate emotions. We, therefore, advance previous work by proposing possible pathways through which immediate emotions shape our pro-environmental intentions, along with recommendations for empirically assessing immediate emotions within the TPB framework. This manuscript aligns with *Frontiers in Climate, Climate and Decision Making* as it expands on an underexplored avenue of research that could assist scientists in maximizing the psychological effectiveness of current pro-environmental messaging, interventions, and policies. We also acknowledge that climate change communicators, public authorities, and other key players in pro-environmental decision-making often underestimate the emotional impact of their initiatives, resulting in undesirable outcomes. Ultimately, we hope our insights will enable climate actors to deepen their understanding of how emotions shape our environmental choices and seize more opportunities for stimulating collective, pro-environmental action.

### *Conflict of interest statement*

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest

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Anne H Berman: Writing - review & editing. Stéphane La Branche: Writing - review & editing. Conner S Philson: Conceptualization, Writing - review & editing. David John Kavanagh: Writing - review & editing. Jackie Andrade: Writing - review & editing. Jon May: Writing - review & editing. Daniel T Blumstein: Conceptualization, Project administration, Supervision, Writing - original draft, Writing - review & editing. Vanessa C Ho: Conceptualization, Project administration, Writing - original draft, Writing - review & editing.

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### *Abstract*

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The Theory of Planned Behavior (TPB) is a highly influential and powerful behavior change model that offers promising guidance on promoting urgently needed, pro-environmental action. Recent pro-environmental research has successfully augmented TPB using anticipated emotions—the emotions an individual consciously predicts they will experience in relation to possible outcomes of their decision. However, immediate emotions—the emotions an individual actually experiences during decision-making—have received far less attention. Given that immediate emotions are relevant to pro-environmental decision-making and can address the theoretical and empirical limitations of TPB, we contend that pro-environmental studies should explicitly examine immediate emotions within the TPB framework. This article aims to stimulate rigorous research that enhances pro-environmental communication and policymaking by providing integrative insights into immediate emotions along with recommendations for evaluating immediate emotions in a pro-environmental TPB context.

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In review

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13 **Keywords: behavior change, decision making, immediate emotions, pro-environmental action,**  
14 **Theory of Planned Behavior.**

15 **Abstract**

16 The Theory of Planned Behavior (TPB) is a highly influential and powerful behavior change model  
17 that offers promising guidance on promoting urgently needed, pro-environmental action. Recent pro-  
18 environmental research has successfully augmented TPB using *anticipated emotions*—the emotions  
19 an individual consciously predicts they will experience in relation to possible outcomes of their  
20 decision. However, *immediate emotions*—the emotions an individual actually experiences during  
21 decision-making—have received far less attention. Given that immediate emotions are relevant to  
22 pro-environmental decision-making and can address the theoretical and empirical limitations of TPB,  
23 we contend that pro-environmental studies should explicitly examine immediate emotions within the  
24 TPB framework. This article aims to stimulate rigorous research that enhances pro-environmental  
25 communication and policymaking by providing integrative insights into immediate emotions along  
26 with recommendations for evaluating immediate emotions in a pro-environmental TPB context.

27 **1 Introduction**

28 Collective behavioral changes at the individual level are pivotal (Williamson et al., 2018) in  
29 addressing the current environmental plight (Bradshaw et al., 2020). Despite numerous opportunities  
30 for individuals to substantially protect the environment (Wynes and Nicholas, 2017; Williamson et  
31 al., 2018), conventional efforts encouraging pro-environmental behaviors have to date been largely  
32 ineffective, a situation that partly stems from a flawed understanding of human behavior (Clayton et  
33 al., 2015; Green et al., 2019). Current research suggests that psychological theories can help inform  
34 efforts to promote such behaviors. Among these theories is Ajzen's Theory of Planned Behavior  
35 (TPB), which has successfully predicted individuals' intentions to engage in various behaviors

36 spanning food waste reduction (Graham-Rowe et al., 2015), eco-friendly dining (Kim et al., 2013),  
37 and air conditioning use reduction (Lam et al., 2022).

38 The quintessential TPB model posits that our *attitudes* (i.e., the evaluation of behaviors as favorable  
39 or unfavorable), *subjective norms* (i.e., the perceived social pressure to perform a behavior), and  
40 *perceived behavioral control* (i.e., the extent that the performance of a behavior is perceived to be  
41 within our control) influence our intention to perform a behavior, which in turn predicts and guides  
42 our performance of the behavior (Ajzen, 2011; Ajzen and Schmidt, 2020). While alternative models  
43 are also constructive for explaining pro-environmental behaviors (Sawitri et al., 2015; Keller et al.,  
44 2019), TPB is notable for several reasons. First, TPB has reportedly contributed to 17 of 83 behavior  
45 change theories (Michie et al., 2014) and is among the most frequently applied models within  
46 (Sawitri et al., 2015; Tian and Liu, 2022) and beyond (Ajzen, 2011; Yuriev et al., 2020) the pro-  
47 environmental domain. Second, TPB yields highly effective behavior change interventions (Yuriev et  
48 al., 2020) comparable to other prominent theories (e.g., Transtheoretical Model of Behavior Change  
49 and Social Cognitive Theory; Ajzen and Schmidt, 2020). Lastly, TPB exhibits parsimony and  
50 flexibility, allowing behavioral scientists to easily incorporate and evaluate potential constructs  
51 (Yuriev et al., 2020).

52 However, TPB gives no formal role to emotions (Ajzen and Schmidt, 2020) and minimizes their  
53 importance in measurement, reasoning that emotions' effects on behavior are mediated by other  
54 factors (Ajzen, 2011). Instead, emotions are generalized as shaping the development and/or retrieval  
55 of background beliefs concerning a behavior's outcomes, social acceptability, and ease of  
56 performance; these beliefs may then inform our attitudes, subjective norms, and perceived behavioral  
57 control regarding the behavior (Ajzen, 2011). Several health psychology studies have adopted this  
58 logic by considering emotions as an affective sub-component of attitude (French et al., 2005;  
59 Kobbeltved and Wolff, 2009; Rocheleau, 2013). Clowes and Masser's (2011) study, in particular,  
60 found that anxiety correlated with less positive attitudes, subjective norms, and perceived behavioral  
61 control in relation to blood donation (Clowes and Masser, 2012).

62 Pro-environmental TPB scientists should then analyze emotions explicitly. Even if emotions tend to  
63 shape behavior indirectly, their dynamic, multidimensional nature (Chapman et al., 2017) and  
64 importance in guiding our responses to pro-environmental opportunities (Brosch, 2021; Stanley et al.,  
65 2021), messages (Nabi et al., 2018), and policies (Smith and Leiserowitz, 2014; Lu and Schuldt,  
66 2015) mean that environmental advocates can benefit from a more nuanced understanding of  
67 emotions. This is especially true since pro-environmental communicators and public authorities often  
68 oversimplify and overlook the full emotional impacts of their initiatives, resulting in suboptimal or  
69 even counterproductive outcomes (Agyeman et al., 2009; Chapman et al., 2017; Stanley et al., 2021).  
70 Furthermore, previous TPB studies in other disciplines reported significant increases in their model's  
71 explanatory power after specifically accounting for emotions (Mohiyeddini et al., 2009; Clowes and  
72 Masser, 2012; Bee and Madrigal, 2013; Berki-Kiss and Menrad, 2022), suggesting that TPB's core  
73 constructs do not capture the influence of emotions in their entirety.

74 Accordingly, recent pro-environmental studies have investigated *anticipated emotions* as a separate  
75 TPB construct. Anticipated emotions, or the emotions an individual consciously predicts they will  
76 experience given their perceptions of the decision outcomes (Loewenstein, 2000; Schlösser et al.,  
77 2013; Dunning et al., 2017), were found to enhance TPB's predictions of pro-environmental  
78 intentions (Kim et al., 2013; Graham-Rowe et al., 2015; Lam et al., 2022). For example, Graham-  
79 Rowe et al.'s extended TPB model with anticipated regret accounted for 64% of the variance in food  
80 waste reduction intentions, while the original TPB model accounted for 55% (Graham-Rowe et al.,

81 2015). Lam et al.'s extended TPB model with anticipated regret likewise accounted for an additional  
 82 32% of variance in intentions to limit air conditioning use (Lam et al., 2022). However, we contend  
 83 that existing pro-environmental TPB studies have yet to comprehensively assess another category of  
 84 emotions with significant implications for pro-environmental interventions, namely *immediate*  
 85 *emotions*. Thus, this paper aims to present a compelling case for the utility and feasibility of  
 86 examining immediate emotions in a pro-environmental TPB context.

## 87 2 Immediate emotions in pro-environmental decision-making

88 Immediate emotions are the visceral emotions an individual experiences during decision-making  
 89 (Loewenstein, 2000; Schlösser et al., 2013) and comprise a combination of incidental (i.e., arising  
 90 from factors and/or events outside of the decision at hand) and anticipatory (i.e., arising from the  
 91 decision-making process) affect (Loewenstein and Lerner, 2003; Mankad, 2012; Dunning et al.,  
 92 2017). Importantly, anticipatory emotions differ from anticipated emotions in that the former is  
 93 experienced in the current moment, whereas the latter is more closely associated with “cold”  
 94 cognition (Baumgartner et al., 2008). Table 1 summarizes the subtle distinctions between the  
 95 classifications of emotions mentioned throughout our discussion.

96 **Table 1.** Distinguishing characteristics of anticipated, immediate, anticipatory, and incidental  
 97 emotions.

Category	Description	Example with potential behavioral consequence
Anticipated	<i>Forecasted</i> in relation to perceived outcomes of a given behavior; <i>not experienced</i> during decision-making; may or may not be experienced <i>after</i> decision-making (Loewenstein and Lerner, 2003; Mankad, 2012; Feil et al., 2022)	Individual predicts they will experience regret in the event they lose money after choosing to gamble → anticipated regret deters gambling (Schlösser et al., 2013)
Immediate	Experienced <i>during</i> decision-making; often accompanied by changes in physiological state (Loewenstein, 2000; Schlösser et al., 2013)	Individual experiences excitement when presented with gambling opportunity → excitement incentivizes gambling (Schlösser et al., 2013)
Anticipatory	Subcategory of immediate emotion; experienced <i>during</i> decision-making as a result of <i>contemplating a given behavior</i> (Loewenstein and Lerner, 2003; Mankad, 2012; Feil et al., 2022)	Anxiety in response to thoughts of investing → heightens perceived riskiness of investment option → potential investor warded off (Loewenstein and Lerner, 2003)
Incidental	Subcategory of immediate emotion; experienced <i>during</i> decision-making as a result of <i>extraneous factors</i> (Loewenstein and Lerner, 2003; Mankad, 2012; Dunning et al., 2017)	Prior happiness spills over → assuages potential investor's apprehension, encouraging investment (Loewenstein and Lerner, 2003)



99 Although immediate emotions have conventionally been studied to explain economic decision-  
100 making under risk (Schlösser et al., 2013; Dunning et al., 2017), their attributes render them pertinent  
101 to pro-environmental behaviors. Immediate emotions, for one, advise and moderate decision-making  
102 behaviors by inducing heightened or reduced risk perceptions (Table 1, column 3, rows 3-4;  
103 Loewenstein and Lerner, 2003; Lerner et al., 2015; Sobkow et al., 2016). Notably, risk perception  
104 plays a critical role in shaping our receptiveness to pro-environmental acts. At the micro and meso  
105 levels of society, the objective and perceived risks of eco-friendly activities like cycling  
106 (Ravensbergen et al., 2020) and sustainable consumption (e.g., ingestion of reclaimed sewage;  
107 Powell et al., 2019) may serve as barriers to performing these behaviors. At the meso and macro  
108 levels, the diminished perception of risk regarding environmental degradation among key decision-  
109 makers commonly results in absent to minimal pro-environmental action (Rickards et al., 2014;  
110 Bradshaw et al., 2020). More thorough examinations of immediate emotions in these contexts can,  
111 therefore, enrich our understanding of how emotions can be leveraged to 1) lessen the public's risk-  
112 based avoidance of high-impact, eco-friendly behaviors and 2) address the pervasive underestimation  
113 of environmental threats.

114 Immediate emotions can also drive behaviors by reinforcing bias toward short-term decision-making  
115 (Table 1, column 3, rows 1-2; Loewenstein, 2000; Loewenstein and Lerner, 2003; Schlösser et al.,  
116 2013; Dunning et al., 2017). This aspect also makes immediate emotions worthy of increased  
117 empirical attention, considering how individuals and institutions often prioritize the short-term  
118 benefits of pro-environmental inaction over the long-term benefits of pro-environmental action  
119 (Kollmuss and Agyeman, 2002; Rickards et al., 2014). To illustrate, positive immediate emotions  
120 (e.g., happiness) associated with meat consumption and luxury vehicle usage may hinder the public  
121 from adopting a plant-based diet (Hopwood and Bleidorn, 2019) and a car-free life (Waitt and  
122 Harada, 2012), respectively, despite the known potency of these lifestyle changes in reducing  
123 greenhouse emissions (Wynes and Nicholas, 2017; Williamson et al., 2018). Negative immediate  
124 emotions (e.g., apprehension) linked to endorsing environmental initiatives that are politically  
125 unpopular and/or jeopardize a party's agenda may prod policymakers and politicians to prioritize  
126 their candidacy and public approval instead (Rickards et al., 2014; Hornsey and Fielding, 2020).

127 Other studies have continued to corroborate immediate emotions' relevance in pro-environmental  
128 decision-making. For instance, Lammers et al. (2019) identified anticipatory disgust as the strongest  
129 predictor for safe insect consumption, outweighing participant awareness of entomophagy's low-risk,  
130 high-return benefits (Lammers et al., 2019). Lu and Schuldt (2015) reported that adults recalling an  
131 autobiographical event eliciting guilt endorsed industry-targeted policies more strongly than those  
132 recalling a neutral one, thereby proving the utility of immediate emotions' incidental dimension (Lu  
133 and Schuldt, 2015).

### 134 **3 The current research gap**

135 Immediate emotions' potential for supporting pro-environmental behavior change is presently limited  
136 by a two-part literature gap. First, existing pro-environmental TPB studies underexplore immediate  
137 emotions. Advanced Google Scholar searches up to November 2022 using "TPB" and "immediate  
138 emotion\*" yielded one pro-environmental TPB study that briefly mentioned immediate emotions  
139 (Ibrahim et al., 2021), two pro-environmental TPB studies suggesting immediate emotions as a  
140 possible avenue of research (Kim et al., 2013; Brosch et al., 2014), and two pro-environmental papers  
141 examining the utility of immediate emotions for enhancing decentralized water system acceptance  
142 (Mankad, 2012) and public service announcement effectiveness (Poškus et al., 2019). Another search  
143 using "TPB" and "anticipatory" or "incidental" yielded one pro-environmental study that evaluated

144 anticipatory worry's influence on cyclists' risk-taking behavior (Kummeneje and Rundmo, 2020). A  
145 final search using "TPB" and "emotion" or "affect" yielded a single pro-environmental TPB study  
146 that investigated whether immediate emotions toward an electric car's appearance predicted  
147 intentions to use electric cars (Moons and De Pelsmacker, 2012).

148 Second, pro-environmental TPB studies inadequately represent and analyze immediate emotions,  
149 with most studies either investigating anticipated emotions as an independent TPB construct (Kim et  
150 al., 2013; Graham-Rowe et al., 2015; Ibrahim et al., 2021; Lam et al., 2022), relying on other  
151 proposed TPB constructs (e.g., attitudes, environmental concerns, moral norms, etc.) to stand for  
152 emotions (de Leeuw et al., 2015; Rhodes et al., 2015; Hameed et al., 2019; Savari and Gharechae,  
153 2020), or omitting the demarcation between anticipated and immediate emotions (Russell et al.,  
154 2017; Ansu-Mensah and Bein, 2019; Berki-Kiss and Menrad, 2022; La Barbera et al., 2022). As part  
155 of our efforts to confirm the existence of this methodological gap, we scanned through the papers'  
156 procedures to account for possible discrepancies in how researchers used (or did not use) affective  
157 terminology. Interestingly, we observed that studies typically employed approaches that did not elicit  
158 immediate emotions or consider their temporal specificity. Simply put, the researchers did not 1)  
159 have participants engage in actual decision-making (e.g., La Barbera et al. [2022] and Russell et al.  
160 [2017] inquired about participants' feelings toward food waste without presenting them with an  
161 opportunity to make a concrete decision between retaining or reducing current levels of personal food  
162 waste) or 2) use questionnaires with the appropriate written cues (e.g., Ansu-Mensah and Bein's  
163 [2019] questionnaire asks "I *will* feel X" rather than "I feel X", thereby assessing anticipated  
164 emotions; Berki-Kiss and Menrad's [2022] questionnaire asks "When I decide to do X, I feel Y",  
165 which implies that the participants are reporting emotions that occurred *after* a decision was made).

166 This oversight may ultimately result in missed opportunities for campaigners, policymakers, and  
167 other critical actors to address pressing environmental threats. Following this rationale, we aim to  
168 stimulate more empirical attention toward immediate emotions by delineating the potential  
169 theoretical and empirical benefits this construct brings to the TPB framework. We also provide  
170 pointers for productively evaluating immediate emotions.

#### 171 **4 Augmenting TPB with immediate emotions**

172 Like other behavior change models, TPB comes with theoretical limitations, one of which is the  
173 intention-behavior gap. The intention-behavior gap refers to the discrepancy between an individual's  
174 predicted and actual behavior (Ajzen and Schmidt, 2020); plausible explanations for this  
175 phenomenon include the provisional nature of intentions and the presence of methodological  
176 drawbacks (Sutton, 1998; Yuriev et al., 2020). Given this information, immediate emotions can likely  
177 ameliorate this shortcoming in two ways. First, a TPB model extended with immediate emotions may  
178 possess an increased capacity for explaining specific changes in intention. This is probable since  
179 immediate emotions at high intensities can alter our behaviors by overwhelming the cognitive  
180 processes responsible for deliberate decision-making (Loewenstein, 2000; Loewenstein and Lerner,  
181 2003). It is known that individuals experiencing heightened levels of immediate emotions tend to be  
182 more impulsive and face greater difficulties with suppressing problematic behaviors like aggression,  
183 overconsumption, and substance abuse; here, immediate emotions can be construed as disrupting pre-  
184 existing intentions to avoid these adverse actions (Pearlstein et al., 2019; Elliott et al., 2023).

185 Second, TPB studies that deliberately factor in immediate emotions will have the opportunity to  
186 adopt empirical approaches that remedy their methodologies' weaknesses. Specifically, research on  
187 immediate emotions generally have participants engage in tasks that activate their decision-making

188 processes; this is done to accommodate the fact that immediate emotions are experienced *during*  
189 decision-making (Schlösser et al., 2013). For example, Notaro and Grilli's (2022) inquiry on how  
190 emotions shape public preferences for wildlife conservation had participants choose between  
191 different monetary amounts that they would donate to conservation efforts (Notaro and Grilli, 2022).  
192 It is also common for affective research to ascertain participants' immediate emotions via objective  
193 physiological measures, which is feasible given that immediate emotions are *actually experienced*  
194 (Schlösser et al., 2013). To illustrate, Bettiga and Lamberti (2020) successfully distinguished  
195 anticipatory happiness from anticipated happiness by analyzing participants' micro-expressions  
196 (Bettiga and Lamberti, 2020). These experimental methods have significant implications for  
197 increasing the reliability of TPB findings, especially since TPB studies heavily rely on questionnaires  
198 and other self-reported measures that are 1) usually limited to gauging hypothetical rather than  
199 authentic intentions (Sutton, 1998) and 2) highly susceptible to self-report bias (Yuriev et al., 2020).

200 Besides the possibility of reducing TPB's intention-behavior gap, immediate emotions could improve  
201 TPB's predictive power by serving as potential measures of past behavior. To clarify, psychologists  
202 have recognized past behavior as a significant indicator for future conduct but could not explain this  
203 phenomenon with TPB's main predictors or other commonly considered constructs (e.g., anticipated  
204 emotions, habit strength, and self-identity; Ajzen, 2011). Ajzen thus proposed the existence of  
205 "missing" variables that mediate past behaviors' influence on intentions. Prior research paints  
206 immediate emotions as a strong contender. For instance, Feil et al.'s (2022) investigation on the  
207 affective drivers of physical activity discovered that immediate emotions associated with  
208 participants' earlier fitness sessions 1) resurfaced when participants pondered a prospective  
209 opportunity to exercise and 2) correlated with the participants' overall exercise frequency (Feil et al.,  
210 2022). Kuwabara and Pillemer (2010) analogously observed that participants prompted to recall  
211 pleasant university experiences subsequently experienced positive immediate emotions while  
212 deciding whether to contribute to their alma mater; additionally, the more intense their positive  
213 immediate emotions were, the stronger their intentions and decisions to contribute (Kuwabara and  
214 Pillemer, 2010).

215 Neuropsychology also supports this notion that immediate emotions recur and shape current conduct  
216 when previous behaviors or experiences are recalled. According to Damasio's somatic marker  
217 hypothesis, prior decision-making events are coupled with bodily responses such as changes in blood  
218 pressure, electrodermal activity, and heart rate; when an individual encounters similar decision-  
219 making opportunities in the future, these bodily responses are reproduced and function as biological  
220 signals that antecedently guide conscious decision-making (Damasio et al., 1996). In other words,  
221 immediate emotions—which are tied to changes in physiological states (Loewenstein, 2000;  
222 Schlösser et al., 2013; Dunning et al., 2017)—can be interpreted as evolutionary features designed to  
223 rapidly inform our behavioral intentions. Extant research has also identified immediate emotions'  
224 visceral aspect as a critical element for adaptive learning and decision-making (Carter and Pasqualini,  
225 2004; Ohira, 2010), with some studies describing this facet as offering biologically "preprogrammed  
226 but partially modifiable behavioral routines" (Pacella et al., 2017; Tyng et al., 2017). In summary, a  
227 TPB model extended with immediate emotions may better predict our intentions because it would  
228 likely account for past behavior's residual effects on current intention.

229 Altogether, we strongly recommend that pro-environmental TPB scientists place greater emphasis on  
230 immediate emotions and their associated evaluation methods when designing their studies. Table 2,  
231 informed by our discussion and literature review findings, presents guidelines for prospective  
232 researchers looking to examine immediate emotions as a distinctive variable.

233 **Table 2.** Recommendations for empirically evaluating immediate emotions

Immediate emotions' attribute of interest	Suggested research protocol	Example set up
Occurrence <i>during</i> decision-making, i.e., temporal specificity) (Loewenstein, 2000; Schlösser et al., 2013)	<ol style="list-style-type: none"> <li>1. Engage participants in tasks that activate their decision-making processes.</li> <li>2. Use appropriate verbal and/or written cues when questioning participants about their immediate emotions.</li> </ol>	<ul style="list-style-type: none"> <li>• Participants are presented with various pro-environmental options and instructed to decide as if their selection was binding (Notaro and Grilli, 2022).</li> <li>• Researchers explain the differences between anticipated and immediate emotions to participants (Feil et al., 2022).</li> <li>• Researchers explicitly ask participants to report how they feel <i>right now</i> (Clowes and Masser, 2012; Schlösser et al., 2013; Feil et al., 2022).</li> </ul>
Association with hot-cognition and visceral feelings (Loewenstein, 2000; Schlösser et al., 2013; Dunning et al., 2017)	<ol style="list-style-type: none"> <li>1. Assess and verify immediate emotions using physiological measures.</li> </ol>	<ul style="list-style-type: none"> <li>• Researchers analyze participants' micro-expressions to distinguish between anticipated and anticipatory emotions (Bettiga and Lamberti, 2020).</li> </ul>
(Potential) mediator between past behavior and intention (Kuwabara and Pillemer, 2010; Feil et al., 2022)	<ol style="list-style-type: none"> <li>1. Inquire about emotional memories related to the study's behavior of interest.</li> <li>2. Evaluate data to identify correlations between past behavioral experience, present immediate emotions, and participants' behavioral intentions/performance.</li> </ol>	<ul style="list-style-type: none"> <li>• Researchers conduct face to face interviews where participants discuss how their prior behavioral experiences relate to their current anticipatory emotions toward a comparable, target behavior; data is then decoded and correlated with how frequently participants perform the targeted behavior (Feil et al., 2022).</li> </ul>

234

235 **5 Discussion and future research**

236 Thus far, the prospects of explicitly examining immediate emotions within TPB appear highly  
 237 promising. Immediate emotions are not only relevant for a wide variety of optimal pro-environmental  
 238 behaviors but also possess the potential to mitigate TPB's intention-behavior gap and the  
 239 unexplained, residual effects of past behavior on current decision-making. Our contribution lies in 1)  
 240 identifying the empirical, methodological, and interdisciplinary gap pertaining to immediate  
 241 emotions in pro-environmental TPB literature and 2) offering suggestions for addressing this gap.

242 Nonetheless, there are limitations to this paper. First, immediate emotions are discounted from  
243 further TPB scrutiny because they only directly influence intentions in special circumstances (e.g., at  
244 high levels of intensity [Loewenstein, 2000; Loewenstein and Lerner, 2003] and when memories of  
245 past behavior are triggered [Kuwabara and Pillemer, 2010; Feil et al., 2022]); Ajzen's sufficiency  
246 assumption states that additional variables merit investigation only if they consistently share a direct,  
247 causal relationship with intentions (Ajzen, 2011). It is then imperative to emphasize that regardless of  
248 Ajzen's stance, immediate emotions in their entirety (including their indirect effects on intentions)  
249 are important for influencing and understanding behaviors (Loewenstein and Lerner, 2003) as well as  
250 for designing interventions (Chapman et al., 2017). Pro-environmental TPB scientists have even  
251 acknowledged the importance and necessity of studying traditionally secondary but contextually  
252 significant variables (Yuriev et al., 2020).

253 Second, while it is ideal to engage participants in authentic decision-making and to verify their  
254 immediate emotions through objective physiological measures, executing these research tasks may  
255 conflict with the researchers' time and monetary constraints. In situations where it is unfeasible to  
256 employ these methods, researchers can consider designing and relying on more comprehensive  
257 questionnaires that include both discrete (e.g., studying specific immediate emotions like immediate  
258 anxiety; Clowes and Masser, 2012; Feil et al., 2022) and dimensional (e.g., assessing immediate  
259 emotions on a continuum like immediate levels of arousal; Schlösser et al., 2013) measures.

260 Finally, our recommendations for empirically evaluating immediate emotions may be insufficient for  
261 studying mixed emotions. Individuals can experience different immediate and anticipated emotions  
262 simultaneously (Loewenstein and Lerner, 2003; Dunning et al., 2017), which makes it less  
263 straightforward to understand how immediate emotions might guide our decisions to engage in pro-  
264 environmental behaviors. Future research will need to determine how specific immediate emotions  
265 interact with each other, the necessary conditions for one emotional reaction to emerge over another,  
266 and how these interactions may differ between short and long-term decision-making. Ultimately, a  
267 thorough understanding of the mechanisms through which immediate emotions impact our decisions  
268 and behaviors can have powerful implications for designing interventions that stimulate urgently  
269 needed pro-environmental action.

## 270 **6 Conflict of Interest**

271 The authors declare that the research was conducted in the absence of any commercial or financial  
272 relationships that could be construed as a potential conflict of interest.

## 273 **7 Author Contributions**

274 VCH: Writing – original draft, Writing – review & editing, Conceptualization, Project  
275 administration; AHB: Writing – review & editing; JA: Writing – review & editing; DJK: Writing –  
276 review & editing; SB: Writing – review & editing; JM: Writing – review & editing; CSP: Writing –  
277 review & editing, Conceptualization; DTB: Writing – original draft, Writing – review & editing,  
278 Conceptualization, Project administration, Supervision.

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293 [using-the-theory-of-planned-behavior/BB87E67D7E443C718DE4BFA0EA9356DE](https://www.cambridge.org/core/books/handbook-of-behavior-change/changing-behavior-using-the-theory-of-planned-behavior/BB87E67D7E443C718DE4BFA0EA9356DE)  
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