



The motivational dynamics of arousal and values in promoting sustainable behavior: A cognitive energetics perspective [☆]



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ABSTRACT

This research applies Cognitive Energetics Theory (CET) to explain when and why consumers engage in sustainable behavior. Across six studies, we find a positive interaction effect of arousal and openness-to-change on sustainable behaviors. In particular, openness-to-change (vs conservation) increases the likelihood of engaging in effortful sustainable behaviors in a high-arousal state rather than in a low-arousal state. Interestingly, our results reveal that this interactive effect is explained by the tendency of consumers to believe that the target sustainable behavior requires *less effort*, when they are in a high-arousal state and endorsing openness-to-change. Moreover, perceived effort is positively related to sustainable behavior for experienced consumers but negatively related to the behavior for less experienced consumers. In addition, the effect of value and arousal on perceived effort is stronger among less experienced consumers but attenuated among more experienced consumers. Thus, arousal can serve as a catalyst to enhance value-consistent sustainable behaviors and help the less experienced consumers form habits. These findings contribute to CET by highlighting the important roles that values and arousal play in the motivational forces that drive and restrain sustainable behaviors. The results improve our understanding of how to motivate value-consistent sustainable behaviors, with implications for both marketers and policy-makers.

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1. Introduction

Arousing stimuli are commonplace in advertising and consumer marketing (Das & Hagtvedt, 2016; Holmqvist & Lunardo, 2015; Keh, Wang, & Yan, 2021; Puccinelli, Wilcox, & Grewal, 2015). Prior research has examined the effects of arousal—defined as a state of activation or energy mobilization ranging from sleepy to excited (Mehrabian & Russell, 1974)—in a variety of contexts, including product choice, product display, ad effectiveness, and review helpfulness (e.g., Berger & Milkman, 2012; Di Muro & Murray, 2012; Kim, Park, & Schwarz, 2010; Noseworthy, Di Muro, & Murray, 2014; Yin, Bond, & Zhang, 2017). We contend that arousal also plays an important role in sustainable behavior, contingent upon the values that a consumer holds or the values that a brand expresses in its marketing messages.

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To explain this interplay between arousal and values, we draw on Kruglanski's (2012) Cognitive Energetics Theory (CET). CET states that the probability of taking action is determined by the balance between driving and restraining forces. Simply put, when the driving force exceeds the restraining force action is likely, and when the restraining force is greater than the driving force action is unlikely. Prior CET research has highlighted goal importance and resource availability as the key driving forces; while task demands, competing goals, and a tendency to conserve resources are critical restraining forces (Bélanger et al., 2015; Kruglanski et al., 2012; Milyavsky et al., 2019). We add to this literature by proposing that values—and, in particular, the openness-to-change versus the conservation dimension of human values (Schwartz, 1992)—can be important driving forces that direct available energy resources (i.e., *arousal*) to promote sustainable behavior, such as recycling and green purchases. In addition, we identify perceived effort as a restraining force in the process and demonstrate that the *reduction in perceived effort* explains the interactive effect of arousal and values on sustainable behaviors. Moreover, we propose that consumer experience moderates the interaction effects of value and emotion on perceived effort as well as the effect of perceived effort on sustainable behavior. The results of six studies, reported below, support these predictions.

We contribute to the literature by addressing the gap between values and sustainable behavior—that is, although people have positive attitudes toward and value sustainable behaviors, they often fail to “walk their talk” (Carrington, Neville, & Whitwell, 2010; Malloy, 2018). The paper not only finds a positive effect of arousal in value-consistent behaviors, but also demonstrates that perceived effort can be an important restraining force. Moreover, our results indicate that these effects are especially salient among novice consumers. As a result, this research deepens our understanding of the motivational dynamics of sustainable consumer behavior from an affect and a values perspective. The paper concludes with a discussion of the theoretical and practical implications of our findings, as well as directions for future research.

2. Theoretical background

2.1. Arousal: The feeling of energy that prepares the body for action

Arousal is often defined as the dimension of affect that ranges from sleepy to excited (Mehrabian & Russell, 1974). While the valence dimension of affect determines how pleasant or unpleasant a person feels which is used to distinguish “positive” and “negative” affective states, arousal reflects the experience of energy mobilization or activation (Russell & Barrett, 1999). Scales measuring arousal utilize words such as “calming” versus “exciting,” “mellow” versus “fire-up” and so on (Keh et al., 2021; Yin et al., 2017). Disentangling arousal from valence is important, as the two dimensions are independent and have distinct effects (Brown & Curhan, 2013; Di Muro & Murray, 2012; Russell & Barrett, 1999). For example, Berger and Milkman (2012) operationalize arousal using specific emotions and found that online content that evoked high-arousal emotions was more viral, regardless of the valence of the emotions.

Prior work has shown that arousal is the feeling of energy activation corresponding to physical changes that prepare a body for action (e.g., elevated heart rate, higher blood pressure, etc., Brown & Curhan, 2013; Pham, 1996; Sanbonmatsu & Kardes, 1988). Arousal has been shown to have important effects on consumer behavior (Holmqvist & Lunardo, 2015; Keh et al., 2021; Noseworthy et al., 2014). For example, consumers' product preferences are affected by the interplay between arousal and the valence of their affective state, such that consumers in a pleasant (vs unpleasant) mood prefer products that are congruent with their current level of arousal (Di Muro & Murray, 2012). Importantly, arousal has also been found to function as a motivational force when consumers are engaged in attitude change (Cooper, Zanna, & Taves, 1978; Raju & Unnava, 2006).

2.2. Cognitive energetics theory

Cognitive Energetics Theory (CET; Kruglanski et al., 2012) provides a deeper explanation of the role of energy in motivated reasoning and behavior change. The basic premise is that goal-directed action depends on two opposing forces: the *driving force* (i.e., the energy allotment to a given activity) and the *restraining force* (i.e., energetic demands the activity poses). The driving force is the amount of energy that an individual invests in goal pursuit. This force is determined by the importance of the goal (i.e., direction for action) and the individual's available resources. According to CET, energy will be applied to whatever goal is currently active and that the availability of resources matters more as task difficulty increases (Bélanger et al., 2014).

The restraining force, which opposes the driving force and inhibits goal pursuit, is the cumulative resistance of task demands, competing goals and the individual's inclination to conserve resources. A person is likely to act only when the driving force is equal to or greater than the restraining force. Recent research has found support for CET in various domains looking at goal-directed behavior, including cognitive reappraisal (Milyavsky et al., 2019), emotion regulation (Sharvit et al., 2015), judgements of the self and others (Bélanger et al., 2014; Bélanger et al., 2015) and memory retrieval tasks (Pica et al., 2013). In this paper, we examine CET in the context of sustainable consumer behavior and directly test the motivational dynamics of arousal and change-regulating values (openness-to-change vs conservation) as driving forces that promote recycling and green purchases.

2.3. Change-regulating values

Human values reflect what we consider to be important in life and, as such, they play a key role in motivating behavior (Schwartz, 1992, 2009; Schwartz et al., 2012). They represent generalized goals capable of guiding action across time and context (Bardi & Schwartz, 2003; Rokeach, 1973). Schwartz (1992) proposed a universal structure of human values with four major values mapping in two bipolar dimensions: self-enhancement values opposed to self-transcendence values (i.e., the SET dimension), and openness-to-change values opposed to conservation values (i.e., the OC dimension). The SET dimension reflects self-regulating values whereas the OC dimension reflects change-regulating values (Tamir et al., 2016).

The current research focuses on OC dimension (openness-to-change vs conservation), because openness-to-change is critical in adopting a variety of new behaviors (Bagchi et al., 2015; Gupta & Arora, 2017; Roczniawska & Higgins, 2019)—including, sustainable behaviors, such as driving electric cars (Barbarossa, De Pelsmacker, & Moons, 2017). Openness-to-change reflects the degree to which a person is motivated to follow his or her own thoughts and act to make changes, including the values of self-direction and stimulation; whereas conservation reflects a motivation to preserve the status quo, including the values of security, tradition, and conformity (Schwartz, 1992, 2009). As life guidelines, openness-to-change emphasizes openness, focusing on favoring change, challenging the status quo, guiding people towards action and pursuing new experiences. Conversely, conservation emphasizes self-discipline, focusing on the preservation of traditions and stability, guiding people toward security and maintaining the status quo (Boer & Fischer, 2013; Schwartz et al., 2012). Thus, from a motivational perspective, the values of openness-to-change and conservation are in conflict (Bardi & Schwartz, 2003; Boer & Fischer, 2013). Prior research suggests that openness-to-change is positively related to sustainable behavior (Karp, 1996) and more likely to translate intentions to behavior (Barbarossa et al., 2017). We show that the positive effect of openness-to-change (vs conservation) value on sustainable behavior lies in its interaction with arousal.

3. Hypotheses development

3.1. The joint driving force of arousal and openness-to-change

CET suggests that increasing the magnitude of a driving force enhances the likelihood of goal attainment. A driving force influences behavior by determining both a direction (e.g., goals or values) and the intensity (e.g., arousal) with which this direction is pursued (Atkinson, 1957). While arousal provides the energy to act, having that resource available is a necessary but insufficient condition for goal attainment (Kruglanski et al., 2012).

This is where human values come into play. They can direct resource allocation during goal pursuit (Halbesleben et al., 2014). For example, when a value that involves the self is activated, it makes success more salient and justifies the mobilization of resources (Gendolla & Richter, 2010). We contend that the value activated in the consumer's mind serves as directional motivation—it highlights the importance of the goal and guides the allocation of resources towards achieving that goal (Hart & Gable, 2013). Thus, when a person is high in arousal and open-to-change, they will tend towards action.

Conversely, conservation motivates people to resist change, maintain the status quo and conserve energy (Purko, Schwartz, & Davidov, 2011), thus reducing the tendency that people will take action despite resource availability. Finally, according to CET, when arousal is low, the driving force of value (openness-to-change vs conservation) is weak and action is less likely. Thus, consumers are most likely to engage in sustainable behavior when openness-to-change is activated and accompanied by a high level of arousal. Formally,

H1: There is an interaction effect of arousal and values such that openness-to-change promotes sustainable behaviors compared to conservation in a high-arousal state, but not in a low-arousal state.

3.2. The mediating role of perceived effort

CET indicates that a person is likely to act only when the effective driving force is equal to or greater than the restraining force (Kruglanski et al., 2012). In the context of sustainable behavior, restraining forces could be physical costs (e.g., effort required to travel to a specific recycling station) or mental costs (e.g., effort required to classify materials into different types of recycling bins) (Smith, 1972). Perceived effort is an important restraining force (Song & Schwarz, 2008) and it is closely related to the mobilization of resources in goal pursuit (Gendolla & Richter, 2010). Thus, we suggest that consumers will tend to engage in sustainable behaviors only when their driving force exceeds the restraining force of perceived effort.

Following Kivetz (2003), we define perceived effort as any inconvenience, difficulty or cost inherent in executing sustainable behaviors—such as the extra exertion required to recycle at a particular location, the time cost of recycling, the physical energy expended when sorting garbage, etc. Prior research has demonstrated that perceived effort can be a major impediment to behavior change (de Morree & Marcora, 2015) in activities that range from adopting an exercise routine (e.g., DuCharme & Brawley, 1995) to changing one's diet (e.g., Sparks, Guthrie, & Shepherd, 1997).

Intuitively, the strength of the driving force will affect how daunting consumers perceive the restraining forces to be. For example, if a consumer is feeling full of energy, then a task, like recycling, will seem less difficult. However, that same recycling task is likely to appear more difficult if a consumer is feeling low in energy. This notion extends prior work, which has

found that when people feel more able or confident in their ability to complete a task, they tend to believe that the task will be easier (Hutchinson et al., 2008; McAuley & Courneya, 1992; Robbins et al., 2004; Rudolph & McAuley, 1996). Building on these findings, we make a novel prediction that, when arousal increases among consumers who value openness-to-change (vs conservation), perceptions of the effort required to execute a sustainable behavior will *decrease*. This prediction is consistent with the general notion that people are more likely to engage in a behavior when it requires less effort (Kivetz & Simonson, 2003; Song & Schwarz, 2008). For example, when people believe that the effort required to complete a task is relatively low, they tend to see their goals as more desirable and more attainable (Schwarz, 2004). Conversely, high perceived effort may make outcomes appear less attainable and less desirable (Luce, Payne, & Bettman, 1999; Song & Schwarz, 2008). Therefore,

H2: The interaction effect of arousal and values on sustainable behaviors is driven by perceived effort required for sustainable behavior, which in turn increases the likelihood of engaging in the target behavior.

3.3. The moderating effect of consumer experience

We further propose that customer experience could affect the interaction of arousal and values on perceived effort because of the learning curve effect. Specifically, experience improves the efficiency of engaging in a target behavior, which is reflected in a decrease in the time and cognitive cost required to complete a given task and an increase in the ease of engaging in that behavior (Card, Moran, & Newell, 1983). Thus, experienced consumers would perceive less effort needed for the target behavior regardless of arousal. Moreover, experience causes an increase in the probability of an action being performed when a congruent goal is activated but a decrease in that probability when an incongruent goal is activated (Murray & Häubl, 2007). As a result, when openness-to-change is activated, experience itself can help enhance value-consistent behavior, regardless of arousal level. However, novice consumers are more likely to believe that greater effort is needed for the target behavior due to lack of experience. In that case, high arousal could help reduce perceived effort. In other words, we expect that the interaction effect of arousal and value on perceived effort only works for novice consumers, but not for experienced consumers. Formally,

H3a: Consumer experience moderates the joint effect of value and arousal on perceived effort, such that the effect is stronger for less experienced consumers, but attenuated for more experienced consumers.

In addition, we expect customer experience will also affect the relationship between perceived effort and behavioral intentions. Prior research has generally viewed effort as costly and, as a result, more effortful options are avoided (Murray & Häubl, 2007; Payne et al., 1993; Shugan, 1980). However, in a review article, Inzlicht, Shenav and Olivola (2018) contend that when people learn that effort is consistently rewarded, effort comes to be seen as valuable and they become more willing to exert it, possibly even seeking it out. This is related to the notion of “learned industriousness”—when effort is rewarded, people become less averse to expending it (Eisenberger, 1992). We extend our theory by suggesting that if a consumer regularly engages in a sustainable behavior (e.g., recycling), they may learn that effort has a positive effect (e.g., recycling reduces the amount of garbage that they produce). As a result, they become less averse to exerting that effort and more likely to engage in sustainable behavior. Novice consumers, however, remain averse to effort because they are aware of the cost but have less experience with the benefits. Formally,

H3b: Consumer experience moderates the effect of perceived effort on sustainable behavior such that perceived effort is negatively related to sustainable behavior for less experienced consumers, but positively related to sustainable behavior for more experienced consumers.

The overall theoretical framework is shown in Fig. 1.

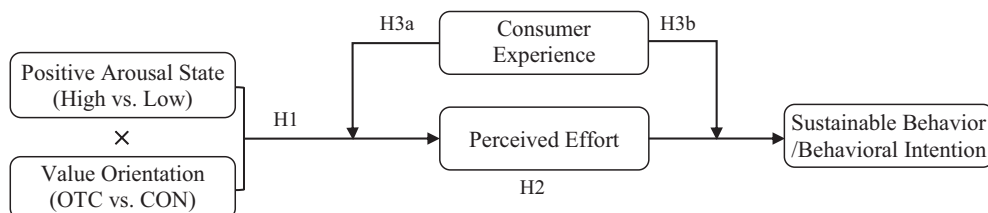


Fig. 1. Overall Theoretical Framework.

3.4. Overview of studies

We tested our predictions in six studies, including one actual behavior study. To increase the practical implication of the findings, we operationalized arousal through various forms such as specific emotions, product experience or expressed arousal in messages (e.g., Berger & Milkman, 2012; Kim et al., 2010; Yin et al., 2017). Our focus in this research is positively valenced state of arousal, which were operationalized through image-elicited or product-evoked emotions (Studies 1a and 2), message-evoked arousal (Studies 1b, 3 and 5) and expressed arousal in online review (Study 4).

Studies 1a and 1b provide initial evidence that high arousal enhances the effect of openness-to-change (vs conservation) value on intention to use a reusable travel mug and recycling intention respectively (H1). Study 2 replicates the interaction effect using different priming methods and tests it on an actual behavior (i.e., signing up to participate in a garbage classification activity). Study 3 tests the underlying mechanism of perceived effort (H2) using a measurement-of-mediation design in the context of recycling behavior. As a complementary, Study 4 uses a moderation-of-process design (Spencer, Zanna, & Fong, 2005) to test the underlying mechanism in green purchase decision. Finally, Study 5 explores the moderating effect of customer experience on the proposed effects (H3a and H3b). We summarize the operationalizations of key constructs and main purposes of studies in Table 1.

4. Study 1: Interaction effects on recycling behavior

We conducted S1a and S1b to explore how arousal interacts with openness-to-change (vs conservation) to affect sustainable behavioral intentions (H1). Study 1a included a neutral affective state as the control condition to test the baseline effect of arousal and values. We predict that a high-arousal state enhances sustainable behavioral intentions when combining with openness-to-change value compared to when combining with conservation value, whereas a low-arousal state would not make a difference regardless of values.

4.1. Study 1a method

Design and participants. Study 1a (https://aspredicted.org/4PX_JRT) was a preregistered study using a 3 (arousal: high vs low vs control) × 2 (salient value: openness-to-change vs conservation) between-participants design. The dependent variable was the likelihood to use a reusable travel mug for coffee instead of using a disposal cup. Following the preregistration, we recruited 650 participants on the Prolific platform with nominal payment. We excluded participants who failed the attention checks or completed the survey too fast. Thirty-two participants were excluded, leaving 618 responses for the analyses (43.7 % female, $M_{age} = 35.64$). The data is stored at https://osf.io/8q5z6/?view_only=aab6d7d053ac48a985a24ee229440786.

Value priming. Participants were instructed to write a short essay to persuade others on the importance of life guidelines related to openness-to-change or conservation, through which we activated the target values (see Arieli, Grant, & Sagiv, 2014; Tamir et al., 2016, for the similar manipulation method). Specifically, participants in the openness-to-change condition were asked to write about the importance of having *stimulation* and *self-direction* as guidelines in life; while those in the conservation condition were asked to write about the importance of having *security* and *tradition* as life guidelines. After completing the writing task, participants rated how difficult it was for them to demonstrate the personal importance of the target values in the writing task (1 = *very easy*, 7 = *very difficult*; $M = 3.51$, $SD = 1.70$). We measured perceived difficulty of the writing task to ensure the two value conditions did not differ in effort exerted during the survey session. As a manipulation check, we measured the importance of openness-to-change value using three items (*open to new things, challenge the status quo, and pursue changes*; $M = 5.06$, $SD = 1.37$, $\alpha = 0.86$) and conservation value using three items (*respect for tradition, seek security, and maintain the status quo*; $M = 4.49$, $SD = 1.29$, $\alpha = 0.72$) on a 7-point Likert scale (1 = *not important at all*, 7 = *very important to me*).

Table 1
Overview of empirical studies.

Study	Operationalization		Dependent variable	Main purpose
	Values	Arousal		
1a	Persuasion writing task	Image-evoked arousal in ad	likelihood to use a travel mug for coffee	Test H1 to establish the baseline interaction effect
1b	Message expressed values in poster	Message-evoked arousal in poster	Recycling intention	Increase the practical implication and test H1
2	Value importance message	Product-evoked arousal	Actual sign-ups for garbage classification activity	Increase the external validity in a field setting using actual behavior, further test H1
3	Message expressed values in poster	Message-evoked arousal in poster	Recycling intention	Test H2 using measurement-of-mediation design.
4	Brand value orientation	Express-arousal in online review	Purchase intention for green product	Test H2 using moderation-of-process design
5	Message expressed values in poster	Message-evoked arousal in poster	Intention to join a recycling program	Test the boundary conditions H3a and H3b

Arousal priming. We primed arousal through ad images eliciting high- and low-arousal emotions and a neutral state. Prior research showed that excitement elicits a high level of arousal while relaxation results in a low level of arousal (Kim et al., 2010; Luffarelli, Stamatogiannakis, & Yang, 2019). Following Rudd, Hildebrand, and Vohs (2018), we created three ads which had identical descriptions except for the image, either showing an exciting skiing moment (high arousal) or a relaxed moment having a rest in the chair (low arousal) or a neutral picture with skiing equipment (control condition).

After viewing the ad, all participants indicated the extent to which they felt *arousal* at the moment on three items (Keh et al., 2021; 1 = *relaxed / not at all energetic / very mellow*, 7 = *stimulated / very energetic / very fire up*; $M = 4.30$, $SD = 1.43$, $\alpha = 0.88$). We also measured the felt valence using three items from Gorn, Pham, and Sin (2001; 1 = *sad / displeased / negative*, 7 = *happy / pleased / positive*; $M = 5.25$, $SD = 1.23$, $\alpha = 0.92$).

Procedure and stimuli. Participants were instructed to complete several unrelated tasks. We counterbalanced the order of the writing task for priming values and the ad evaluation task for emotion induction. After that, participants read a scenario about a daily action that can help the environment – using a reusable travel mug vs a disposable cup for morning beverage (e.g., coffee), which was adapted from Whillans and Dunn (2015, Web Appendix). Participants read that, “Imagine that you have recently watched a TV program about the importance of everyday environmental behaviors. This program reminded you about a simple daily action that can help the environment – using a travel mug vs a disposable cup for your favorite morning beverage (e.g., coffee). You have purchased a travel mug, but after leaving home this morning, you realize that you have left your travel mug at home.” Participants were then asked to indicate their likelihood to go back home and get their travel mug (“How likely / How willing are you to go back home to get your travel mug?” 1 = *extremely unlikely / unwilling*, 7 = *extremely likely / willing*; $M = 3.08$, $SD = 1.66$, $r = 0.84$), with a higher score denoting a greater likelihood to use the travel mug. We listed the measurement items across all studies in Appendix A.

4.2. Study 1a results

Manipulation checks. A 3×2 MANOVA on reported arousal, valence, openness-to-change, and conservation values showed that both value and emotion were manipulated successfully. As expected, emotion priming only affected felt arousal ($F(2, 612) = 85.34$, $p < .001$) and valence ($F(2, 612) = 4.27$, $p = .014$), but not openness-to-change ($F(2, 612) = 0.435$, $p = .64$) and conservation values ($F(2, 612) = 1.11$, $p = .329$). Conversely, value priming only affected openness-to-change ($F(1, 612) = 40.16$, $p < .001$) and conservation values ($F(1, 612) = 64.75$, $p < .001$), but not felt arousal ($F(1, 612) = 0.486$, $p = .48$) and valence ($F(1, 612) = 0.093$, $p = .76$). There were nonsignificant interactions on all indices (all $ps > 0.11$).

Specifically, pairwise comparisons showed that participants in the high-arousal condition reported greater arousal than those in the low-arousal ($M_{\text{high}} = 5.03$, $SD = 1.17$ vs $M_{\text{low}} = 3.41$, $SD = 1.24$, $p < .001$) and control conditions ($M_{\text{control}} = 4.49$, $SD = 1.37$, $p < .001$). However, the high-arousal condition was not significantly different from the low-arousal ($M_{\text{high}} = 5.28$, $SD = 1.19$ vs $M_{\text{low}} = 5.42$, $SD = 1.18$, $p = .25$) in valence. Thus, high- and low-arousal conditions varied in the arousal, but not in the valence. Moreover, participants in the openness-to-change condition reported a higher score on openness-to-change than those in the conservation condition ($M_{\text{OTC}} = 5.41$, $SD = 1.12$ vs $M_{\text{CON}} = 4.74$, $SD = 1.50$, $p < .001$). In contrast, participants in the conservation condition reported a higher score on conservation than those in the openness-to-change condition ($M_{\text{OTC}} = 4.08$, $SD = 1.29$ vs $M_{\text{CON}} = 4.89$, $SD = 1.17$, $p < .001$). Moreover, the two conditions were not significantly different in the perceived difficulty of the writing task ($F(1, 618) = 1.32$, $p = .25$). Thus, arousal and value were manipulated successfully.

Likelihood to use the travel mug. A 3 (arousal) \times 2 (value) ANOVA showed only a significant interaction effect of arousal \times value on the likelihood to use the travel mug ($F(2, 612) = 4.28$, $p = .014$, $\eta_p^2 = 0.014$). In addition, the main effects

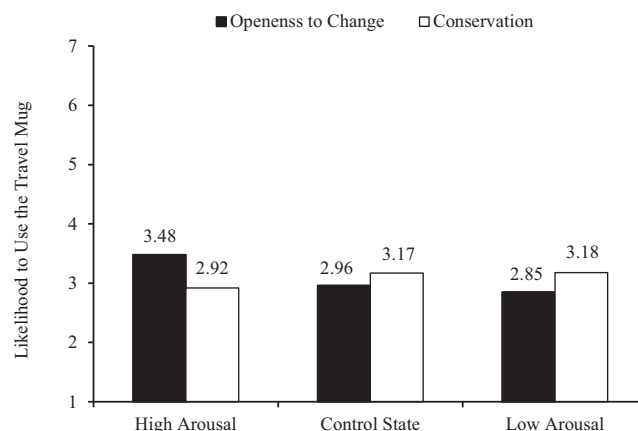


Fig. 2. Interaction Effect of Arousal and Value on Likelihood to Use the Travel Mug.

of arousal and value were both nonsignificant (both $ps > 0.52$). An ANCOVA with perceived difficulty of the writing task as a covariate still revealed a significant interaction effect ($F(2, 611) = 4.27, p = .014, \eta_p^2 = 0.014$).

Decomposing the interaction effect (Fig. 2), planned contrasts showed that participants with openness-to-change value were more likely to use the reusable travel mug compared to those with conservation value in the high-arousal state ($M_{OTC} = 3.48, SD = 1.63$ vs $M_{CON} = 2.92, SD = 1.60$; $F(1, 612) = 5.76, p = .017, \eta_p^2 = 0.009$), but not in the low-arousal ($M_{OTC} = 2.85, SD = 1.62$ vs $M_{CON} = 3.18, SD = 1.74$; $F(1, 612) = 2.03, p = .154$) and the control conditions ($M_{OTC} = 2.96, SD = 1.72$ vs $M_{CON} = 3.17, SD = 1.62$; $F(1, 612) = 0.764, p = .382$). Thus, high arousal enhances the effect of openness-to-change (vs conservation) on the likelihood to use the reusable travel mug. These results supported H1.

Viewed another way, the effect of arousal was significant in the openness-to-change condition ($F(2, 612) = 3.97, p = .019, \eta_p^2 = 0.013$), such that participants in the high-arousal state were more likely to use the reusable travel mug than those in the low-arousal state (3.48 vs $2.85, p = .007$) and the neutral state (3.48 vs $2.96, p = .032$), while the low-arousal and neutral states were not significantly different from each other (2.85 vs $2.96, p = .636$). In the conservation condition, the three affective states did not differ significantly (all comparisons $ps > 0.25$).

Discussion. Study 1a provided initial evidence that arousal enhances value-consistent behavior such that consumers oriented with openness-to-change are more likely to use the reusable travel mug than those with conservation when they were in a high-arousal state, but the effect was nonsignificant in a low-arousal state, supporting H1. Moreover, high- and low-arousal conditions were not significantly different in valence but only differed in arousal level, suggesting that the effect of high versus low arousal in the openness-to-change condition was not confounded with the valence dimension. To increase the practical implication and the robustness of the results, we conducted S1b to replicate the effect through priming values in marketing messages.

4.3. Pretest of study 1b stimuli

Stimuli development. For study 1b, we created four recycling posters which were identical except for the expressed arousal and values (Appendix B). Specifically, in terms of manipulating arousal, we talked about how recycling provides people with a sense of *enthusiasm* and *excitement* about caring for the environment (a high-arousal state) or with a sense of *peace* and *tranquility* about caring for the environment (a low-arousal state). In terms of priming values, we used the words of “*embrace challenges, open to new things, and make changes*” (openness-to-change condition) or “*follow traditions, maintain stability, and conserve resources*” (conservation condition).

Stimuli pretest. A pretest ($N = 198, 66.7\%$ female, $M_{age} = 38.1$) was conducted to test the effectiveness of the message. Participants were randomly assigned to see one of the four posters, and reported their felt arousal and valence, as well as the importance of openness-to-change and conservation values for manipulation checks. We measured arousal (Keh et al., 2021; $M = 4.54, SD = 1.11, \alpha = 0.91$) and valence (Gorn et al., 2001; $M = 5.16, SD = 1.36, \alpha = 0.82$) using the same items as in the study 1a (Appendix A). We measured the importance of openness-to-change value (*open to new things, challenge the status quo, and pursue changes*, $M = 4.20, SD = 1.50, \alpha = 0.86$) and conservation value (*follow old practices, respect for traditions, and keep stability*, $M = 4.14, SD = 1.54, \alpha = 0.84$) using items from Schwarz (1992).

We also checked whether priming values was confounded with regulatory focus (Higgin, 1997). We measured prevention focus (e.g., “*I am focused on preventing negative outcomes*,” and “*I am motivated to prevent being a failure*,” $M = 5.43, SD = 1.15, \alpha = 0.89$), and promotion focus (e.g., “*I am focused on achieving positive outcomes*,” and “*I am motivated to attain positive outcomes*,” $1 = strongly disagree, 7 = strongly agree; M = 5.73, SD = 1.08, \alpha = 0.92$) using the six items from White, MacDonnell, and Dahl (2011, Appendix A).

Manipulation checks. A 2×2 MANOVA on arousal, valence, openness-to-change and conservation scores showed that arousal priming had a significant effect on arousal ($M_{low-arousal} = 4.35$ vs $M_{high-arousal} = 4.74$; $F(1,194) = 6.06, p = .015$), but not significantly different on reported valence ($F(1,194) = 2.40, p = .12$), openness-to-change ($p = .15$) or conservation values ($p = .18$). Conversely, value priming only had a significant effect on reported openness-to-change ($M_{OTC} = 4.58$ vs $M_{CON} = 3.96$; $F(1,194) = 13.32, p < .001$) and conservation values ($M_{OTC} = 3.31$ vs $M_{CON} = 4.97$; $F(1,194) = 79.97, p < .001$), but not significantly different on arousal ($F(1,194) = 1.41, p = .24$) and valence ($F(1,194) = 0.89, p = .35$). In addition, there were nonsignificant interactions of value and emotion priming on any of these indices (all $ps > 0.70$). Thus, values and arousal were manipulated successfully in the four posters.

In addition, a 2×2 MANOVA on promotion focus and prevention focus showed that neither arousal priming nor value priming had main effects on promotion focus and prevention focus (all $ps > 0.45$). However, there was a significant interaction of value and emotion on prevention focus ($F(1,194) = 5.23, p = .023$), but not on promotion focus ($F(1,194) = 1.77, p = .19$). Thus, we measured the regulatory focus in the following main study.

4.4. Study 1b

Design and participants. Study 1b used a 2 (arousal: high vs low) $\times 2$ (salient value: openness-to-change vs conservation) between-participants design. The dependent variable was the recycling intention in the local community. We recruited 600 participants on the Prolific platform with nominal payment. Fifty participants were excluded due to failure of attention check questions, leaving 550 participants for analyses (58.9% female, $M_{age} = 34.98$).

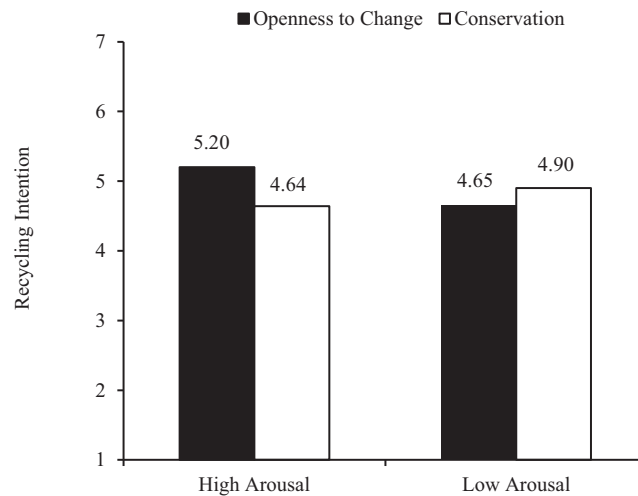


Fig. 3. Interaction Effect of Arousal and Value on Recycling Intention.

Procedure. Participants were randomly assigned to see one of the four recycling posters and then indicated their recycling intentions on three items (Kidwell, Farmer, & Hardesty, 2013; “How likely / How inclined / How willing are you to recycle?” 1 = not at all, 7 = very much; $M = 4.85$, $SD = 1.43$, $\alpha = 0.92$). After that, we measured the prevention focus ($M = 5.37$, $SD = 1.25$, $\alpha = 0.89$) and promotion focus ($M = 5.76$, $SD = 1.07$, $\alpha = 0.92$) using the same items as in the pretest.

Recycling intention. A 2 (arousal) \times 2 (value) ANOVA revealed only a significant interaction effect of arousal \times value on recycling intention ($F(1, 546) = 11.49$, $p = .001$, $\eta_p^2 = 0.021$). In addition, an ANCOVA with prevention focus ($F(1, 544) = 13.10$, $p < .001$, $\eta_p^2 = 0.024$) and promotion focus ($F(1, 544) = 20.75$, $p < .001$, $\eta_p^2 = 0.037$) as covariates also showed a significant interaction effect ($F(1, 544) = 10.29$, $p = .001$, $\eta_p^2 = 0.019$). Thus, the interaction effect of arousal \times value on recycling intention can be independent from the effect of regulatory focus.

Planned contrasts (Fig. 3) showed that participants with openness-to-change value led to a higher recycling intention compared to conservation value in the high-arousal state ($M_{OTC} = 5.20$, $SD = 1.38$ vs $M_{CON} = 4.64$, $SD = 1.42$; $F(1, 546) = 10.78$, $p = .001$, $\eta_p^2 = 0.019$), but not significant in the low-arousal state ($M_{OTC} = 4.65$, $SD = 1.37$ vs $M_{CON} = 4.90$, $SD = 1.48$; $F(1, 546) = 2.23$, $p = .14$), supporting H1. Viewed another way, high arousal led to higher recycling intentions compared to low arousal in the openness-to-change condition ($M_{high-arousal} = 5.20$ vs $M_{low-arousal} = 4.65$; $F(1, 546) = 10.45$, $p = .001$, $\eta_p^2 = 0.019$), but it was nonsignificant in the conservation condition ($M_{high-arousal} = 4.64$ vs $M_{low-arousal} = 4.90$; $F(1, 546) = 2.45$, $p = .12$).

Discussion. Study1b provided consistent evidence that high arousal increased sustainable behavior intentions when combining with openness-to-change value compared to conservation value (H1). Next, we conducted a field study to increase the external validity of the results.

5. Study 2: Actual sign-ups for garbage classification activity

Study 2 aimed to replicate the interaction effect of arousal with openness-to-change (vs conservation) in a field setting on an actual sign-up for a garbage classification activity. Different from Studies 1a and 1b, we elicited the level of arousal using a highly-arousing product (i.e., energy drink) versus a low-arousing product (i.e., ice tea), which reflects the type of arousal that products tend to evoke in the marketplace.

5.1. Method

Design and participants. Study 2 used a 2 (arousal: high vs low) \times 2 (salient value: openness-to-change vs conservation) between-participants design. The dependent variable was the actual sign-up for a garbage classification activity. We recruited 220 students from a large University in China. Ten participants were excluded due to incomplete responses, leaving 210 valid responses for the final analyses (63.5 % female, $M_{age} = 21.34$).

Arousal priming. Participants were asked to complete a survey about their beverage drinking experience. They were randomly assigned to see either an image of an energy drink or iced tea (see Web Appendix). Prior research shows that exposure to energy drinks elicits higher level of arousal compared to iced tea (Di Muro & Murray, 2012). After viewing the product, participants indicated how they felt about drinking the energy drink (high arousal) or the iced tea (low arousal) on three items (1 = relaxing / calming / unrousing, 7 = stimulating / exciting / arousing; Di Muro & Murray, 2012). The three items were averaged to form an index for the manipulation check for arousal ($M = 4.45$, $SD = 1.42$, $\alpha = 0.85$). We also measured the ad

likability (1 = not at all, 7 = very much; $M = 4.49$, $SD = 1.12$), the likability of drinking energy drink [iced tea] (1 = not like it at all, 7 = like it very much, $M = 4.30$, $SD = 1.63$), and brand familiarity (1 = not familiar at all, 7 = extremely familiar, $M = 4.74$, $SD = 1.67$) as covariates.

Value priming. Following that, participants were randomly assigned to read a message about the importance of openness-to-change or conservation values. For example, participants in the openness-to-change condition read, “Openness to change provides us a sense of self-direction in our lives. By endorsing openness to change, we are curious, creative and self-directed to make changes...” In contrast, participants in the conservation condition read, “Conservation provides us a sense of security in our lives. By endorsing conservation, we are secured, self-disciplined and conforming the senior...” (see [Web Appendix](#)).

Procedure and stimuli. Following the message, participants were told that, they can change the environment [conserve the environment] by participating in a garbage classification activity. They then indicated whether they were willing to participate in the activity by clicking “Yes” or “No”. For those who selected “Yes”, they were directed to a registration form in which they provided their name and student ID. Actual behavior was assessed by recording the act of clicking “yes” and provision of personal information. For those who selected “No”, they skipped the registration form. All participants indicated the extent to which the message reflected the openness-to-change and conservation value on a bipolar scale (1 = openness-to-change, 7 = conservation), which were reverse-coded for manipulation check, with a higher score denoting openness-to-change and a lower score denoting conservation ($M = 4.35$, $SD = 1.69$).

5.2. Results and discussion

Manipulation checks. As expected, participants exposed to the energy drink felt higher level of arousal ($M = 5.00$, $SD = 1.31$) than those exposed to the iced tea ($M = 3.89$, $SD = 1.32$, $F(1, 208) = 37.06$, $p < .001$). In addition, participants in the openness-to-change condition ($M = 5.34$, $SD = 1.35$) reported a higher value score than those in the conservation condition ($M = 3.49$, $SD = 1.48$, $F(1, 208) = 87.78$, $p < .001$). The priming of arousal did not affect the reported value scores ($F(1, 208) = 2.41$, $p = .12$). Thus, the manipulations were successful.

Actual sign-up for garbage classification activity. Overall, 47.1 % participants signed up for the garbage classification activity by clicking the “yes” button and providing their personal information. A binary logistic regression on choice (yes = 1, no = 0) with arousal, value and their interaction as predictors showed a significant interaction effect of arousal \times value ($B = 1.21$, Wald (1) = 4.60, $p = .032$). There was neither a significant main effect of arousal ($B = -0.38$, Wald (1) = 0.99, $p = .32$) nor value ($B = -0.32$, Wald (1) = 0.65, $p = .42$). Moreover, a binary logistic regression with ad likability, brand familiarity and beverage likability as covariates also showed a significant interaction effect of arousal \times value on choice ($B = 1.16$, Wald (1) = 4.12, $p = .042$).

Planned contrasts ([Fig. 4](#)) showed that openness-to-change value increases sign-ups compared to conservation value in the high-arousal condition (60.8 % vs 38.9 %, $B = 0.89$, Wald (1) = 4.95, $p = .026$), but not in the low-arousal condition (40.4 % vs 48.3 %, $B = -0.32$, Wald (1) = 0.65, $p = .42$), supporting H1. Correspondingly, high arousal led to more sign-ups (60.8 %) than low-arousal (40.4 %) when openness-to-change was activated ($B = 0.83$, Wald (1) = 3.99, $p = .046$), but not when conservation was activated (38.9 % vs 48.3 %, $B = -0.38$, Wald (1) = 0.99, $p = .32$).

Discussion. Consistent with Studies 1a and 1b, Study 2 confirmed that high arousal enhances sustainable behavior when combined with openness to change rather than conservation values (H1). Moreover, a low-arousal state did not motivate people to take action, regardless of the activated value. Nonetheless, we acknowledge the limitation of using drinks to elicit

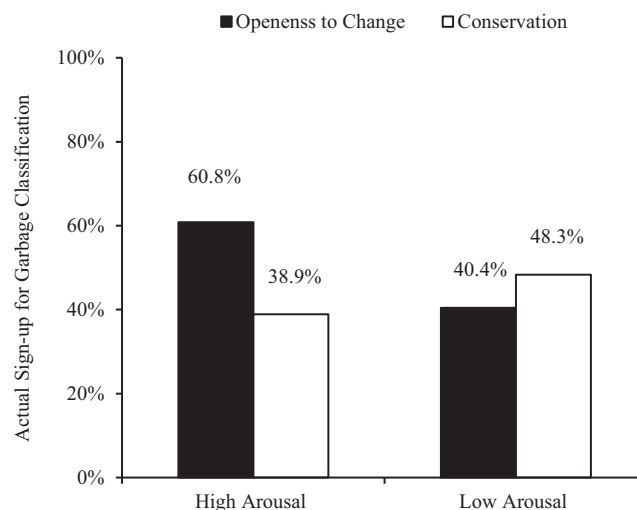


Fig. 4. Interaction Effect of Arousal and Value on Actual Sign-up.

arousal. Although it increased the realism of arousal experiences in the marketplace, it might evoke varied specific emotions beyond arousal. Thus, we further address the internal validity of the effects in the following studies in more controlled lab experiments.

6. Study 3: The mediating role of perceived effort

Study 3 aims to test the mediating role of perceived effort (H2). We propose that a high-arousal state with openness-to-change value can reduce the effort that consumers *perceive* is required to complete a task, thus increasing the likelihood that they will engage in the target behavior. On the flipside, a high-arousal state with conservation value or a low-arousal state with openness-to-change value will lead consumers to perceive greater effort required to achieve the same outcome, thus restrained their action. Before the main study, we conducted a pretest to confirm our theoretical assumption that consumers perceive more effort is needed for sustainable behavior, compared to corresponding conventional behaviors.

6.1. Pretest on the assumption of perceived effort

The pretest was a one factor two-levels (behavior: recycling vs green purchase) between-subjects design. Participants ($N = 145$, 50.3 % female, $M_{\text{age}} = 37.79$) were randomly assigned to rate the perceived effort required for recycling (“Compared to trashing, I need to exert more effort/spend more time to recycling”, $M_{\text{recycling}} = 4.97$, $SD = 1.48$, $r = 0.85$) or green purchase (“Compared to purchase a conventional product, I need to exert more effort / spend more time to buy a green product”, $M_{\text{green-purchase}} = 4.34$, $SD = 1.60$, $r = 0.78$). The measures of perceived efforts ($M_{\text{combined}} = 4.66$, $SD = 1.57$, $r = 0.87$) were adopted from Thompson and Ince (2013).

We conducted two separated T-test against the midpoint of 4 for each behavior. The results showed that participants perceived more effort needed for recycling compared to trashing ($M = 4.97$, $t(71) = 5.51$, $p < .001$). Participants also perceived more effort needed for green purchase compared to conventional purchase ($M = 4.34$, $t(72) = 1.86$, $p = .067$). These results suggested that people perceive greater efforts needed for sustainable behaviors than conventional behaviors. In other words, perceived effort is one of the restrain forces inhibiting people from engaging in sustainable behaviors.

Our theory suggests that arousal and values serve as the driving forces while perceived effort serves as the restraining force. Following CET, consumers would be more likely to engage in sustainable behavior when the driving force is greater than the restraining force. If our predictions held, participants with openness-to-change value would perceive *less efforts* needed than those with conservation value in a high-arousal state, but not a low-arousal state. Similarly, participants in the high-arousal would perceive *less efforts* needed than those in the low-arousal state when openness-to-change value was activated. In other words, the *reduction in perceived efforts* explained the positive effect of openness-to-change value and high-arousal on likelihood for sustainable behavior. We next directly tested this underlying mechanism in the Study 3.

6.2. Methods

Design and participants. Study 3 used a 2 (arousal: high vs low) \times 2 (salient value: openness-to-change vs conservation) between-participants design. The dependent variable was participants' intention to recycle. We recruited 340 participants on the Prolific platform with nominal payment. Forty participants were excluded due to failure of attention check questions, leaving 300 valid responses for the final data analyses (48.0 % female, $M_{\text{age}} = 32.15$).

Procedure. We created four posters similar as in Study 1b using the same description but adding a picture of recycling bins for all conditions (see Web Appendix). Participants were randomly assigned to see one of the four posters and then indicated their recycling intentions (“How likely / How inclined are you to recycle?” 1 = not at all, 7 = very much, $M = 5.16$, $SD = 1.35$, $r = 0.83$). Following that, participants indicated how much effort it takes them to recycle (1 = not much effort at all, and 7 = a lot of effort) and how time-consuming it is for them to recycle (1 = not time-consuming at all, 7 = very time-consuming). The two items formed the index of perceived efforts (adopted from Thompson & Ince, 2013; $M = 3.20$, $SD = 1.35$, $r = 0.67$). Finally, we measured the prevention focus ($M = 5.42$, $SD = 1.24$, $\alpha = 0.93$) and promotion focus ($M = 5.66$, $SD = 1.08$, $\alpha = 0.93$) as potential covariates.

6.3. Results and discussion

Recycling intention. A 2 (arousal) \times 2 (value) ANOVA showed only a significant interaction effect of arousal \times value on recycling intention ($F(1, 296) = 7.42$, $p = .007$, $\eta_p^2 = 0.024$). Moreover, an ANCOVA with prevention focus ($F(1, 294) = 13.49$, $p < .001$, $\eta_p^2 = 0.044$) and promotion focus ($F(1, 294) = 16.39$, $p < .001$, $\eta_p^2 = 0.053$) as covariates still revealed a significant interaction effect of arousal \times value ($F(1, 294) = 6.29$, $p = .013$, $\eta_p^2 = 0.021$). Planned contrasts showed that openness-to-change value increased the recycling intention compared to conservation value in the high-arousal state ($M_{\text{OTC}} = 5.47$, $SD = 1.19$ vs $M_{\text{CON}} = 4.91$, $SD = 1.38$; $F(1, 294) = 6.52$, $p = .011$, $\eta_p^2 = 0.022$), but not in the low-arousal state ($M_{\text{OTC}} = 4.99$, $SD = 1.25$ vs $M_{\text{CON}} = 5.26$, $SD = 1.50$; $F(1, 294) = 1.00$, $p = .32$). Viewed another way, high arousal led to higher recycling intentions than low arousal in the openness-to-change condition ($M_{\text{high-arousal}} = 5.47$ vs $M_{\text{low-arousal}} = 4.99$; $F(1, 294) = 5.62$, $p = .018$,

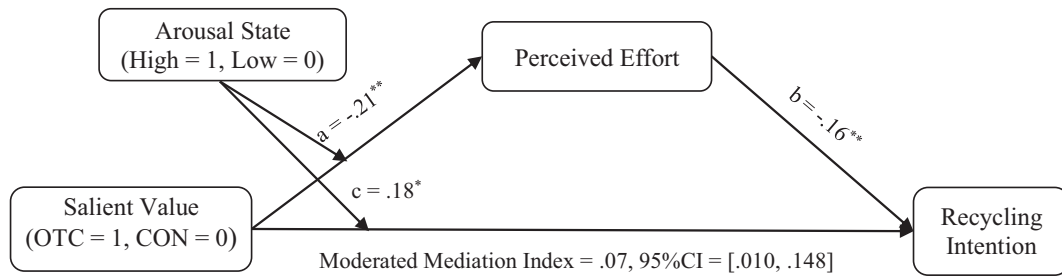


Fig. 5. Moderated Mediation Effect (Model 8). Notes: a = coefficient of the interaction effect of arousal \times value on perceived effort; b = coefficient of the effect of perceived effort on recycling intention; c = coefficient of the interaction effect of arousal \times value on recycling intention. ** $p < .01$, * $p < .05$. OTC = openness to change, CON = conservation.

$\eta_p^2 = 0.019$), but not in the conservation condition ($M_{\text{high-arousal}} = 4.91$ vs $M_{\text{low-arousal}} = 5.26$; $F(1, 294) = 1.36$, $p = .25$). These results further supported H1.

Perceived effort. Similarly, a 2 (arousal) \times 2 (value) ANOVA on perceived effort showed a significant interaction effect of arousal \times value ($F(1, 296) = 7.20$, $p = .008$, $\eta_p^2 = 0.024$). An ANCOVA with prevention focus ($F(1, 294) = 3.04$, $p = .082$, $\eta_p^2 = 0.01$) and promotion focus ($F(1, 294) = 4.47$, $p = .035$, $\eta_p^2 = 0.015$) as covariates also revealed a significant interaction effect of arousal \times value on perceived effort ($F(1, 294) = 6.28$, $p = .013$, $\eta_p^2 = 0.021$). Planned contrasts showed that participants with openness-to-change perceived lower effort required for recycling than those with conservation in the high-arousal state ($M_{\text{OTC}} = 2.81$, $SD = 1.27$ vs $M_{\text{CON}} = 3.47$, $SD = 1.38$; $F(1, 294) = 8.87$, $p = .003$, $\eta_p^2 = 0.029$), but not significantly different in the low-arousal state ($M_{\text{OTC}} = 3.34$, $SD = 1.38$ vs $M_{\text{CON}} = 3.18$, $SD = 1.28$; $F(1, 294) = 0.34$, $p = .56$). Viewed another way, participants in the high-arousal state perceived lower effort required for recycling than those in the low-arousal state in the openness-to-change condition ($M_{\text{high-arousal}} = 2.81$ vs $M_{\text{low-arousal}} = 3.34$; $F(1, 294) = 5.93$, $p = .015$, $\eta_p^2 = 0.02$), but there was no difference between the two affective states in the conservation condition ($M_{\text{high-arousal}} = 3.47$ vs $M_{\text{low-arousal}} = 3.18$; $F(1, 294) = 1.21$, $p = .27$).

Moderated mediation effect. To assess whether the difference in perceived effort can explain the effect of arousal \times value on recycling intention, we conducted a moderated mediation analysis using PROCESS Model 8 (Hayes, 2018) with the value as the independent and arousal as the moderator. For all the mediation analyses, we constructed at 95% confidence intervals with 10,000 resamples. As shown in Fig. 5, there was a significant interaction effect of emotion \times value on perceived effort ($b = -0.21$, $SE = 0.08$, $t(296) = -2.68$, $p = .008$), which had a significant negative effect on recycling intentions ($b = -0.16$, $SE = 0.06$, $t(295) = -2.79$, $p = .006$). Importantly, the bootstrapping analysis showed a significant moderated mediation effect (index = 0.07, $SE = 0.04$, 95% CI = [0.010, 0.148]). The conditional indirect effect analyses showed that perceived effort explained the positive effect of openness-to-change on recycling intention in the high-arousal condition ($b = 0.05$, $SE = 0.02$, 95% CI = [0.011, 0.113]), but not significant in the low-arousal condition ($b = -0.01$, $SE = 0.01$, 95% CI = [-0.055, 0.023]).

A similar analysis with arousal as the independent variable and value as the moderator also showed a significant moderated mediation effect (index = 0.07, $SE = 0.04$, 95% CI = [0.010, 0.148]). The conditional indirect effect analyses showed that perceived effort explained the positive effect of arousal on recycling intention in the openness-to-change condition ($b = 0.04$, $SE = 0.02$, 95% CI = [0.004, 0.098]), but not in the conservation condition ($b = -0.02$, $SE = 0.02$, 95% CI = [-0.072, 0.010]). Taken together, perceived effort mediates the interaction effect of arousal and values on recycling intention, supporting H2.

Discussion. Study 3 supported our prediction that the interaction effect of arousal and value on recycling intentions (H1) can be explained by a reduction in perceived effort (H2). Specifically, openness-to-change (vs conservation) value reduced the perceived effort needed for recycling in a high-arousal state, which in turn increased the recycling intentions. Similarly, high (vs low) arousal reduced perceived effort when openness-to-change value was activated, which increased recycling intentions. Next, we tested the robustness of the underlying process in a different sustainable behavior, green product purchase decision.

7. Study 4: Green product purchase decision

Study 4 uses a moderation-of-process design (Spencer et al., 2005) to manipulate the perceived effort to provide further evidence for reduction in perceived effort as a mediator for the effect of value and arousal on sustainable behavior. If openness-to-change (vs conservation) value leads consumers more likely to engaging in sustainable behavior when they are in a high-arousal state because they perceived lower effort needed for the target behavior, information signaling that the target behavior is low-effort should attenuate this effect.

7.1. Stimuli development and pretest

Stimuli development. We first created four product ads which were identical in picture and product information except for expressed values and effort (Appendix B). Specifically, we used a slogan of “always open to change”, and words of “challenge its classic silhouette, and make changes for achieving the goal of” in the product message to prime the openness-to-change values. In contrast, we used the slogan of “always iconic and classic” and the words of “follow its classic silhouette, respect traditions” in the product message to prime the conservation value. We used “REGISTER ONLINE FIRST to place the order” to prime high-effort purchase, and used “SIMPLY CLICK this button to place the order” to prime low-effort purchase.

We then developed two identical online reviews varying in expressed arousal in contents (see Web Appendix). Following Yin et al. (2017), we operationalized the expressed arousal through two ways. First, we varied the presence of exclamation marks, such that sentences in the low- and high-arousal conditions ended with a period or an exclamation, respectively. Next, we varied specific words in the text to convey different degrees of arousal using an emotional sentence (e.g., *I feel relaxed and cool vs I feel excited and energetic when I wear them*).

Stimuli pretest. A pretest ($N = 316$, 45.2 % female, $M_{\text{age}} = 36.5$) was conducted to test the effectiveness of the value, effort and arousal priming. Participants were instructed to imagine that they were shopping online for a pair of tennis shoes. They were first randomly assigned to see one of the four product ads, and then indicated to what extent the ad expressed the values of openness-to-change ($M = 5.65$, $SD = 1.18$, $\alpha = 0.90$) and conservation ($M = 3.56$, $SD = 1.32$, $\alpha = 0.79$, Appendix A). Participants also indicated perceived effort for purchase this product using same items as in Study 3 ($M = 3.06$, $SD = 1.52$, $r = 0.72$). Following that, they saw either a low-arousal or high-arousal online review about this product. After that, participants rated the level of arousal they felt (1 = *relaxed / not at all energetic / very mellow*, 7 = *stimulated / very energetic / very fire up*; $M = 4.35$, $SD = 1.41$, $\alpha = 0.86$), and the level of felt valence (1 = *sad / displeased / negative*, 7 = *happy / pleased / positive*; $M = 5.68$, $SD = 1.16$, $\alpha = 0.89$).

Manipulation checks. A $2 \times 2 \times 2$ MANOVA on arousal, valence, perceived effort, openness-to-change and conservation showed that the manipulations of values, effort and arousal were successful. Specifically, arousal priming significantly affected the level of arousal ($M_{\text{low-arousal}} = 3.72$ vs $M_{\text{high-arousal}} = 5.00$; $F(1,308) = 79.16$, $p < .001$), but not significantly different on valence ($p = .21$), effort ($p = .42$), openness-to-change ($p = .91$) or conservation ($p = .74$). Value priming only significantly affected the scores of openness-to-change ($M_{\text{OTC}} = 5.85$ vs $M_{\text{CON}} = 5.45$; $F(1,308) = 8.58$, $p = .004$) and conservation ($M_{\text{OTC}} = 3.22$ vs $M_{\text{CON}} = 3.91$; $F(1,308) = 22.45$, $p < .001$), but not different on perceived effort ($p = .91$), arousal ($p = .24$) and valence ($p = .29$). Similarly, effort priming only affected the effort score ($M_{\text{high-effort}} = 3.92$ vs $M_{\text{low-effort}} = 2.21$; $F(1,308) = 141.82$, $p < .001$), not different on arousal ($p = .55$), valence ($p = .42$), openness-to-change ($p = .51$) or conservation ($p = .45$). There were nonsignificant two-way interactions (all $ps > 0.17$) or three-way interactions effects (all $ps > 0.26$).

7.2. Method

Design and participants. Study 4 (https://aspredicted.org/X7Q_46X) was a preregistered study using a 2 (arousal: high vs low vs control) \times 2 (salient value: openness-to-change vs conservation) \times 2 (perceived effort: high vs low) between-participants design. The dependent variable was participants' purchase intention for green shoes. Following the preregistration, we recruited 820 participants on the Prolific platform with nominal payment. Thirty-eight participants were excluded due to failure of attention checks or completed the survey too fast, leaving 782 responses for the final analyses (45.7 % female, $M_{\text{age}} = 35.98$).

Procedure. The procedure was similar to the pretest of stimuli, participants imagined that they were shopping online and they were randomly assigned to one of four shopping scenarios (Appendix B), followed by either a high-arousal or low-arousal online review (Web Appendix). After that, participants indicated their purchase intentions for the new green shoes made with recyclable materials (“How likely/how inclined/how willing are you to buy this pair of shoes?” 1 = *not at all*, 7 = *very much*, $M = 3.82$, $SD = 1.59$, $\alpha = 0.94$). Participants also reported felt arousal ($M = 4.43$, $SD = 1.49$, $\alpha = 0.89$), openness-to-change ($M = 5.56$, $SD = 1.12$, $\alpha = 0.87$) and conservation values ($M = 3.55$, $SD = 1.35$, $\alpha = 0.82$), and perceived effort ($M = 3.00$, $SD = 1.46$, $r = 0.75$) using the same items as in the pretest for manipulations checks.

7.3. Results and discussion

Manipulation checks. A $2 \times 2 \times 2$ MANOVA on arousal, perceived effort, openness-to-change and conservation showed that the manipulations of these factors were successful. Specifically, arousal priming significantly affected the level of arousal ($M_{\text{low-arousal}} = 3.65$, $SD = 1.26$ vs $M_{\text{high-arousal}} = 5.21$, $SD = 1.28$; $F(1,774) = 292.29$, $p < .001$), but not significantly different on perceived effort ($p = .73$), openness-to-change ($p = .37$) or conservation ($p = .26$). Value priming only significantly affected the scores of openness-to-change ($M_{\text{OTC}} = 5.78$, $SD = 0.94$ vs $M_{\text{CON}} = 5.36$, $SD = 1.24$; $F(1,774) = 27.25$, $p < .001$) and conservation ($M_{\text{OTC}} = 3.06$, $SD = 1.25$ vs $M_{\text{CON}} = 4.04$, $SD = 1.27$; $F(1,774) = 117.37$, $p < .001$), but not different on perceived effort ($p = .74$) and arousal ($p = .99$). Similarly, effort priming only affected the effort score ($M_{\text{high-effort}} = 3.46$, $SD = 1.47$ vs $M_{\text{low-effort}} = 2.53$, $SD = 1.30$; $F(1,774) = 85.35$, $p < .001$), not different on arousal ($p = .34$), openness-to-change ($p = .52$) or conservation ($p = .14$). There were nonsignificant two-way (all $ps > 0.094$) or three-way interactions effects (all $ps > 0.25$).

Purchase intention. A 2 (arousal) \times 2 (value) \times 2 (effort) ANOVA showed a significant three-way interaction effect on purchase intention ($F(1, 774) = 6.94$, $p = .009$, $\eta_p^2 = 0.009$). There were no any other significant main or interaction effects (all

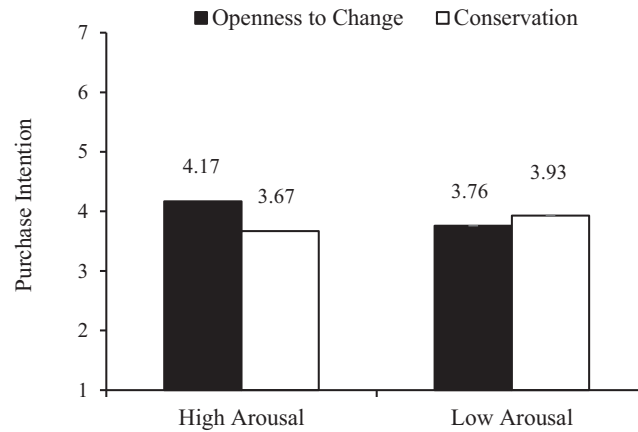


Fig. 6a. Interaction Effect of Arousal and Value in the High-Effort Condition.

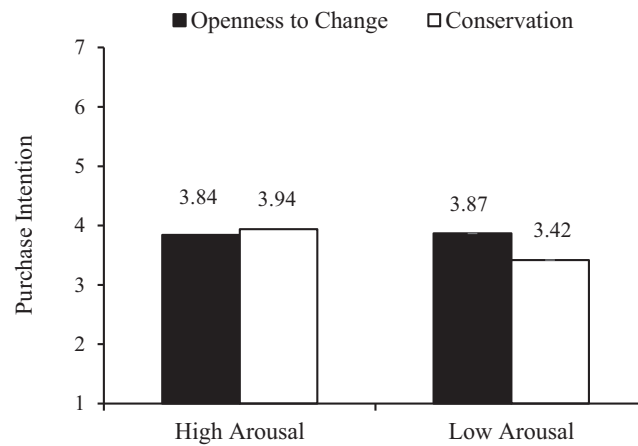


Fig. 6b. Interaction Effect of Arousal and Value in the Low-Effort Condition.

$ps > 0.14$). Decomposing the three-way interaction (Fig. 6a and Fig. 6b), in the high-effort condition, openness-to-change led to a higher purchase intention compared to conservation in the high-arousal condition ($M_{OTC} = 4.17$, $SD = 1.45$ vs $M_{CON} = 3.67$, $SD = 1.75$; $F(1, 774) = 4.71$, $p = .030$, $\eta_p^2 = 0.006$), but not in the low-arousal condition ($M_{OTC} = 3.76$, $SD = 1.66$ vs $M_{CON} = 3.93$, $SD = 1.54$; $F(1, 774) = 0.52$, $p = .47$). Thus, the effect of high arousal and openness-to-change value on purchase intention were significant in a high-effort condition, consistent with the previous findings in studies 1, 2 and 3.

However, in the low-effort condition, openness-to-change led to a marginally higher purchase intention than conservation in the low-arousal condition ($M_{OTC} = 3.87$, $SD = 1.55$ vs $M_{CON} = 3.42$, $SD = 1.52$; $F(1, 774) = 3.77$, $p = .052$, $\eta_p^2 = 0.005$), and not significant in the high-arousal condition ($M_{OTC} = 3.84$, $SD = 1.48$ vs $M_{CON} = 3.94$, $SD = 1.72$; $F(1, 774) = 0.18$, $p = .66$). Thus, the effect of high arousal and openness-to-change value on purchase intention was attenuated in a low-effort condition.

Viewed another way, in the high-effort condition, the effect of high (vs low) arousal was marginally significant in the openness-to-change condition ($F(1, 774) = 3.11$, $p = .078$, $\eta_p^2 = 0.004$), but not significant in the conservation condition ($F(1, 774) = 1.26$, $p = .26$). However, in a low-effort condition, the effect of high- (vs low-) arousal was significant in the conservation condition ($F(1, 774) = 5.28$, $p = .022$, $\eta_p^2 = 0.007$), but not in the openness-to-change condition ($F(1, 774) = 0.014$, $p = .90$).

Discussion. Study 4 showed that, when green purchase behavior was perceived as high-effort, we replicated the positive effect of openness-to-change in a high-arousal state as in the previous studies, such that openness-to-change (vs conservation) increased green purchase in a high-arousal state, but not in a low-arousal state. However, when the green purchase behavior was perceived as low-effort, the positive effect of openness-to-change (vs conservation) was disappeared in the high-arousal condition. Taken together, studies 3 and 4 confirm that perceived effort was a critical restraining force preventing consumers from high-effort sustainable behaviors, and perceived reduction in effort can explain the positive effect of high-arousal and openness-to-change on the target behaviors. The positive effect of high-arousal and openness-to-change was disappeared when the behavior was perceived as low-effort.

8. Study 5: Moderating effect of consumer experience

Study 5 aimed to test the moderating effect of consumer experience (H3). In addition, we measured outcome efficacy as a rival explanation because it is a strong predictor of sustainable behavior (Xu, Arpan, & Chen, 2015), and arousal is strongly related to perceived efficacy.

8.1. Method

Design and participants. Study 5 was a 2 (arousal: high vs low) \times 2 (salient value: openness-to-change vs conservation) between-participants design. The dependent variable was participants' intention to join a recycling program. We measured consumers' experience of recycling as a continuous variable. In total, we collected 630 responses from the Prolific platform with nominal payment. After excluding fifty participants who failed attention check questions or completed the survey too fast, we had 580 valid responses for the final analyses (63.8 % female, $M_{age} = 35.95$).

Procedure. We used the same experimental stimuli as the Study 3. Participants were told that their community was going to launch a recycling program and they were randomly assigned to see one of the four posters. Then they indicated their intention to join the recycling program ("How likely/How inclined/How willing are you going to join the recycling program?" 1 = not at all, 7 = very much, $M = 5.20$, $SD = 1.43$, $\alpha = 0.92$). After that, we measured perceived effort using the same items as in the Study 3 ($M = 3.11$, $SD = 1.41$, $r = 0.82$). We measured consumers' experience with recycling using two items ("How often/How frequent do you recycle in your daily life? 1 = never, 7 = always. $M = 4.87$, $SD = 1.66$, $r = 0.94$).

Next, we measured perceived outcome efficacy using three items adapted from Xu et al. (2015) ("To what extent do you think recycling can improve the environment / is effective to help the environment / can make a positive impact on the environment?" 1 = not at all, 7 = very much, $M = 5.55$, $SD = 1.25$, $\alpha = 0.95$). Finally, we measured prevention focus ($M = 5.44$, $SD = 1.22$, $\alpha = 0.90$) and promotion focus ($M = 5.68$, $SD = 1.13$, $\alpha = 0.92$) as in the previous studies.

8.2. Results and discussion

Intention to join the recycling program. A 2 (arousal) \times 2 (value) ANOVA showed a significant interaction effect on participants' intention to join the recycling program ($F(1, 576) = 7.81$, $p = .005$, $\eta_p^2 = 0.013$) and a main effect of arousal ($F(1, 576) = 3.87$, $p = .050$, $\eta_p^2 = 0.007$). The main effect of value was nonsignificant ($p > .60$). Moreover, an ANCOVA with prevention focus ($F(1, 574) = 1.25$, $p = .264$) and promotion focus ($F(1, 574) = 45.58$, $p < .001$, $\eta_p^2 = 0.074$) as covariates still showed a significant interaction effect of arousal \times value on intention to join the recycling program ($F(1, 574) = 5.88$, $p = .016$, $\eta_p^2 = 0.010$).

Planned contrasts showed that openness-to-change value increased the recycling intention compared to conservation value in the high-arousal state ($M_{OTC} = 5.51$, $SD = 1.40$ vs $M_{CON} = 5.13$, $SD = 1.59$; $F(1, 297) = 4.93$, $p = .027$), but not in the low-arousal condition ($M_{OTC} = 4.95$, $SD = 1.21$ vs $M_{CON} = 5.23$, $SD = 1.47$, $F(1, 297) = 2.71$, $p = .10$). Viewed another way, high arousal led to higher recycling intentions than low arousal in the openness-to-change condition ($M_{high-arousal} = 5.51$ vs $M_{low-arousal} = 4.95$; $F(1, 576) = 11.38$, $p = .001$, $\eta_p^2 = 0.019$), but not in the conservation condition ($M_{high-arousal} = 5.13$ vs $M_{low-arousal} = 5.23$; $F(1, 576) = 0.34$, $p = .56$). These results further supported H1.

Perceived effort. Similarly, a 2 (arousal) \times 2 (value) ANOVA on perceived effort showed a significant main effect of arousal ($F(1, 576) = 4.09$, $p = .043$, $\eta_p^2 = 0.007$), and a significant interaction effect of arousal \times value ($F(1, 576) = 5.85$, $p = .016$, $\eta_p^2 = 0.010$). The effect of value was nonsignificant ($F(1, 576) = 1.19$, $p = .27$). In an ANCOVA with prevention focus ($F(1, 574) = 0.26$, $p = .61$) and promotion focus ($F(1, 574) = 3.27$, $p = .071$, $\eta_p^2 = 0.006$) as the covariates, the effect of arousal \times value remained significant ($F(1, 574) = 5.20$, $p = .023$, $\eta_p^2 = 0.009$).

Planned contrasts showed that participants with openness-to-change value perceived lower effort than those with conservation value in the high-arousal state ($M_{OTC} = 2.79$, $SD = 1.36$ vs $M_{CON} = 3.20$, $SD = 1.46$; $F(1, 576) = 6.16$, $p = .013$, $\eta_p^2 = 0.011$), but not significantly different from each other in the low-arousal state ($M_{OTC} = 3.31$, $SD = 1.42$ vs $M_{CON} = 3.15$, $SD = 1.39$; $F(1, 576) = 0.88$, $p = .35$). Viewed another way, high arousal reduced perceived effort required for recycling than low arousal in the openness-to-change condition ($M_{high-arousal} = 2.79$ vs $M_{low-arousal} = 3.31$; $F(1, 576) = 9.91$, $p = .002$, $\eta_p^2 = 0.017$), but the two affective states were not significantly different in the conservation condition ($M_{high-arousal} = 3.20$ vs $M_{low-arousal} = 3.15$; $F(1, 576) = 0.08$, $p = .78$).

Mediating effect of perceived effort. Next, we conducted a moderated mediation analysis using PROCESS Model 8 with value as the independent variable and arousal as the moderator to assess the mediating role of perceived effort. Consistent with Study 3, there was a significant interaction effect of arousal \times value on perceived effort ($b = -0.14$, $SE = 0.06$, $t(299) = -2.42$, $p = .016$), which in turn had a significant effect on recycling intention ($b = -0.10$, $SE = 0.04$, $t(298) = -2.38$, $p = .017$). Importantly, the bootstrapping analysis showed a significant moderated mediation effect (index = 0.03, $SE = 0.02$, 95 % CI = [0.000, 0.075]). The conditional indirect effect analyses showed that perceived effort explained the effect of openness-to-change (vs conservation) value on intention to join the recycling program in the high-arousal condition ($b = 0.02$, $SE = 0.02$, 95 % CI = [0.014, 0.000]), while the indirect effect was not significant in the low-arousal condition ($b = -0.00$, $SE = 0.01$, 95 % CI = [-0.032, 0.007]).

In addition, a similar moderated mediation analysis with arousal as the independent variable and value as the moderator showed that perceived effort explained the effect of high (vs low) arousal on recycling intention in the openness-to-change

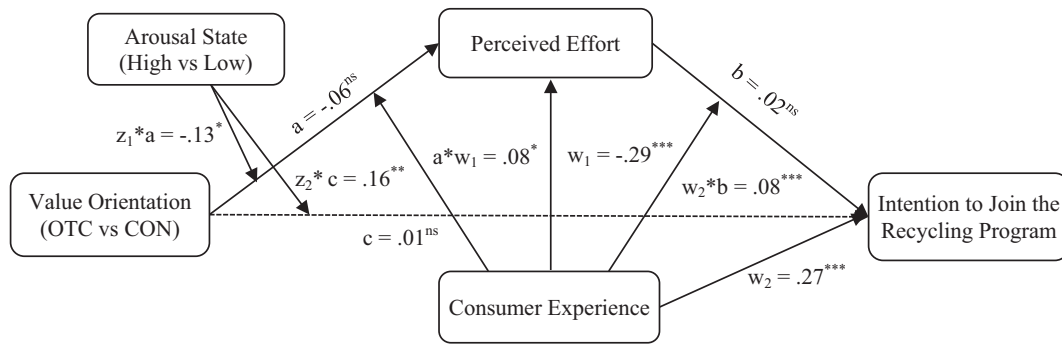


Fig. 7. Statistic Model of Moderating Effects of Customer Experience (Model 62). Notes: a = coefficient of the effect of value on perceived effort; b = coefficient of the effect of perceived effort on intention to join the recycling program; c = coefficient of value on intention to join the recycling program; z = coefficient of the effect of arousal on perceived effort (z_1) and on intention to join the recycling program (z_2); w = coefficient of the effect of customer experience on perceived effort (w_1) and on intention to join the recycling program (w_2); *** $p < .001$, ** $p < .01$, * $p < .05$, ns. = nonsignificant, OTC = openness to change, CON = conservation.

condition ($b = 0.03$, $SE = 0.02$, $95\% \text{ CI} = [0.002, 0.063]$), but not in the conservation condition ($b = -0.00$, $SE = 0.01$, $95\% \text{ CI} = [-0.025, 0.015]$). These results supported H2, such that perceived effort mediates the interaction effect of arousal and values on intention to join the recycling program.

The moderating effects of customer experience. We further tested the moderating effects of customer experience on both path a (between values and mediator) and path b (between mediator and sustainable behavior) using PROCESS Model 62 (Hayes, 2018), with the value as the first-stage moderator (Z) and customer experience as both the first-stage and second-stage moderator (W). The statistic model was showed in Fig. 7. Consistent with Study 3, there were significant interaction effects of arousal \times value on perceived effort ($b = -0.13$, $SE = 0.05$, $t(574) = -2.41$, $p = .016$) and on intention to join the recycling program ($b = 0.16$, $SE = 0.05$, $t(573) = 2.78$, $p = .005$).

As expected, customer experience was negatively related to perceived effort ($b = -0.29$, $SE = 0.03$, $t(574) = -9.03$, $p < .001$), but positively related to intention to join the recycling program ($b = 0.27$, $SE = 0.03$, $t(573) = 7.61$, $p < .001$). Importantly, there was a significant interaction effect of value \times customer experience on perceived effort ($b = 0.08$, $SE = 0.03$, $t(574) = 2.34$, $p = .019$). The conditional effects analyses showed that the effect of value was significant for less experienced consumers (i.e., novice users, -1 SD from the mean) in the high-arousal state ($b = -0.34$, $SE = 0.10$, $t(574) = -3.32$, $p < .001$, $95\% \text{ CI} = [-0.537, -0.138]$), but not significant in the low-arousal state ($p = .45$, $95\% \text{ CI} = [-0.263, 0.116]$). Conversely, the effect of value was significant for more experienced consumers ($+1$ SD from the mean) in the low-arousal state ($b = 0.19$, $SE = 0.09$, $t(574) = 2.06$, $p = .04$, $95\% \text{ CI} = [0.008, 0.387]$), but not in the high-arousal state ($p = .46$, $95\% \text{ CI} = [-0.247, 0.114]$). On average (at mean value of customer experience), the effect of value was significant in the high-arousal state ($b = -0.18$, $SE = 0.07$, $t(574) = -2.36$, $p = .018$, $95\% \text{ CI} = [-0.344, -0.031]$), but not in the low-arousal state ($p = .29$, $95\% \text{ CI} = [-0.070, 0.234]$). Thus, the positive interaction effect of arousal \times value on perceived efforts was stronger for less experienced consumers and reversed for more experienced consumers, supporting H3a.

At the same time, there was a significant interaction effect of perceived effort \times customer experience on intention to join the recycling program ($b = 0.08$, $SE = 0.02$, $t(573) = 3.39$, $p < .001$). Decomposing the interaction effect, perceived effort was negatively related to intention to join the recycling program for less experienced consumers ($b = -0.12$, $SE = 0.05$, $t(573) = -2.07$, $p = .038$). In contrast, perceived effort was positively related to intention to join the recycling program for experienced consumers ($b = 0.15$, $SE = 0.05$, $t(573) = 2.57$, $p = .010$), supporting H3b.

Discussion. Study 5 confirmed the moderating effect of customer experience on perceived effort and subsequently on sustainable behavior. Specifically, the interaction effect of arousal and value on perceived reduction in effort was stronger for less experienced consumers but reversed for more experienced consumers compared to the average group (H3a). At the same time, customer experience also moderated the effect of perceived effort on recycling behavioral intention (H3b). Additional analyses on outcome efficacy showed that outcome efficacy couldn't explain the interaction effect of arousal and value on the recycling intention.

9. Discussion and conclusions

This research contributes to our understanding of Cognitive Energetics Theory by explaining how openness to change interacts with arousal to drive sustainable behavior. Importantly, we reveal the counterintuitive finding that higher levels of arousal *reduce openness-to-change* consumers' perceptions of the effort that is required to take action. This *reduction in perceived effort* is the mechanism that underlies the effect of the values-by-arousal interaction on recycling behavior. Furthermore, we show that customers' experience moderates the effect of perceived effort on sustainable behavior. Overall,

the results support our theory of the motivational dynamics of arousal, openness to change and perceived effort in the context of recycling behavior. We summarized the key findings of all studies in [Table 2](#).

9.1. Theoretical implications

Cognitive Energetics Theory contends that the probability of goal-directed action is determined by the balance between driving and restraining forces (Kruglanski, 2012). Prior research has demonstrated that goal importance and resource availability are key driving forces that compete with restraining forces that include task demands, alternative goals and a desire to conserve resources (Bélanger et al., 2015; Kruglanski et al., 2012; Milyavsky et al., 2019). The current work illustrates the important role that human values can play as both driving (e.g., openness-to-change) and restraining forces (e.g., conservation). These values interact with available energy resources to affect the probability that a consumer will take action.

By examining the interaction of arousal and values, this work contributes to recent research that indicates sustainable behavior may be best promoted over the long term by using a combination of in-the-moment tools (e.g., emotional states) and lasting-change tools (e.g., values) (White, Habib, & Hardisty, 2019). It is also consistent with the idea that endorsed values reflect how people want to experience the world, whereas emotions reflect how people actually experience the world (Tamir et al., 2016). Our results indicate that it is necessary to understand the interplay between human values and affective states, rather than just their individual or direct effects, as the interaction better explains complex consumer behaviors, such as recycling.

In this vein, we contribute to the link between human values and sustainable consumer behavior. Our findings are consistent with work suggesting that the relationship between values and environmental behavior is more complex than is often assumed (Poortinga, Steg, & Vlek, 2004). We contribute to recycling behavior by showing that taking action to recycle is not only dependent on strong motivation guided by values, but is also determined by an individual's level of arousal. We find that the joint effect of high arousal and openness-to-change helps consumers overcome behavior change challenges by affecting consumers' perception of the effort required to complete the task.

Importantly, this research identifies the critical role that a perceived reduction in effort plays as an underlying psychological mechanism. Somewhat counterintuitively, high arousal not only prepares the body for action, but when combined with openness-to-change values it also reduces the effort that the consumers believe is required to undertake the target behavior. In this way, the interaction has two paths towards facilitating action: providing the required energy and making the task seem more attainable.

9.2. Practical implications

In terms of practical implications, the results indicate that motivating consumers to engage in recycling behavior has complex psychological underpinnings. The effort required to recycle has previously been identified as a critically important determinant of behavior (Sun & Trudel, 2017). This research, however, demonstrates that the interaction between human values and arousal influences perceptions of the effort required to take action and such interaction effects vary depending on customer experience. As a practical example, if an organization aims to promote recycling it would make sense to segment its audience to identify those who are open to change and then build communications around arousing emotional appeals, while at the same time minimizing the perceived effort of the sustainable behavior. Going further, our results suggest that people new to the target sustainable behavior are more likely to engage the behavior as a result of such communications, as compared to more experienced individuals who have more established patterns of behavior.

Marketers wishing to apply these findings should aim to create stimulating shopping environments to enhance the positive effect of arousal (Holmqvist & Lunardo, 2015) for behavior change. This will be especially effective when openness-to-change is embedded in advertisements and brand images to promote sustainable behavior. Prior research documented the presence of various arousal-inducing stimuli in the marketplace such as music and scent (Das & Hagtvedt, 2016), exciting store environments (Holmqvist & Lunardo, 2015), advertisements (Kim et al., 2010), online content/reviews (Berger &

Table 2
Summary of key findings.

Study	Key Findings
1a,1b,2	High arousal enhanced the effect of openness-to-change (vs conservation) on sustainable behavior intentions, while low arousal did not (H1). Openness-to-change enhanced the effect of high arousal on sustainable behavior intentions, while conservation did not.
3	Openness-to-change (vs conservation) reduced the perceived effort needed for recycling in a high-arousal state, which in turn increased recycling intentions (H2). High (vs low) arousal reduced perceived effort when openness-to-change value was activated, which increased recycling intentions.
4	When green purchase behavior was framed as high-effort, consumers open-to-change (vs conservation) were more likely to engage in green purchase in a high-arousal state, but not in a low-arousal state (H2). However, when the green purchase behavior was framed as low-effort, the results were reversed such that openness-to-change (vs conservation) increased the likelihood of engaging in green purchase in a low-arousal condition, but not in a high-arousal condition.
5	First, perceived effort was positively related to sustainable behavior for experienced consumer but negatively related to sustainable behavior for novice consumers (H3a). Second, the interaction effect of arousal and value is more effective for novice consumers (H3b).

Milkman, 2012; Yin et al., 2017), brand logo asymmetry (Luffarelli et al., 2019), color saturation (Hagtvedt & Brasel, 2017; Yan et al., 2016), as well as product type and product displays (Di Muro & Murray, 2012; Keh et al., 2021). Marketers and policy makers can identify sources of arousal in the environment and apply the findings of this research to create messaging that effectively increases sustainable behavior. Moreover, for companies marketing recyclable products, highlighting the low-effort of the purchasing process, priming openness-to-change together with low arousal in the brand or marketing communications is likely to nudge consumers toward recycling and green products.

9.3. Limitations and directions for future research

The current research examines the fundamental human value dimension of openness to change versus conservation. Future research could investigate the effect of self-transcendence (ST) versus self-enhancement (SE) dimensions and arousal on pro-environmental behaviors. As ST-SE dimensions are self-regulating values rather than change-regulating values, we would expect some difference in the interaction effects and underlying mechanism. Meanwhile, we only tested the interaction effects on recycling and green purchase behavior. Future research could systematically investigate how to promote other specific high-effort behaviors such as household energy use and preferences for public transportation. In addition, we recognize that customer experience is highly related to the importance or strength of existing goals. Whether people have an existing goal of engaging in sustainable behaviors matters, thus further research could test the potential moderating effect of goal importance by controlling for the customer experience.

Moreover, at the center of CET is the role that energy plays in driving behavior, which is why we focused on positive states of arousal in this research. Of course, arousal can also be experienced as part of negatively valenced emotions and it is possible that valence moderates the impact of arousal in motivating behavior. In fact, even within the broad affective dimensions of arousal and valence, specific emotions (e.g., awe, pride, anger, fear, etc.) may have nuanced effects. Thus, examining the role of specific emotions, as well as testing the moderating effect of valence (positive vs negative), may be a fruitful avenue for future research.

Finally, this research examined the values-by-affect interaction in the context of sustainable behavior. Beyond sustainable consumer behavior, the theory we propose might have implications in other domains of effortful consumer behavior, such as problem-solving behavior and creative behavior. Thus, future research could explore whether the proposed framework on arousal and openness to change could be also applied to other domains.

Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Measurement Items

Construct	Measurement Items (7-point Likert scales)
Intention to use the travel mug (Study 1a)	How likely are you to go back home to get your travel mug? 1 = <i>extremely unlikely</i> , 7 = <i>extremely likely</i> How willing are you to go back home to get your travel mug? 1 = <i>extremely unwilling</i> , 7 = <i>extremely willing</i>
Recycling intention (Studies 1b, 3, and 5)	How likely are you to recycle/join the recycling program? How inclined are you to recycle/join the recycling program? How willing are you to recycle/join the recycling program? 1 = <i>not at all</i> , 7 = <i>very much</i>
Purchase Intention (Study 4)	How likely are you to purchase this new product? How inclined are you to purchase this new product? How willing are you to purchase this new product? 1 = <i>not at all</i> , 7 = <i>very much</i>
Arousal (Studies 1a, 1b, 3, 4, and 5)	<i>How did you feel at the moment?</i> • 1 = relaxed, 7 = stimulate • 1 = not at all energetic, 7 = very energetic

(continued on next page)

Measurement Items (continued)

Construct	Measurement Items (7-point Likert scales)
Arousal (Study 2)	<ul style="list-style-type: none"> • 1 = very mellow, 7 = very fire up <p><i>How they felt about drinking energy drink/ice tea?</i></p> <ul style="list-style-type: none"> • 1 = relaxing, 7 = stimulating • 1 = calming, 7 = exciting • 1 = unrousing, 7 = arousing
Valence (Studies 1a, 1b, 3, 4, and 5)	<p><i>How did you feel at the moment?</i></p> <ul style="list-style-type: none"> • Sad/ happy • displeased/ pleased • negative/ positive
Manipulation check for Values (Studies 1a, 1b, 3, 4, and 5)	<p>To what extent each of the following values is important to you?</p> <p>Openness to change value</p> <ul style="list-style-type: none"> • open to new things • challenge the status quo • pursue changes / embrace changes <p>Conservation value</p> <ul style="list-style-type: none"> • respect for traditions • maintain the status quo • seek security / follow old practices <p>1 = <i>not important at all</i>, 7 = <i>very important to me</i></p>
Regulatory Focus (Studies 1b, 3, and 5)	<p>To what extent do you agree with the following statements?</p> <p>Promotion focus</p> <ul style="list-style-type: none"> • I am focused on achieving positive outcomes. • I am motivated to attain positive outcomes • I am motivated to be a success <p>Prevention focus</p> <ul style="list-style-type: none"> • I am focused on preventing negative outcomes. • I am motivated to avoid negative outcomes. • I am motivated to prevent being a failure. 1 = <i>strongly disagree</i>, 7 = <i>strongly agree</i>
Perceived Effort (Studies 3, 4 and 5)	<p>How much effort does it take you to recycle/purchase this product? 1 = <i>not much effort at all</i>, and 7 = <i>a lot of effort</i></p> <p>How time-consuming it is for you to recycle/purchase this product? 1 = <i>not time-consuming at all</i>, 7 = <i>very time-consuming</i></p>
Consumer Experience (Study 5)	<p>How often do you recycle in your daily life? How frequent do you recycle in your daily life? 1 = <i>never</i>, 7 = <i>always</i></p>

Appendix B. Studies 1b and 4 Experimental Stimuli

Study 1b

Openness-to-Change + Low Arousal

Make Changes for a Better Planet 
 RECYCLE

Recycling provides us with a sense of **peacefulness and tranquility** about caring for the environment. Let's **embrace challenges, open to new things, and make changes** to protect the environment by sorting the garbage and recycling for a better planet!

JOIN THE RECYCLING PROGRAM

Conservation + Low Arousal

Conserve Resources for a Better Planet 
 RECYCLE

Recycling provides us with a sense of **peacefulness and tranquility** about caring for the environment. Let's **follow traditions, maintain the stability, and conserve resources** to protect the environment by sorting the garbage and recycling for a better planet!

JOIN THE RECYCLING PROGRAM

Openness-to-Change + High Arousal

Make Changes for a Better Planet 
 RECYCLE

Recycling provides us with a sense of **enthusiasm and excitement** about caring for the environment. Let's **embrace challenges, open to new things, and make changes** to protect the environment by sorting the garbage and recycling for a better planet!

JOIN THE RECYCLING PROGRAM

Conservation + High Arousal

Conserve Resources for a Better Planet 
 RECYCLE

Recycling provides us with a sense of **enthusiasm and excitement** about caring for the environment. Let's **follow traditions, maintain the stability, and conserve resources** to protect the environment by sorting the garbage and recycling for a better planet!

JOIN THE RECYCLING PROGRAM

Study 4

Openness-to-Change + High Effort

STAN SMITH SHOES
 - Always Open to Change -

For over 50 years and counting, adidas Stan Smith Shoes have continued to **create new products** that are more sustainable.

This new pair of shoes **challenges its classic silhouette** by redesigning its iconic style with a vegan upper and an outsole made from rubber waste. This shows its commitment to **make changes** for achieving the goal of only using recycled polyester by 2024.

This product is also made with Primegreen, a series of high-performance recycled materials. 50% of upper is recycled content. No virgin polyester.

 **STAN SMITH, END PLASTIC WASTE**
 FAMOUS FOR LOOKING CLEAN, THE NEW STAN SMITHS ARE NOW MADE CLEAN.



SHOP NOW! REGISTER ONLINE FIRST to place the order

Openness-to-Change + Low Effort

STAN SMITH SHOES
 - Always Open to Change -

For over 50 years and counting, adidas Stan Smith Shoes have continued to **create new products** that are more sustainable.

This new pair of shoes **challenges its classic silhouette** by redesigning its iconic style with a vegan upper and an outsole made from rubber waste. This shows its commitment to **make changes** for achieving the goal of only using recycled polyester by 2024.

This product is also made with Primegreen, a series of high-performance recycled materials. 50% of upper is recycled content. No virgin polyester.

 **STAN SMITH, END PLASTIC WASTE**
 FAMOUS FOR LOOKING CLEAN, THE NEW STAN SMITHS ARE NOW MADE CLEAN.



SHOP NOW! SIMPLY CLICK this button to place the order

Conservation + High Effort

STAN SMITH SHOES
 - Always Iconic and Classic -

For over 50 years and counting, adidas Stan Smith Shoes have continued to **hold their place as a classic icon**.

This new pair of shoes **follows its classic silhouette** by redesigning its iconic style with a vegan upper and an outsole made from rubber waste. This shows its commitment to **respect traditions** and conform with the goal of only using recycled polyester by 2024.

This product is also made with Primegreen, a series of high-performance recycled materials. 50% of upper is recycled content. No virgin polyester.

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For over 50 years and counting, adidas Stan Smith Shoes have continued to **hold their place as a classic icon**.

This new pair of shoes **follows its classic silhouette** by redesigning its iconic style with a vegan upper and an outsole made from rubber waste. This shows its commitment to **respect traditions** and conform with the goal of only using recycled polyester by 2024.

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Appendix C. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijresmar.2022.12.004>.

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