

# Interdependent orientations increase pro-environmental preferences when facing self-interest conflicts: The mediating role of self-control



Yating Chuang, Xiaofei Xie\*, Chang Liu

Department of Psychology, Beijing Key Laboratory of Behavior and Mental Health, Peking University, Beijing, 100871, China

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## ABSTRACT

The conflict between self-interested and pro-environmental choices induces psychological barriers to environmental protection. We propose that self-construals can influence the preference in such conflicting choices and that self-control plays a mediating role. The current research offered conflicting choices related to green consumption. Participants were asked to choose between buying eco-friendly (pro-environment) and cheaper (self-interest) products. Individuals with both chronic and primed interdependence but not independence had an increased likelihood of selecting the pro-environmental option (Studies 1a and 1b). In Study 2, interdependent individuals exhibited better self-control in a Stroop task and were willing to pay more for a pro-environmental choice than independent individuals. In Study 3, we found that the effect was diminished in an ego-depletion condition. Our findings indicate that individuals with interdependence favor pro-environmental choices compared with those with independence because interdependent individuals are better at exerting self-control to restrain their self-interested desires.

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## 1. Introduction

China's rapid growth is causing environmental deterioration and arousing great apprehension among the general public. An environmental awareness survey of the Chinese public (CEAP, 2007) showed that Chinese citizens' knowledge and awareness of environmental protection have improved significantly over the last decade; however, the results related to environmental behaviors such as classifying waste and recycling that require people to actively engage revealed a decreasing trend.

Identifying the factors that shape pro-environmental behavior is a complex process. Individuals' pro-environmental tendencies are influenced by numerous factors that include childhood experience, education, personality, social norms and other personal and social elements (e.g., Gifford & Nilsson, 2014; Kollmuss & Agyeman, 2002). Prior research suggests that people are more likely to act pro-environmentally if they also think that such actions will have positive consequences for themselves (Evans et al., 2013). However, not all pro-environmental actions align with self-interest (e.g., De Young, 1996; Lindenberg & Steg, 2007). For example, eco-friendly

sprays can be more expensive than conventional sprays, and nonorganic food is cheaper than organic food; the less-expensive options in these examples provide individuals with short-term financial advantages. China is the fastest growing developing country in the world. The Chinese government solved the starvation problem only approximately 20–30 years ago. However, the economic conditions of the majority of people in China have only slightly improved; therefore, they spend their money frugally. Although people realize that environmental protection is important, given the economic conditions, they likely feel internal conflict between pro-environmental and self-interested (e.g., saving money) sentiments when faced with potentially pro-environmental decisions.

The current research sought to elucidate China's environmental dilemma between self-interest (particularly economic benefits) and environmental protection. We are interested in the actions of individuals facing such conflicts. Consistent with the concept that self-construal can have an important effect on environmental concerns (Arnocky, Stroink, & DeCicco, 2007), the present research was designed to explore how self-construal affects preference during choices in which conflicts between pro-environmental and self-interested sentiments are present. To extend previous research, we propose that self-control is a mediator. Specifically, individuals with interdependent orientations value harmonious

\* Corresponding author.

E-mail address: [xiaofei@pku.edu.cn](mailto:xiaofei@pku.edu.cn) (X. Xie).

relations with others and social norms and usually suppress selfish desires relative to those with independent orientations (Cross, Hardin, & Gercek-Swing, 2011). Thus, self-control might be a mediating mechanism that helps interdependent individuals restrict self-interested impulses and favor more pro-environmental choices compared with independent individuals.

### 1.1. Conflict between self-interested and pro-environmental choices

Pro-environmental behaviors occur when one's actions are consciously designed to minimize negative influences on the natural world (Kollmuss & Agyeman, 2002) such as reducing greenhouse gas emissions and waste production. Pro-environmental behaviors are also considered prosocial, altruistic, and moral behaviors (Griskevicius, Tybur, & Van den Bergh, 2010; Thøgersen, 1996) that can provide long-term sustainable benefits for the environment and society. Anti-environmental behaviors often imply acting according to personal interests, while many pro-environmental behaviors require people to inhibit egoistic desires to benefit the natural world (e.g., Dawes, 1980; Samuelson, 1990).

From a consumer behavior perspective, green consumption contributes positively to environment protection but usually requires customers to spend more than conventional consumption patterns. For example, a gas-electric vehicle costs more than a conventional car, and eco-friendly batteries cost more than common batteries. Most people might want to save money in the short-term and thus choose non-eco-friendly products. In addition to the monetary costs, when pro-environmental choices require personal time and effort, the barriers to pro-environmental behavior increase. For example, recycling and rubbish collection are both important processes for protecting the natural environment, but not all people take such actions. Some might consider such actions to be time- and effort-wasting behaviors.

When individuals encounter conflicting pro-environmental and self-interested goals, they must intentionally favor the pro-environmental goals to achieve pro-environmental behavior. For example, when the weather is very hot in the summer, people's self-interest might urge them to set the thermostat to 16 °C for comfort, whereas their pro-environmental sentiments might insist that 28 °C would be more appropriate because that setting reduces carbon emissions. When these two goals are in conflict, the goal is to persuade people to imbue the pro-environmental action with more weight and adopt the pro-environmental choice.

Two approaches to solving such a conflict can be considered: to increase individuals' environmental concerns or decrease their self-interested desires. However, based on a CEAP report (2007), increasing positive environmental awareness seems to be insufficient to cause people to act pro-environmentally in China. Similarly, many studies have observed weak correlations between environmental attitudes and conservation behaviors (Gagnon Thompson & Barton, 1994). These findings indicate that emphasizing positive environmental awareness seems to be insufficient to cause people to act pro-environmentally. Thus, we suggest that inhibiting egoistic desire is an alternative method to induce pro-environmental behaviors. We propose that individuals' self-construals in terms of independence and interdependence affect their preferences in such choices.

### 1.2. Self-construal affects pro-environmental tendencies

The concept of self-construal was introduced by Markus and Kitayama (1991), who distinguished two typical types of self-cognition in terms of the relationships between individuals and others. Individuals with independent orientations consider

themselves to be separate and unique from others; their behaviors arise from internal attributes (e.g., traits, abilities, and values). In contrast, individuals with interdependent orientations consider themselves to be connected with others; their actions are regulated by contextual factors and intended to maintain harmony with others (Cross et al., 2011). In addition to the cultural aspects, Singelis (1994) noted that these two self-construals are both basic human needs that coexist in individuals and can be measured. Similarly, Trafimow, Triandis, and Goto (1991) illustrated that private (independent) and collective (interdependent) self-cognitions are stored separately—in different memory spaces—within a single person and that these cognitions are retrieved in a manner that depends on one's cultural background, priming procedures, and situational cues (e.g., Aaker & Lee, 2001; Brewer & Gardner, 1996; Lindenberg & Steg, 2007; Trafimow et al., 1991).

Research in cultural domains has shown that people with interdependent orientations place greater emphasis on social happiness than on personal delight (Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009) and exhibit less self-interest (Kitayama & Park, 2013) compared with those who have independent orientations. Additionally, studies that have employed experimental manipulations of participants' self-construals have obtained similar results. Howard, Gardner, and Thompson (2007) explored how self-construal determines the use of power. These authors found that individuals who had been primed to be independent were more likely to favor their own interests during disputes with low-powered opponents than those who had been primed to be interdependent (Howard et al., 2007). Similarly, Gardner, Gabriel, and Lee (1999) found that people primed to be independent were likely to be less considerate of others' needs than participants who had been primed to be interdependent, regardless of their cultural backgrounds. These converging lines of evidence indicate that people with independent orientations are more likely to exhibit self-beneficial actions and that those with interdependent orientations are more connected to the social welfare of others.

Interdependent or independent orientations also influence pro-environmental preferences. Past research has shown that individuals with interdependent orientations are inclined to express greater levels of environmental concern than are those with independent orientations (e.g., Arnocky et al., 2007). Arnocky et al. (2007) measured participants' self-construal orientations and utilized an environmental concern scale and a questionnaire involving resource dilemma situations to examine self-construal in association with environmental engagement. These authors found that independent orientations predicted egoistic environmental concerns and resource competition, whereas interdependent orientations were related to cooperation with others in resource sharing. This result may also indicate that self-construal can influence conflicting preferences between pro-environment and self-interest because interdependent individuals may place more emphasis on social norms when conducting their choices than independent individuals.

*Hypothesis 1:* Self-construals influence individuals' inclinations regarding conflicting pro-environmental and self-interested options. Individuals with interdependent orientations are more inclined toward pro-environmental options than those with independent orientations, and this difference is independent of whether the orientation is chronic (as measured with a scale) or activated by situational cues (i.e., experimental priming).

In addition, we investigate the possible mechanisms that influence such conflicting preferences between interdependent and independent individuals, focusing particularly on the ability for self-control.

### 1.3. Self-control and pro-environmental behavior

Self-control is the capacity to regulate one's instinctive responses or actions in accordance with the requirements of oneself or the external world (Baumeister & Heatherton, 1996). Self-control can inhibit natural impulses (e.g., self-interested tendencies) and help people pursue long-term benefits (Baumeister, Vohs, & Tice, 2007; Milkman, Rogers, & Bazerman, 2008). People in states of low self-control are more likely to be dominated by the impulsive system, which is associated with behavior that is based on the evolutionary history of the organism. In contrast, people in states of high self-control are more likely to be dominated by the reflective system, which serves regulatory goals that control the impulsive system (Hofmann, Friese, & Strack, 2009; Strack & Deutsch, 2004). People with high levels of self-control adopt deliberative thinking over instinctual responses, a behavior that helps them achieve long-term goals.

However, according to the strength model of self-control (Baumeister et al., 2007; Muraven & Baumeister, 2000), self-control is a limited inner resource that resembles a human muscle. Exerting self-control in any domain can cause ego-depletion, which is similar to a state of mental fatigue state and results in reduced performance levels on subsequent tasks that require self-control. Abundant evidence indicates that it is easy to reduce an individual's self-control through emotional regulation, thought control, and temptation resistance (e.g., Muraven & Baumeister, 2000; Muraven, Tice, & Baumeister, 1998) or by applying an extreme cognitive load (Shiv & Fedorikhin, 1999). For example, individuals in states of high cognitive load are more likely to choose an option that meets their immediate desire (e.g., chocolate cake), whereas those in states of low cognitive load tend to choose a healthier option (e.g., a fruit salad).

Self-control is also an important factor that determines a person's engagement in pro-environmental behavior. Griskevicius et al. (2010) stated that pro-environmental behaviors are a type of prosocial behavior, and Martinsson, Myrseth, and Wollbrant (2012) found that the trait of self-control is positively correlated with pro-social behavior. Specifically, people exert self-control to restrain their instinctual desires (e.g., saving money) when they consider the long-term benefits to the natural world. Therefore, faced with decision-making conflicts between pro-environmental and self-interested goals, individuals with low levels of self-control might prioritize personal goals and follow their natural responses. Consequently, the self-interested goals of such individuals outweigh their pro-environmental goals, which inhibits their ability to make choices that favor environmental protection. However, people with high levels of self-control are more likely to follow social norms and adopt the appropriate behavior. Thus, self-control is an important factor that helps people select pro-environmental goals. Moreover, independent and interdependent self-construals are indicative of different levels of self-control.

### 1.4. Self-construal and self-control

Previous research has shown that individuals with interdependent orientations perform better on tasks based on both cultural and chronic measurements that require self-control compared with individuals with independent orientations. Seeley and Gardner (2003) clustered collective cultural background, interdependent beliefs, and other-directed self-monitoring into a measure called social orientation. They found that participants with strong social orientation were less depleted after exerting self-control than those with weak social orientation.

There are two profound reasons that people with interdependent orientations perform better in terms of self-control compared

with those who have independent orientations. First, according to Seeley and Gardner (2003), people who possess strong social focus (e.g., interdependent beliefs) exhibit greater motivation and practice more self-control in daily social interactions. Research has shown that motivation (Muraven, 1998) and practice (Muraven, Baumeister, & Tice, 1999) can improve self-regulatory ability. Second, Masuda and Nisbett (2001) suggested that people with interdependent orientations exhibit more holistic attention, which involves the use of abstract, general terms (i.e., high-level construals) and not concrete, detailed terms (i.e., low-level construals); in other words, such individuals pay more attention to context. Additionally, Fujita, Trope, Liberman, and Levin-Sagi (2006) demonstrated that participants who activate high-level construals exhibit more effective self-control than do those who activate low-level construals because interdependent orientations might possibly result in better self-control via high-level construal mindsets. These two lines of reasoning demonstrate that interdependent people are less depleted than independent people after exerting self-control.

Therefore, we propose that when faced with conflicts between pro-environmental and self-interested choices, the difference in self-control between independent and interdependent orientations is a mediating factor that influences individuals' tendencies to make self-interested versus pro-environmental choices.

*Hypothesis 2:* Self-control is a mediating factor when making self-interested versus pro-environmental choices. Specifically, participants with interdependent orientations have greater self-control resources than those with independent orientations. Thus, interdependent people can restrain their self-interested desires and give greater consideration to pro-environmental options.

## 2. Overview of the research

The present study intended to apply experimental methods to verify whether self-construals influence preferences for conflicting pro-environmental and self-interested options. This paper used scenarios related to green consumption to design opposing choices, specifically conflicts between pro-environmental benefits (e.g., we should favor eco-friendly products even at higher prices) and self-interested benefits (e.g., favor lower prices over more expensive eco-friendly products). The scenarios used in this study are typical examples of the environmental dilemmas faced by Chinese people. Chinese people know that they should choose more eco-friendly products, but they are usually unwilling to pay more money because that would harm their self-interest. When participants select the former option, they are considered to be pro-environment rather than self-interested, while when they select the latter option, they are assumed to be more self-interested than pro-environment.

Our first experiment examined whether individuals who were dominantly interdependent and those who were dominantly independent exhibited distinct inclinations regarding the conflicting options using a scale measurement (Study 1a) and experimentally induced priming (Study 1b). Study 2 examined whether self-control is a mediating factor using the Stroop response latency as an implicit measure. Finally, we depleted the self-control resources of the participants in Study 3 and predicted that the effect of distinct inclination would be reduced in the ego-depleted condition; we used a moderation technique to deplete participants' self-control resources to prove that self-control is a crucial mediator.

### 2.1. Studies 1a and 1b

Studies 1a and 1b aimed to explore whether people in different states of interdependence or independence exhibit different choice

tendencies when they encounter a conflict between pro-environmental and self-interested goals. In Study 1a, we used a Chinese modified version of Singelis' self-construal scales (Wang, Yuan, & Xu, 2008) to measure participants' chronic self-construals in a Chinese context. In Study 1b, we used a classic laboratory method designed by Trafimow et al. (1991) to activate participants' interdependence or independence. We hypothesized that the participants who were dominantly interdependent (whether chronically or due to priming) would be more inclined toward the pro-environmental options than those who were dominantly independent.

### 2.1.1. Study 1a

**2.1.1.1. Method. Participants.** A total of 79 students (45 males, 34 females,  $M_{age} = 22.86$ ,  $SD = 2.39$ ) from Peking University and Beijing Forestry University participated in the study through online or paper-based surveys.

**Materials and procedure.** The participants completed a self-construal scale (Chinese version) (Wang et al., 2008) that was translated from the self-construal scale of Singelis (1994) and has demonstrated high reliability and validity. The scale consisted of 12 items related to independence ( $\alpha = 0.68$ ; e.g., "I enjoy being unique and different from others in many respects") and 12 items related to interdependence ( $\alpha = 0.60$ ; e.g., "It is important for me to maintain harmony within my group"). The items were rated on a 7-point scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Next, the participants were instructed to read the following passage:

"Based on eco-friendly and economic considerations, the school cafeterias decide to provide two types of takeout boxes. There are no apparent differences in the designs of the two types; however, the type A takeout boxes are more biodegradable than are the type B boxes; thus, the type A boxes are more expensive than the type B boxes. The type A boxes are one yuan, and the type B boxes are 0.5 yuan."

After reading this passage, we asked the following two contextual questions to confirm that the participants completely understood the scenario: "Which type of takeout box is more eco-friendly?" and "Which type of takeout box is less expensive?" Next, we asked the main question, "If you needed a takeout box, which one would you prefer to buy?" and the participants replied on a 7-point scale (1 = *definitely choose type A*, 7 = *definitely choose type B*). In this scenario, type A was more biodegradable but more expensive, whereas type B was more economical but less eco-friendly. The participants who favored type A were considered more pro-environmental, and those who favored type B were considered more self-interested.

Then, we asked two questions as control variables. The first measured the frequencies of the participants' use of takeout boxes (1 = *never*, 5 = *always*), and the second measured the participants' sense of environmental protection self-efficacy ("How much effect do you believe that your personal environmental behavior has on improving the environment?"; 1 = *no effect*, and 7 = *strong effect*). We measured "environmental protection self-efficacy" as a control variable. Prior research has indicated that people are less likely to adopt pro-environmental behaviors they believe that their actions make no contribution to environmental protection (e.g., Lee & Holden, 1999; Lubell, 2002); therefore, this phenomenon can be considered as a sense of self-efficacy in eco-protection (Gifford & Nilsson, 2014). Our participants primarily had backgrounds in higher education and had sufficient environmental knowledge to understand the environmental consequences of their actions. Therefore, in addition to their habits, we believed that their sense of self-efficacy in eco-protection would influence their environment-related decisions. Subsequently, the participants were asked to

answer demographic questions.

**2.1.1.2. Results.** The resulting self-construal scale scores were used to separately calculate the sums of the independence and interdependence subscales, and the independence score minus the interdependence score was taken as the final score. Higher scores indicated greater independence, and lower scores indicated greater interdependence.

As suggested by Spector and Brannick (2011), we first examined the hypothesis conducting a regression model that did not include any control variables and then assessed how adding the control variables would affect our findings. First, we conducted a regression analysis using the self-construal scores as the predictor and the choice between A (the pro-environmental option) and B (the self-interested option) as the dependent variable. The results revealed a significant relationship,  $F(1,77) = 6.67$ ,  $p = 0.01$ ,  $R^2_{adj} = 0.07$ . Self-construal scores indicative of interdependence were associated with the pro-environmental option,  $\beta = 0.28$ ,  $t(77) = 2.58$ ,  $p < 0.05$ .

Finally, analyses were rerun with age, sex, takeout box type, and sense of self-efficacy in eco-protection as the control variables in level one of the regression model, and we added self-construal score in level two. Only the sense of self-efficacy in eco-protection had a significant effect ( $\beta = -0.24$ ,  $t(73) = -2.06$ ,  $p < 0.05$ ) on the participants' choices; other choices exerted no effect. The results still remained significant,  $F(1,72) = 2.35$ ,  $p < 0.05$ ,  $R^2_{adj} = 0.07$ . Self-construal was still significant in predicting the conflicting options,  $\beta = 0.27$ ,  $t(72) = 2.41$ ,  $p < 0.05$ .

Thus, our results indicated that the participants with chronically interdependent orientations were more likely to choose the pro-environmental option when faced with conflicting self-interested and pro-environmental options compared with the participants who had chronically independent orientations.

### 2.1.2. Study 1b

**2.1.2.1. Method. Participants and Procedure.** Fifty-four students (17 males, 37 females,  $M_{age} = 22.8$ ,  $SD = 3.09$ ) participated in this study by completing an online questionnaire. The first step was to activate their independent or interdependent orientations. We used the priming task developed by Trafimow et al. (1991) in which participants were required to read either an independent or an interdependent story. The story described a warrior who had to pick a general to aid the king. In the independent condition, the warrior sent the most talented general to the king with the goal of obtaining a reward for himself. In the interdependent condition, the warrior chose a member of his own family based on the consideration that the king would be indebted to his family. Next, the participants were given two minutes to write about either the differences (priming independence) or the similarities (priming interdependence) between themselves and their family and friends.

To prove that the self-construal manipulation used throughout the following studies selected activated independence or interdependence, we recruited thirty-eight students (18 males, 20 females,  $M_{age} = 23.34$ ,  $SD = 3.22$ , 19 of whom were primed with independence) who did not participate in study 1b to participate in a pre-test. These participants were asked to describe themselves by completing a modified 10-item version of the Twenty Statements Test (TST) (Kuhn & McPartland, 1954). The test was completed within three minutes of finishing the priming procedure.

The TST coding procedure was taught to two independent coders, who had psychology backgrounds. The rules followed prior research (e.g., Gardner et al., 1999): sentences that referred to personal traits, attitudes (e.g., I am intelligent), or behaviors would be coded as independence, whereas sentences that referred to relationships or group members (e.g., I am a student) would be coded



as interdependence. The final score was calculated as the average of the two independent coders' scores (interrater reliability = 0.97). The two priming types were analyzed by independent *t*-test, *t*(36) = 2.06, *p* < 0.05, *Cohen's d* = 0.69. The analysis revealed that the priming manipulation was successful. The participants in the pretest who were primed with independence described themselves with a greater proportion of independent self-construals than those who were primed with interdependence ( $M_{Ind} = 6.18$ ,  $SD = 3.89$ ;  $M_{Inter} = 3.76$ ,  $SD = 3.33$ ). These findings indicated that the self-construal manipulation used in the following studies could successfully prime participants' interdependent or independent orientations.

After the priming procedure, the participants in Study 1b read the following scenario and answered a question:

"You need to buy a car and have a budget of 150–200 thousand yuan (RMB). You go to a 'vehicle house' to browse and compare relevant information. According to your requirements, the salesperson recommends cars A and B. There are no considerable differences between the two cars in terms of appearance, capacity, fuel consumption, and so on; the only difference is that car A has a new exhaust gas purifier installed that can increase the purity of its emission by 8%; thus, car A is 10 thousand yuan more expensive than car B."

Although car A (pro-environmental option) was more eco-friendly than car B (self-interested option), car B was less expensive than car A. The participants who chose car B were considered to prioritize self-benefits, whereas those who chose car A were considered to prioritize long-term environmental benefits. Similar to Study 1a, we asked two contextual questions to confirm that the participants understood the scenario ("Which car is more eco-friendly?" and "Which car is less expensive?"). Next, we asked the main question, "If you decide to buy a car, which one would you prefer to buy?", and the participants answered on a 7-point scale (1 = definitely choose car A, 7 = definitely choose car B). Finally, we asked control questions to measure the participants' sense of self-efficacy in eco-protection, as described for Study 1a.

**2.1.2.2. Results.** A total of 28 participants were primed with independence, and 26 participants were primed with interdependence. First, we conducted a one-way ANOVA without control variables. The self-construals were found to have a significant effect on car selection,  $F(1,52) = 5.67$ , *p* < 0.05,  $\eta^2 = 0.10$  (*Cohen's d* = 0.67). The participants who were primed with interdependence ( $M = 2.58$ ,  $SD = 1.07$ ) were more inclined to select car A than were those who were primed with independence ( $M = 3.46$ ,  $SD = 1.60$ ; see Fig. 1).

Then, we conducted an ANCOVA to control for the sense of self-

efficacy in eco-protection, which also exhibited a significant effect on the selection,  $F(1,51) = 11.48$ , *p* < 0.01,  $\eta^2 = 0.18$  (*Cohen's d* = 0.94); however, self-construals still reveal a significant effect on car decision,  $F(1,51) = 8.02$ , *p* < 0.01,  $\eta^2 = 0.14$  (*Cohen's d* = 0.80).

### 2.1.3. Discussion

The results of Studies 1a and 1b initially supported Hypothesis one, which stated that chronic (1a) and experimentally induced (1b) self-construals affected decisions in conditions of conflict between pro-environmental and self-interested goals. We wanted to determine whether the participants who were dominantly interdependent, either chronically or due to experimental manipulation, would choose the pro-environmental options more frequently than would those dominated by independence.

## 2.2. Study 2: mediator of self-control

Study 2 aimed to verify the mediating role of self-control on the effects of the different self-construals on decision-making in conditions of pro-environmental conflict with self-interest. Measurements were performed using the Stroop task (Stroop, 1935), which requires self-control to override the urge to react to the indicated color and not the semantic meaning of the presented word. The response latencies of this test have been widely used as a measure of self-control (e.g., Gailliot et al., 2007). We used a similar scenario as presented in Study 1b, but the 'willingness to pay' was used as the dependent variable in this study. If the participants agreed to pay a higher price, they were considered to be more inclined to choose the pro-environmental option than the self-interested option. In contrast, participants who chose to pay less were considered to be more inclined to choose the self-interested option.

### 2.2.1. Method

**Participants.** One hundred and twenty-one university students were recruited through a campus BBS, which cost 10 yuan (RMB). Three participants were excluded from the analysis; one participant failed to finish the procedure, and the Stroop task response times of two participants were considered to be outliers. Data from 118 participants (57 males, 55 females,  $M_{age} = 22.59$ ,  $SD = 2.82$ ; six participants misreported their age and gender) were used for the subsequent analyses.

**Procedure.** The participants came to the laboratory individually. They were required to complete the color-word Stroop task on a computer. This task, which consisted of 24 trials, served as the control for the baseline differences in self-control resources. The design involved identifying the color of a Chinese character (red, green, blue, or black). The participants were instructed to react to the ink color and to ignore the semantic meaning of the stimulus. The inter-stimulus interval was 200 ms, and various colors and words were displayed randomly. In the incongruent trials, the semantic meaning of the word was not related to the presented color, whereas in the congruent trials, the word and the color were the same. After completing the baseline Stroop task, the participants were randomly grouped into interdependent or independent priming groups. The priming procedure was identical to that used in Study 1b (i.e., the participants read a story and wrote down similarities or differences between themselves and their family and friends). Next, the participants immediately completed 96 more trials of the Stroop task. The Stroop interference scores of these latter trials were used as a primary measure of the participants' self-control. Subsequently, the participants read a scenario similar to that presented in Study 1b but with some modifications. In this phase, we asked the participants the following question: "You need to buy a car with a budget of 200–250 thousand yuan (RMB). Car B has a new exhaust gas purifier installed that can increase the purity

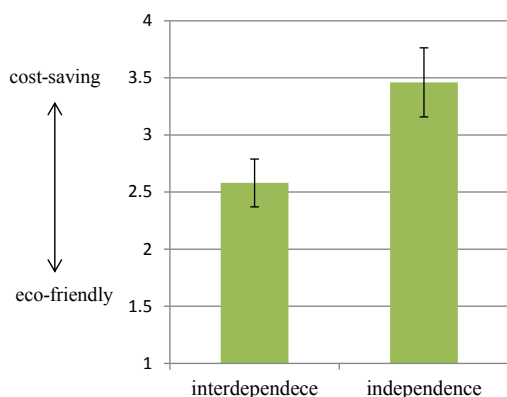


Fig. 1. Mean choices of car A (eco-friendly) vs. car B (cost-saving) following interdependence or independence priming in Study 1b.

of the emissions by 8% compared with car A (210 thousand). How much money are you willing to pay for car B?” The participants wrote their answers on the blank lines provided. If the participants provided a higher price for car B, they were considered to be more inclined toward the pro-environmental option, while those who offered a lower price were considered to be more inclined toward the self-interested option.

Similarly, we supposed that the participants' average monthly spending and sense of self-efficacy in eco-protection would influence their decisions. Therefore, we asked the participants to answer questions about self-efficacy in eco-protection and average monthly spending at the end of the procedure.

### 2.2.2. Results

The independent and interdependent priming groups were composed of 59 participants each. First, we conducted one-way ANOVA without any control variables. The self-construals significantly affected the amount offered for the pro-environmental option.  $F(1,116) = 4.26, p < 0.05, \eta^2 = 0.04$  (Cohen's  $d = 0.41$ ). The interdependence-primed participants ( $M = 1.61, SD = 1.04$ , unit 10 thousand yuan) were willing to pay more than were those primed with independence ( $M = 1.23, SD = 0.96$ ). This result indicated that the participants who were primed with interdependence supported pro-environmental options, whereas those primed with independence did not.

Then, we added self-efficacy in eco-protection and average monthly spending as covariates. Self-efficacy in eco-protection was revealed to have a significant effect on willingness to pay,  $F(1,112) = 16.92, p < 0.01, \eta^2 = 0.13$  (Cohen's  $d = 0.77$ ), whereas monthly consumption did not. The self-construals revealed no effect on paying,  $F(1,112) = 2.37, p > 0.05, \eta^2 = 0.02$  (Cohen's  $d = 0.29$ ). This result seemed to suggest that self-efficacy in eco-protection exerts more influence on the decision to pay more, but the original model—without control variables—had supported our hypotheses.

**Mediation analysis.** The Stroop interference score was calculated by subtracting the latencies of the congruent trials from those of the incongruent trials. High performance scores indicated significant failure to override the interference, which in turn reflected low self-control. We conducted an ANCOVA on the participants' second Stroop interference scores using the baseline Stroop task scores as a covariate and found that interference was significantly lower among the interdependent priming group than the independent priming group,  $F(1,115) = 5.88, p < 0.05, \eta^2 = 0.05$  (Cohen's  $d = 0.45$ ). Priming with interdependence ( $M = 149.5$  ms,  $SD = 115.6$  ms) resulted in less response interference than did priming with independence ( $M = 179.7$  ms,  $SD = 112.3$  ms), which indicated that the interdependent priming group had more self-control.

Finally, we conducted a bootstrap analysis (Preacher & Hayes, 2008) to determine whether self-control mediated the effect of self-construal on the amount offered for the pro-environmental option. In this analysis, the priming group served as the independent variable; the second Stroop task score served as the mediator variable; and the first Stroop score was the covariate. The results revealed a 95% bias-corrected and accelerated confidence interval (CI) [0.0016, 0.2183] that excluded zero, based on 5000 bootstrap samples. Thus, our results verified the mediating role of self-control on the effect of self-construal on the outcome of pro-environment-self-interest conflict.

### 2.2.3. Discussion

Study 2 demonstrated that self-control mediated the effect of self-construal on the pro-environmental-self-interest conflict. After controlling for the baseline Stroop performance, the participants

primed with interdependence exhibited less interference in the Stroop task than the participants primed with independence. Additionally, Study 2 revealed that the interdependent participants were more willing to pay higher prices to purchase the pro-environmental product. Although the dependent variable in the 'willingness to pay' design in Study 2 had a smaller effect ( $\eta^2 = 0.04$ ) than did the inclinations toward self-interested and pro-environmental options in the decisions in Study 1b ( $\eta^2 = 0.10$ ), the results still illustrated that the tendency to support pro-environmental options differed between the self-construals. This study revealed that the interdependent group was more inclined to select the pro-environmental option than was the independent group.

### 2.3. Study 3: manipulation of self-control using a moderator

We experimentally manipulated self-control in Study 3 to obtain further evidence for the mediator mechanism using the moderation approach (Spencer, Zanna, & Fong, 2005). The manipulation materials were 6 min of self-edited videos (without audio) that were modified versions of those used in the classic self-regulation attention methods (Schmeichel, Vohs, & Baumeister, 2003). The scenario involved the purchase of an eco-friendly air-conditioning system, and the dependent variable was the inclination toward pro-environmental or self-interested options and was similar to those used in Studies 1a and 1b.

#### 2.3.1. Method

**Participants and procedure.** A total of 81 Peking University students (40 males, 41 females,  $M_{age} = 23.38, SD = 2.35$ ) were recruited using the campus BBS, which cost 10 yuan (RMB). The participants came to the laboratory and were randomly assigned to the depletion or control condition. In the ego depletion condition, the participants were instructed to watch two simultaneous videos playing side by side on a single screen. The participants were required to watch the video on the left, which showed a woman giving a lecture and to ignore the video on the right (which displayed unrelated titles). In the control condition, the participants were provided with only one screen and no specific instructions. After watching the video, the participants were asked to answer the manipulation questions ("How difficult was it to watch the video?" where 1 = *very easy* 7 = *very difficult*, and "How much effort was required from you to complete the task?" where 1 = *no effort* and 7 = *great effort*;  $\alpha = 0.88$ ).

Next, the participants were randomly assigned to interdependence- or independence-primed groups in a manner similar to that of Studies 1b and 2. The participants read the following scenario:

"Your house needs an air-conditioner, and your budget is approximately 3 thousand yuan (RMB). Therefore, you go to the shopping mall. An agent recommends two types of air-conditioner. There are no substantial differences between the two in terms of friction and power consumption. The only specific difference is that the type A model utilizes a fluorine-free refrigerant and is thus more eco-friendly. However, the price of the type A air-conditioner is greater than that of the type B model by 600 yuan."

After reading the scenario, the participants answered questions regarding their intentions to buy an air-conditioning system (1 = *definitely choose type A*, 7 = *definitely choose type B*) on a 7-point scale. They also answered demographic questions and questions that aimed to measure their sense of self-efficacy in eco-protection as controls.

#### 2.3.2. Results

**Manipulation checks.** An independent-sample *t*-test was conducted to differentiate the difficulties of the video-watching task in

the depletion and control conditions. The expectation was verified. The participants in the depletion condition ( $M = 4.22$ ,  $SD = 1.73$ ) rated the task of watching the video as more difficult and requiring greater effort than did those in the control condition ( $M = 2.86$ ,  $SD = 1.43$ ),  $t(79) = 3.85$ ,  $p < 0.01$ , *Cohen's d* = 0.86. The manipulation successfully varied the level of self-control.

Statistical tests revealed that the sense of self-efficacy in eco-protection of the participants in the depletion and control conditions differed significantly,  $t(79) = 2.62$ ,  $p < 0.05$ , *Cohen's d* = 0.59. Thus, we conducted a 2 (self-regulatory: depletion vs. control)  $\times$  2 (priming group: interdependence vs. independence) ANCOVA using self-efficacy in eco-protection as a covariate. The self-efficacy in eco-protection was revealed as having a significant effect on the participants' preferences  $F(1, 76) = 26.59$ ,  $p < 0.01$ ,  $\eta^2 = 0.26$  (*Cohen's d* = 1.59), which was similar to the results in previous studies. Our main results revealed a significant interaction effect,  $F(1, 76) = 4.27$ ,  $p < 0.05$ ,  $\eta^2 = 0.05$  (*Cohen's d* = 2.85). The effect of different self-control levels was also significant,  $F(1, 76) = 9.59$ ,  $p < 0.01$ ,  $\eta^2 = 0.11$  (*Cohen's d* = 0.94), whereas the effect of group (i.e., independent or interdependent priming) was not,  $F(1, 76) = 0.34$ ,  $p > 0.05$ ,  $\eta^2 = 0.003$  (*Cohen's d* = 0.47).

A simple main effect analysis was conducted. In the control condition, the results revealed that participants primed with interdependence ( $M = 2.10$ ,  $SD = 1.33$ ) were more inclined toward the pro-environmental option than were those primed with independence ( $M = 3.10$ ,  $SD = 1.62$ ),  $t(38) = 2.13$ ,  $p < 0.05$ , *Cohen's d* = 0.67, which was consistent with the results of Study 1b. In contrast, in the depleted condition, the two priming groups exhibited no difference in their choices between the conflicting options,  $t(39) = -0.69$ ,  $p > 0.05$ , *Cohen's d* = -0.22 (see Fig. 2).

### 2.3.3. Discussion

The results of Study 3 provided further evidence that in individuals dominated by interdependence or independence, self-control was a mediating factor that affected their inclination toward pro-environmental or self-interested options. Self-control is predicted to be an important resource for interdependent individuals, who use it to restrain their desires for self-interested choices. However, when interdependent people have had to exert self-control in a previous condition, causing the depletion of their self-control, they tend choose the self-interested option. This result is consistent with previous research (Baumeister et al., 2007; Muraven & Baumeister, 2000). In the absence of self-control (i.e., the depletion condition), the difference in inclination toward pro-environmental and self-interested options between the

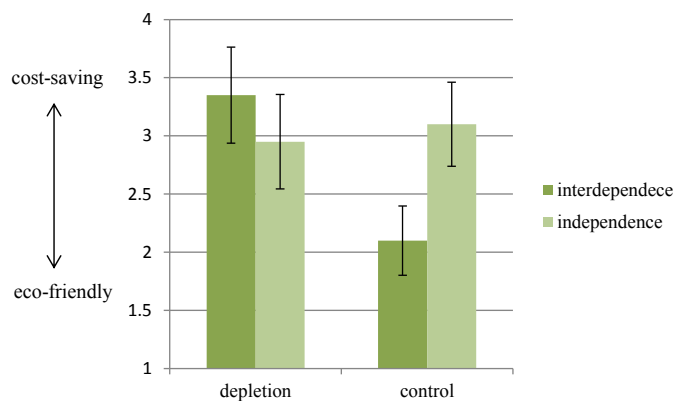


Fig. 2. Mean preferences for type A (eco-friendly) and type B (cost-saving) air-conditioning systems following interdependence and independence priming under the depletion and control conditions in Study 3.

interdependent and independent groups decreased. However, the results from the control condition are consistent with the findings of Study 1b, which showed that the participants who were primed with interdependence were more inclined toward the pro-environmental option than those who were primed with independence. These results indicate that interdependent individuals are required to utilize their self-control resources to restrain their desire for self-interest, but when they are in an ego-depletion condition, they are less able to make themselves choose a pro-environmental option.

### 3. General discussion

The present investigation began with the idea that self-construals would influence the choices between conflicting pro-environment and self-interested options. We provided empirical evidence that individuals with interdependence were more inclined toward the pro-environmental options than those with independence. The three experiments reported in this article provide support for this idea. The conflict scenarios were designed in green consumption situations; i.e., the participants were required to select either a cost-saving product for self-interested reasons or an expensive product for environmental reasons. These products included take-out boxes (Study 1a), eco-friendly vehicles (Studies 1b and 2), and eco-friendly air-conditioning systems (Study 3).

Both chronic (i.e., measured with a scale, Study 1a) and experimentally induced orientations (Studies 1b and 2) produced similar results: participants with interdependent orientations were more inclined toward the pro-environmental choices than those with independent orientations. Studies 2 and 3 further demonstrated that self-control was a mediating factor of these effects. In Study 2, participants primed with interdependence exhibited more self-control than those primed with independence as measured by their Stroop task performance. In Study 3, we found that the effect was diminished in an ego-depletion condition, which indicates that self-control is a crucial mediator.

Self-control is an important factor that helps individuals with an interdependent orientation restrain their self-interested desires. In particular, we conducted these studies in a Chinese context. The self-construal condition revealed main effects across studies, but when manipulated in an ego-depletion condition (Study 3), interdependent individuals are not significantly different compared with independent individuals. Our results indicated that Chinese people with strong interdependent orientations can follow normative options (i.e., pro-environment), but doing so requires them to consume self-control resources. When that self-control resource has been depleted, even interdependent people may not have the power to restrain their motives of self-interest. Our findings also supported Seeley and Gardner (2003) who showed that people with social orientation (i.e., interdependence) are better able to regulate their desires to harmonize with others and to conform to social expectations (see more discussion in Section 3.1, Theoretical contribution).

Furthermore, our results showed a significant effect for “environmental protection self-efficacy.” Although we obtained the same results regardless of whether the control variables of “self-efficacy in eco-protection” were included or excluded, we should still be concerned with the effect of “self-efficacy in eco-protection” which is a measure of whether people believe their actions can benefit the environment.

#### 3.1. Theoretical contribution

We extended prior research that has shown the impact of self-construal on pro-environmental choices (e.g., Arno et al.,

2007). Our research verified that individuals' self-construals can influence their decision-making preferences when faced with choices imbued with conflict between pro-environmental and self-interested motivations. To address such conflicts, we can either strengthen personal pro-environmental concerns or reduce self-interested preferences. This study focused on the latter aspect. We found that people with interdependent orientations exhibit better self-control performances (Study 2) and were better able to suppress their self-interested (i.e., cost-saving) desires. This result indicates that self-control is a mediating factor that helps interdependent individuals follow normative choices and reduces their self-interested tendencies. However, when their self-control resource is depleted (Study 3), the difference preference between interdependent and independent individuals disappears.

Although Seeley and Gardner (2003) found that people with strong social orientation were less depleted after exerting self-control than people with weak social orientation, we found that after self-control depletion, interdependent people acted no differently than independent people—both groups chose the self-interest option more often. Initially, these results seemed contradictory. However, our studies were conducted within a Chinese context by trait and by priming, while Seeley and Gardner (2003) studies were conducted across different cultures (US vs. Chinese), which may have been the cause of the different results. In addition, according to the strength model of self-control (Baumeister et al., 2007; Muraven & Baumeister, 2000), people in ego-depletion conditions perform worse on subsequent tasks that require self-control. Self-control resources are also required for interdependent individuals to resist temptations and choose idealistic options that may benefit their future or social group. Therefore, in Study 3, interdependent participants in a depletion condition did not have sufficient remaining self-control to inhibit their self-interest. These results are not contrary to the findings of Seeley and Gardner (2003); instead, they emphasize that adequate self-control resources are a substantial factor in the ability of interdependent people to make pro-environmental choices.

### 3.2. Practical implications

According to the 2012 Environmental Performance Index (EPI) report, China ranked 116th out of 132 countries. Environmental issues have become a substantial factor in restricting China's economic growth and social stability. The behavior of the general population during their daily lives cannot be ignored because some patterns of consumption accelerate the deterioration of the environment such as purchasing products that increase pollution but save money. It is true that when faced with conflicts between the environment and self-interest, individuals might fail to engage in environmental behaviors. This study demonstrated that individuals with orientations between independence and interdependence exhibit different decisions in such situations.

Our research adopted a laboratory approach to priming the participants' specific self-construals as either independent or interdependent. The results suggest that priming individuals' interdependent orientations can improve their likelihood of making pro-environmental choices. Therefore, by launching new eco-friendly products and publicizing conservation-promoting behaviors, policy makers and related agencies might activate people's interdependent orientations. It should be noted that consideration must be made concerning the object of individuals' interdependent orientations. For example, prior studies have shown that advertisement slogans can activate different self-construals in individuals (e.g., Aaker & Lee, 2001; Hamilton & Biehal, 2005). When policy makers and related agencies employ slogans such as "Protect our earth today for our children's tomorrow" to prime people's

interdependent orientations for environmental purposes, such slogans may influence only individuals with children, have no impact on childless individuals.

However, the pro-environmental preference effect from priming individuals' interdependent orientation can fail when their self-control resources are depleted. Thus, reducing the condition of self-control depletion in daily life should also be considered. In particular, when people face a conflicting choice between self-interest and normative desire, if we wish people follow the social norm, we need to avoid having them make such choices in a depleted condition.

### 3.3. Limitation and future direction

The present research sought to examine China's environmental conundrum; thus, only Chinese university students were recruited, and this study lacks any comparison with Western subjects. However, the results illustrate that the relationship between distinct self-construals and conflicts between pro-environmental and self-interested sentiments are widespread psychological phenomena that might extend universally and be represented across cultures.

It is important to realize that our studies did not indicate that independent people are less eco-friendly or perform worse on tasks involving self-control. The studies indicate only that—when facing conflict between pro-environment and self-interest—-independent people may more often prefer a self-interested choice when compared with interdependent people. In addition, independent individuals might not face such conflicts between self-interested and pro-environmental choices. Moreover, their preferences may currently be more influenced by other personal or social factors (see more details in Gifford & Nilsson, 2014). In recent years in China, people have only gradually increased their eco-awareness, but this awareness is not stronger than in Western countries. Therefore, when Chinese individuals face conflicts between self-interest and the environment, they might be easily influenced by their self-construal and self-control.

Although we consider self-control as an important mediating factor to reduce self-interested preference, we cannot represent self-control as always resulting in pro-environmental choices. Other factors might impact the selection process, for example, the environmental concerns of individuals might foster their habitual preferential behavior for eco-friendly products. Moreover, when choosing products under time pressure, people might simply follow their intuition.

Individuals' self-construal tendencies can be either chronic or influenced by priming. When both conditions are in the same direction, the individual's preference will stay the same, whereas when the two conditions are dissimilar, the effect may be weaker. In our studies, we adopted two priming procedures to successfully confirm our manipulation, but in the real world, if the situational cue priming is not strong enough, it may fail to influence individuals' distinct chronic orientations. Thus, it should be further considered how we can successfully activate individuals' interdependent orientations to prompt pro-environmental preferences.

Additionally, the self-interested goals in the scenarios used in the studies were related only to financial costs. Future studies might consider relating environmental concerns to a broader range of similar conflicting scenarios that involve other costs such as effort or time. For example, such studies could ask participants to be environmental volunteers or measure participants' waste collection behavior (e.g., whether they make an effort to dispose of bottles in recycling bins). Moreover, the present study focused on whether self-control played a mediating role; however, there are likely other mediating factors that further research should consider. For example, guilt might influence interdependent people to



engage in pro-environmental behaviors; some people might experience guilt and discomfort if they do not act according to social expectations. The priming of self-construals in our study was based on previous laboratory methods and may have been slightly monotonous. To improve upon the current study, future studies could employ approaches that are more ecologically relevant such as the use of advertisement slogans.

Additionally, an individual's self-construal is not limited to relationships with others but can also be related to the environment. Davis, Green, and Reed (2009) suggested measuring the inclusion of nature in the self and found that individuals who are closer to the environment exhibit more pro-environmental behaviors. This finding agrees with the view of Arnocky et al. (2007), who proposed a meta-personal self-construal by which the self is associated with nature. People with this type of self-construal are predicted to exhibit more environmentally friendly behaviors and eco-cooperation. In its traditional philosophy, China not only aspires to a culture with an interdependent orientation, but the people of China also believe in the concept of nature and people as one (i.e., a meta-personality). Based on this ancient Chinese belief, future researchers should consider how the pro-environmental and interdependent orientations of the Chinese people can be combined and use these ideas to explore novel ways to make substantial contributions to environmental protection.

### 3.4. Conclusion

In conclusion, the current findings suggest that when faced with a conflict between pro-environmental and self-interested options, people with interdependent orientations choose a pro-environmental option more often than those with independent orientations. This research also provides evidence that differences in self-control capacity for people with interdependent and independent orientations is a mediating factor that enhances the interdependent participants' pro-environmental tendencies by allowing them to suppress their self-interested desires.

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