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## Can recycling compensate for speeding on highways? Similarity and difficulty of behaviors as key characteristics of green compensatory beliefs

**Abstract:** People believe that the effects of unecological behaviors may be compensated for by engaging in alternative conservation activities. The problem is, however, that those who hold such beliefs are less likely to engage in real behaviors. Understanding the structure of compensatory beliefs could potentially minimize this negative effect. In a pair of studies (qualitative and quantitative) we explored two aspects that appear key for compensatory beliefs 1) the similarity and 2) the relative difficulty of behaviors. We found that people spontaneously proposed compensatory behaviors which belonged to the same pro-ecological domain as the corresponding initial behaviors (Study 1). However, participants in the quantitative study agreed more often that they should compensate for one behavior with another when both behaviors belonged to the same cognitive category and simultaneously the compensatory behavior was relatively less demanding than the initial one (Study 2).

**Key words:** Green compensatory beliefs, difficulty of behaviors, similarity, compensatory behaviors, spillover effects

Even a person who is truly dedicated to a cause such as environmental conservation may sometimes fail to engage in specific behaviors of importance for the assumed objective. The greater the dedication, the more it is probable that a person will experience remorse and guilt arising from failure to perform specific behaviors. One of the strategies that people often apply to neutralize negative feelings in such a situation is formulating compensatory beliefs. Compensatory beliefs are convictions that the harmful effects of people's behaviors may be compensated for by engaging in other activities (Kaklamanou, Jones, Webb, & Walker, 2013). For example, someone who buys an SUV believes that the harmful effects of exhaust gases may be neutralized by using public transportation on weekends. Compensatory beliefs serve as strategic justifications for the failure to engage in specific behaviors that lead to an important goal (Knäuper, Rabiau, Cohen, & Patriciu, 2004).

Unfortunately, the more people believe that a means to compensate for the negative effects of some behaviors exists, the less they engage in real and overt beneficial behaviors. For example, in the health domain, higher levels of compensatory beliefs were found to increase caloric intake among dieters (Kronick, Auerbach, Stich, & Knäuper, 2011) or to decrease readiness to quit smoking among

adolescents (Radtke, Scholz, Keller, & Hornung, 2011). In another domain, green compensatory beliefs appeared to be negatively related to self-reported engagement in behaviors such as using energy-efficient vehicles (Kaklamanou et al., 2013). This effect of green compensatory beliefs can at least partially explain the inefficiency of some pro-environmental campaigns and long-term policies (Geller & Attali, 2005; Kaklamanou et al., 2013). After failing to engage in promoted behaviors, people might rest on their laurels by reformulating their cognitions rather than acting.

The aim of this research is to explore what components of compensatory beliefs affect the level of their endorsement. We expect that green compensatory beliefs are not chance combinations of environmentally friendly and unfriendly behaviors. On the basis of the literature on spillover effects and sequential behavior changes, we expect that people formulate such beliefs according to two rules (Burger, 1999; Byrka, 2015). First, compensatory behaviors are perceived as similar and belong to the same pro-ecological domain as target behaviors. Second, compensatory behaviors are relatively easier than target behaviors. To our knowledge these characteristics have never been tested before in the context of compensatory beliefs.

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### Compensatory beliefs

Compensatory beliefs are strategies that help people to resolve cognitive dilemmas which result from encountering temptations (Baumeister & Heatherton, 1996). People are constantly balancing their hedonistic desires with the need to consistently pursue their goals. Desires and temptations are usually concrete and close by. Gratification for the fulfillment of goals is usually distant in time and abstract (Miquelon, Knäuper, & Vallerand, 2012). For example, refraining from using a car is a means to achieve the abstract goal of protecting the environment, but the temptation of using a comfortable vehicle, especially on rainy days, is immediate and tangible.

The experience of such cognitive conflicts arising from readiness to fulfill one's desires and to avoid the negative consequences of harmful behaviors activates self-regulatory processes. People may either resist the desire or give in to temptation and re-evaluate the harmfulness of the behavior they have engaged in (Klein & Goethals, 2002; Knäuper et al., 2004). Resisting temptations usually requires effort, making less demanding re-formulation of beliefs more likely.

Research shows that people who hold these reformulated beliefs are more likely to refrain from engaging in overt beneficial behaviors. This phenomenon can be explained by making reference to balance theories (e.g. Knäuper et al., 2004). For example, after engaging in unecological behavior people perceive a discrepancy between what they have done and their general goal of being ecologically friendly. People who act in a manner inconsistent with their values and goals experience an unpleasant tension – negative emotions which they need to rid themselves of. These emotions may weaken if people adjust their goals, or if they assume that the consequences of some behaviors may be ameliorated by engaging in other activities. According to balance theories, another option for neutralizing this tension is to engage in behaviors that facilitate achievement of the same goal (Festinger, 1962; Heider, 1958). Obviously, reformulation of cognitions is far less demanding than performing compensatory behaviors, and therefore far more likely to occur.

### Difficulty of behaviors

When deciding how to compensate for harmful behaviors, people may choose from a broad spectrum of options. They might reformulate their cognitions regarding a harmful behavior, or they may perform one from among an array of behaviors that are meant to accomplish a particular goal. Each option bears some personal cost, either mental, figurative or physical. People generally tend to choose easier, less demanding and less costly means of accomplishing their goals. The more is person engaged in a given cause, the higher is the likelihood she would choose a more demanding option.

The functional relationship between the costs of performing a given behavior and the general motivation to achieve a goal was described in a recently developed model

coined the Campbell paradigm (Kaiser, Byrka and Hartig, 2010), in which the likelihood of engagement in a given behavior depends on its difficulty and the individual's attitude towards a given goal (such as environmental conservation). According to the Campbell Paradigm, difficulties stem from all sorts of external sources, such as when a behavior involves personal effort, skills, financial means or time (Kaiser et al., 2010). The more demanding these barriers are, the more favorable an attitude towards a general goal (such as environmental conservation) people need to have to overcome them. Within a given domain behaviors can be ordered from the least (easy) to the most (difficult) demanding ones. The more difficult behaviors a person undertakes, the more evident that individual's engagement and positive attitude toward a given goal is.

According to Kaiser et al. (2010), people tend to select behaviors in a cost-effective, rational manner; that is, they readily select easy behaviors over more difficult, "costly" ones. When people act in order to protect the environment they usually choose from an array of conservation behaviors. Logically, if they aim to compensate for non-performance of some behaviors, they will choose the relatively easiest way to do so. Therefore, we expect that compensatory behaviors should be relatively easier than target behaviors. Logically, we assume that if a person fails to perform a given behavior it was because this behavior was too difficult to perform relative to the motivation to perform it.

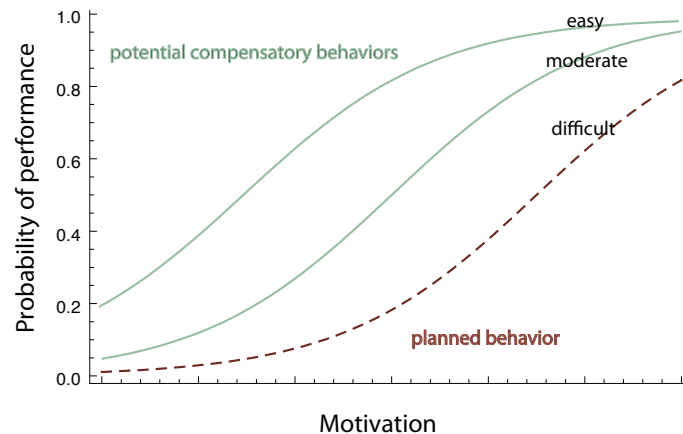
Higher levels of attitude relative to the difficulty of a compensatory behavior increase the chances people will engage in the performance of such behavior. At the same time, it is highly unlikely that a person with a very favorable attitude towards a given goal will engage in harmful behaviors. For example, a highly motivated environmental activist is unlikely to exchange public transportation for a car. Figure 1 illustrates the probability of the performance of a target behavior and possible compensatory behaviors as a function of a person's motivation to achieve a particular goal.

The key role of difficulty has been already recognized in the classic literature on multiple behavior change. The literature on sequential behavior change demonstrates that an inadequate threshold value of difficulty, for example when the first request is too difficult, renders persuasive techniques ineffective (Cialdini & Ascani, 1976; Crano & Sivacek, 1982; Foss & Dempsey, 1979). The difficulty of behaviors has been also considered when theorizing about sequential changes of conservation behaviors (e.g. Thøgersen & Crompton, 2009; Truelove, Carrico, Weber, Raimi, & Vandenberg, 2014). Difficulty is infrequently accounted for in empirical research study designs.

### Similarity of behaviors

The literature on sequential behavior changes informs us that similarity of behaviors is another characteristic that seems to affect the likelihood of engaging in a given behavior. However, the research on behavioral similarity and chain changes in behaviors offers mixed results. On

**Figure 1. Likelihood of compensatory behaviors as a function of behavioral difficulty and people's attitudes towards a given goal**



the one hand, a few systematic studies in the conservation domain have shown that chain changes are observed exclusively in respect of behaviors cognitively associated with each other, such as recycling and avoiding waste (Thøgersen, 2004). Behaviors from different, more distant domains, such as recycling and buying organic food, appeared to be poorly related (e.g. Thøgersen & Ölander, 2003). On the other hand, ecological consumer behaviors were found to be related with political activism (Thøgersen & Noblet, 2012) and using energy efficient bulbs was related with using unbleached toilet paper (Harland, Staats, & Wilke, 1999).

These equivocal results may be the effect of terminological vagueness. The dominant view regarding similarity of two behaviors focuses on whether they are perceived as similar and whether they can be categorized as belonging to one category (Doll & Ajzen, 1992). In line with Spreading Activation Theory, the strength of the association between two terms/behaviors depends on their semantic proximity (Collins & Loftus, 1975). The more similar they are, the stronger the association. At the measurement level, judgments about similarity are usually based on the results of factor analyses.

No study has yet to systematically analyze the similarity of target/initial and compensatory behaviors. Existing results, however, suggest that even an ad-hoc similarity based on whether a given behavior belongs conceptually to one subdomain or another translates into an endorsement of compensatory statements. Table 1 displays items from the Green Compensatory Behaviors Scale developed by Kaklamanou et al. (2013). They are ordered from the least endorsed to the most endorsed by study participants, as reported by its authors. We shaded items that belong to a different pro-ecological subdomain in grey. We define subdomains *a priori* on the basis of previous research as being transportation, waste avoidance, eco-consumption, energy saving, political behavior (e.g., Kaiser & Wilson, 2000; McKenzie-Mohr, 2000; Stern, 2000). As can be seen in Table 1, aside from two items (#1 i #7), the participants agreed more often with statements in

which the target behavior and the compensatory behavior belonged to the same pro-ecological subdomain. If we analyze the mean agreement with both types of statements, participants agreed almost half as often with statements containing dissimilar behaviors ( $M = 5.48\%$ ) than with those containing similar behaviors ( $M = 10.16\%$ ).

In sum, we should expect it to be more likely that a negative behavior will be compensated for with a positive behavior that exhibits some similarities. For example, it is more probable to compensate for taking a bath (instead of a shower) by turning off the water while brushing your teeth than by using public transport (instead of driving a car).

### Research goals

Compensatory beliefs do not have to be rational, accurate or consistent with facts. For example, using public transportation at the weekend does not neutralize the effects of using a car during the working week, even if people believe it is so. Nonetheless, we expect that compensatory beliefs are formed in line with some rules. Compensatory beliefs could be formed following the same logic as that which leads to the appearance of spillover effects and sequential changes in behaviors.

The aim of this research is to focus on two elements, the first of which is similarity of behaviors understood as belonging to the same pro-ecological subdomain, while the second is the relative difficulty of a target and a compensatory behavior as defined by the Campbell Paradigm. We hypothesize that these elements will affect the level of agreement compensatory beliefs and they will guide people when proposing compensatory behavior spontaneously.

### Study 1

The aim of Study 1 is to explore the structure of compensatory beliefs generated by study participants. We expect that freely-given suggestions for compensation will be similar to target behaviors, and they will belong to the same pro-ecological domain as a given target

**Table 1. Percentage of respondents that agreed with the statement in the study by Kaklamonou et al. (2013) ordered from the least agreement to the highest**

Compensatory beliefs	Agree
1. It does not matter how much energy you use if you are on a green energy tariff	3.5
2. Flying abroad can be made up for by being a vegetarian (i.e., not eating meat)	3.6
3. Not driving a car compensates for not recycling	3.7
4. It is okay to drink bottled water if you limit the number of car journeys that you make	4.5
5. Limiting your household water consumption can compensate for not better insulating your home	5.0
6. You do not need to worry about which country your food comes from if you use energy-efficient appliances in the home	5.4
7. It is okay to leave electrical goods turned on if they are modern and efficient	5.7
8. Recycling compensates for driving a car	6.3
9. Having a water butt can compensate for using the oven	6.7
10. Walking to the supermarket can compensate for buying highly packaged food	8.5
11. If you have a low flush toilet, then it is okay to use more water in other ways	9.5
12. If you have energy-efficient electrical equipment, then it is okay to leave it on standby	11.0
13. Composting food waste can make up for buying imported food	12.2
14. It is okay to leave the lights on if you use low-energy light bulbs	12.7
15. Not using a dishwasher can compensate for taking longer showers	15.6
16. Not driving a car compensates for flying on holiday	16.2

Grey highlights indicate statements composed of green behaviors conceptually belonging to the same pro-ecological sub-domain.

Source: based on the table by Kaklamonou, Jones, Webb, Walker, 2015.

behavior. Additionally, we expect that in respect of difficult target behaviors, people will generate more potential compensatory behaviors as a larger spectrum of feasible and relatively easier behaviors exists in such cases.

## Methods

### *Participants and procedure*

A qualitative exploratory study was carried out via the Internet. Twenty-nine adults from the general population were asked by e-mail to enter the website and finish 12 sentences. A qualitative exploratory study was carried out via the Internet. Twenty-nine adults from the general population were asked by e-mail to enter a website and complete 12 sentences. Of these individuals, 4 resigned from filling in the form, 1 person did not understand the instructions, and 1 filled in the form twice. Data provided by 23 participants was ultimately analyzed. The mean age of participants was 32 years and 3 months (SD = 10.53 and ranged from 23 to 64); 69.6% (n = 16) of the sample were females.

The participants generated responses to twelve open-ended statements consisting of ecologically unfriendly behaviors. It was not obligatory to complete all of the statements.

### *Measures*

Each person who entered the website was asked to think of compensatory behaviors that people would likely perform after engaging in one of twelve environmentally-unfriendly target behaviors. The structure of every statement was as follows: "People believe that if they ... *environmentally-unfriendly behavior*... they could ... [fill in the gap] ... instead." An exemplary target behavior was: "People believe that if they put a dead battery in the garbage they could ... instead." (for all sentences see Table 2). Behaviors belonged to different sub-domains (such as recycling, water saving, transportation) and posed different difficulties.

Target behaviors differed in terms of content and objectively-measured (by the Rasch model) difficulty. In this case, the difficulty estimate was measured not with the analyzed restricted sample of 23 people, but with larger sample of people coming from the same city. So the difficulty in this study can be treated as a proxy measure.

Technically, behavioral difficulty as defined in the Campbell paradigm is estimated in the one-parameter logistic Rasch model through a maximum likelihood procedure, using the proportion of individuals that endorse a given

**Table 2. Frequencies of compensatory behavior suggested by participants and categorized by pro-environmental subdomains**

Target statements	Rasch-based difficulty	Kappa	Vicarious behaviors	Recycling	Eco-consumption	Water saving	Good example	Energy saving	Sustainable transportation	Pro-social behaviors/other
People are convinced that if they don't point an unecological behavior to someone, they can ..... instead. nie zwrócić uwagi osobie, która postępuje nieekologicznie, to mogą w zamian...	0.15	0.94	4(3)	4	0	1	8(9)	0	0	6
People are convinced that if they drive on freeways at speeds over 100kph, they can ..... instead.	0.33	1	0	0	0	0	0	0	7	13
People are convinced that if they put used paper in the garbage, they can ..... instead.	0.46	0.93	0	6	5	0	2(1)	0	0	6(7)
People are convinced that if they keep the engine running while waiting in front of a railroad crossing, they can ..... instead.	0.47	0.85	0	2(1)	1	0	0	0	6	9(10)
People are convinced that if they drive their car into or around the city, they can ..... instead.	0.49	0.86	1	4	0(1)	0	0	0	12(10)	5(7)
People are convinced that if they don't turn radiators off while airing out a room in winter, they can ..... instead.	0.54	0.89	0	0	0	1	0	6(5)	0	11
People are convinced that if they kill insects with a chemical insecticide, they can ..... instead.	0.59	0.67	1	1	2(3)	1	5(3)	0	0	9(10)
People are convinced that if they use a car with high fuel consumption, they can ..... instead.	0.67	0.93	0(1)	1	4	0	1(0)	1	6	8
People are convinced that if they put dead batteries in the garbage, they can ..... instead.	0.72	0.92	0	7	6	0	1(0)	0	0	6(7)
People are convinced that if they don't turn the tap off while brushing their teeth, they can ..... instead.	0.77	0.69	0(2)	0	0(1)	10(8)	0	4	0	6(5)
People are convinced that if they buy beverages in plastic bottles, they can ..... instead.	0.86	0.85	1(2)	11(10)	2(1)	0	0	0	0	7(8)
People are convinced that if they throw a plastic bag away after just a single use, they can ..... instead.	0.95	0.93	0	11(10)	4(5)	0	1	0	1	6
<b>Total</b>		<b>0.91</b>	<b>7(10)</b>	<b>47(44)</b>	<b>24(27)</b>	<b>13(11)</b>	<b>18(14)</b>	<b>11(10)</b>	<b>32(30)</b>	<b>92(98)</b>

Cells in grey indicate categories identified by the judges as the same as a given target behavior.

behavior. In the Rasch model the probability of a person acting in a particular way is believed to be a function of two components: (a) the person's propensity to do something (i.e. the extent of that person's environmental attitude) and (b) the difficulty of implementing a particular protective behavioral measure, the latter of which is a composite of the effective difficulty of behaviors. Mathematically, this relation is described as follows:

$$\ln\left(\frac{p_{ki}}{1-p_{ki}}\right) = \theta_k - \delta_i \quad (1)$$

The natural logarithm of the ratio of the probability ( $p_{ki}$ ) that person  $k$  will engage in behavior  $i$  (e.g. refraining from collecting mushrooms, expressing support for restrictions in nature preserves) relative to the probability that person  $k$  will not engage in behavior  $i$  ( $1-p_{ki}$ ; e.g. using public transportation) is given by the arithmetic difference between  $k$ 's attitude level ( $\theta_k$ ) and the composite of the costs involved in performing the behavior ( $\delta_i$ ). Behavioral difficulties are estimated in logits. The higher the value of logits, the more difficult a given behavior.

## Results and discussion

The responses to open-ended statements were analyzed by two referees, who agreed that all suggestions could be classified as belonging to one of seven pro-ecological subdomains: vicarious behaviors (political actions, donating to pro-ecological organisation), energy saving, water saving, giving a good example, sustainable transportation. The judgements of the two referees appeared to be consistent; Kappas for individual statements ranged from 0.67 to 1, and the total Kappa for all responses was 0.91 (see Table 2).

The participants provided a combined total of 244 suggestions for what could be done to neutralize the negative effects of 12 proposed unecological behaviors. However, not all of the reactions could be classified as compensatory behaviors. Out of 244, 146 (according to the stricter referee) could be considered as such. The rest were responses like 'I don't know', 'have peace of mind', or something entirely unrelated to the environment and compensation.

Out of these 146 behaviors, 87 (59.59%, see highlighted cells in Table 2) belonged to the same pro-ecological subdomain as the target behavior. For example, people proposed compensating for driving a car into or around the city by cycling more, going shopping on foot, carpooling or using public transportation at weekends.

The data showed no regularity concerning difficulty levels of target behaviors and behaviors which (in the respondents' opinions) could compensate for them. Thus, our hypothesis that more demanding behaviors would generate more suggestions was not confirmed. We expected such an outcome because in the case of more demanding behaviors people have a larger spectrum of easier behaviors that can compensate for their failure. It would be illogical to expect that failure to engage in the relatively easy behavior of recycling would be compensated for by demanding behaviors such as signing up for pro-environmental organization.

Interestingly, the behavior from a different pro-ecological domain which was mentioned the most frequently was recycling – a behavior which Polish people feel is relatively easy to perform (Byrka, 2015). Depending on which type of recycling was measured, the research showed that the probability of performing this behavior ranges from 46% to 96%. For example, a typical resident of Wroclaw recycles old paper with a frequency of 46%, puts empty bottles into a recycling container with a frequency of 66%, and reuses plastic bags with a frequency of 96%.

## Study 2

The aim of Study 2 was to verify the effect of two elements in a large sample: similarity of behaviors and relative difficulty on the level of endorsement of compensatory beliefs.

## Methods

### Participants and procedure

Thousand two hundred seventy two addresses were randomly sampled from the Wroclaw municipality register. Out of 1272 individuals, 463 completed questionnaires (response rate: 36.4%) while 278 refused to take part in the research; in 531 cases nobody was found at the sampled address. The average age of respondents was 41 years and 7 months (range: from 18 to 82). There were 277 female (59.8%) and 186 male (40.2%) respondents.

Research assistants were hired to find the addresses and ask people who lived there to complete the questionnaire. In the event there was nobody present at a particular address, the assistants were allowed to knock on the door of the direct neighbors of the initial target location and make the request (they could also ask neighbors to fill in the survey when a person who lived at the sampled address refused). Only one person (at least 18 years old) from each flat or house could be given a questionnaire.

### Measures

To estimate person-independent difficulty, we used a Polish version of the General Environmental Scale (GEB, Kaiser, & Wilson, 2004). The compensatory beliefs scale was developed for the sake of this study.

*Difficulty estimate.* The most recent version of the General Ecological Behaviour (GEB) scale (Kaiser & Wilson, 2004) was employed in the research. The items (50) which form the scale are derived from such domains as energy conservation, mobility and transportation, waste avoidance and recycling. Additionally, five items which describe behaviors considered in Poland as typically ecological were included to the questionnaire, such as "I only wash my car only at a car wash").

20 allowed respondents for those items indicated behaviors which require a single decision. For example, 'I bought solar panels'. The other 35 items represent behaviors performed continuously, and they had a five-level response scale format ("never", "seldom", "sometimes", "often",

“always”). Polytomous items were dichotomised before statistical analysis. “Never”, “seldom” and “sometimes” responses were treated as an indicator that the respondent does not perform the behavior, while “often” and “always” were taken as an indicator of engagement in a particular behavior. This a standard and established procedure for the GEB scale which has been confirmed in many contexts (see e.g. Kaiser & Wilson, 2004). For all items there was a possibility to choose a “not applicable” response, which was treated in the analysis as a missing value. Thirteen items in the questionnaire were negatively formulated and responses to them were appropriately recoded.

All items had infit MS-values below 1.25, which indicates acceptable goodness of fit for those items in Rasch models (Wright & Masters, 1982). Only 20 (4%) out of 463 respondents did not fit the model’s assumptions by having a t-value above 1.96. This means that the response patterns of less than 5 % of respondents deviated from the model’s prediction. Rasch separation reliability was  $r = .70$ . A comparable indicator of internal stability was Cronbach’s  $\alpha = 0.72$ . In sum, the analysis showed that all 55 items met the Rasch assumption of unidimensionality and difficulties of behaviors generalized across the population. Therefore, they could be used as reliable estimates for the measured sample (Embretson & Reise, 2000).

*Compensatory beliefs.* Using the behaviors from the GEB scale we constructed our questionnaire so that 20 items could be divided into four groups:

- 1) both behaviors are from the same cognitive category – the compensatory behavior is easier than the target one; e.g., ... if you take a plastic bag you are offered in a store, you should reuse it.
- 2) both behaviors are from the same cognitive category – the compensatory behavior is more difficult than the target one; e.g. ... if you kill insects with a chemical insecticide, you should use natural substances for cleaning (e.g. soda, citric acid).
- 3) the behaviors are from different cognitive categories – the compensatory behavior is easier than the target one; e.g. ... if you do not contribute financially to environmental organizations, you should read about environmental issues.
- 4) the behaviors are from different cognitive categories – the compensatory behavior is more difficult than the target one.; e.g. ... if you kill insects with a chemical insecticide, you should collect and recycle used paper.

The participants received the following instructions: “Please mark to which extent you agree that: ... if you *target behavior* you should *compensatory behavior*.” The items constructed in line with the presented scheme were randomly ordered before they were handed to participants. The participants responded on a 5-point scale from “I definitely disagree” (1) to “I definitely agree” (5).

## Results and discussion

We adopted the same criterion of similarity as in Study 1 to decide whether given behaviors belonged to a similar category or not. Namely, we judged whether two behaviors

belonged to one of the subdomains such as water saving, recycling and sustainable transport.

Four questions belonged to the category similar/compensatory behavior easier than the target behavior (1 in Table 2), six to the category similar/compensatory behavior more difficult, two to dissimilar/compensatory behavior easier and six to the category dissimilar/more difficult. Two items could not be classified to any of the groups as the target and compensatory behaviors did not differ in difficulty. The difference in the number of behaviors in each group stems from the fact that difficulty of the behaviors was estimated post-hoc for a given data set after the study was conducted. At the same time, it was the first study conducted in Poland in which Rasch-based difficulty was estimated.

The results show that respondents were more eager to endorse statements in which both target behaviors and compensatory behaviors belonged to the same pro-environmental subdomain while at the same time the compensatory behavior was relatively easier ( $M = 3.53$ ;  $SD = 0.61$ ;  $CI_{95\%} 3.47 - 3.58$ ). The lowest level of endorsement was observed for the statements in which compensatory behaviors were more difficult than target behaviors and both components were dissimilar, that is, they belonged to a different pro-environmental domain ( $M = 2.98$ ;  $SD = 0.74$ ;  $CI_{95\%} 2.91 - 3.05$ ). Agreement was at a medium level for statements in which behaviors were similar while the target behavior was more difficult ( $M = 3.31$ ;  $SD = 0.70$ ;  $CI_{95\%} 3.24 - 3.37$ ) and in which they were dissimilar while the target behavior was easier ( $M = 3.17$ ;  $SD = 0.84$ ;  $CI_{95\%} 3.08 - 3.24$ ).

Overall, respondents agreed more often with statements in which the compensatory behavior was easier than the target behavior ( $M = 3.35$ ;  $SD = 0.63$ ;  $CI_{95\%} 3.29 - 3.41$ ) than when it was more difficult ( $M = 3.14$ ;  $SD = 0.65$ ;  $CI_{95\%} 3.08 - 3.20$ ). Additionally, correlation between agreement with statements and the objectively-measured relative difficulty of compensatory behaviors relative to target behaviors equaled  $r = -0.46$ ,  $p < 0.05$ . The easier the compensatory behavior relative to the target behavior, the more likely endorsement of the statement was. It is noteworthy that difficulty explained almost 20% of variance in the level of endorsement, despite the fact that this difficulty was measured in an objective manner and was independent of perception. As for similarity, respondents agreed more often when two behaviors were similar ( $M = 3.42$ ;  $SD = 0.59$ ;  $CI_{95\%} 3.36 - 3.47$ ) than when they were dissimilar and belonged to different pro-ecological subdomains ( $M = 3.07$ ;  $SD = 0.74$ ;  $CI_{95\%} 3.03 - 3.13$ ).

## General discussion

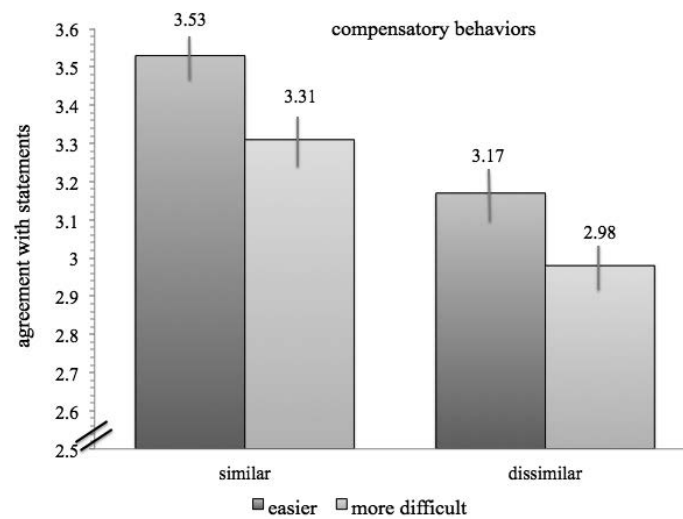
The objective of this paper was to explore the structure of green compensatory beliefs by focusing on two characteristics of behaviors – similarity and relative difficulty. Our results suggest that people formulate compensatory beliefs in a logical way and in accordance with theoretical predictions. Two characteristics seem to be complementary and to explain the nature of such beliefs.

**Table 3. Levels of agreement with compensatory beliefs, similarity and relative difficulty**

	Green compensatory beliefs	<i>M</i>	<i>SD</i>	$\text{diff}_{\text{target}} - \text{diff}_{\text{comp.}}$
4	... if you drive to work, you should contribute financially to environmental organizations.	2.74	0.97	-3.56
4	... if you use a car with high fuel consumption, in winter you should keep the heat on so that you do not have to wear a sweater.	2.75	0.98	-1.24
1	... if you buy bleached and colored toilet paper, you should not use a chemical air freshener in your bathroom (toilet).	2.79	0.97	1.44
4	... if you do not reuse plastic bags, you should – in nearby areas – use public transportation or ride a bike.	2.97	1.02	-2.64
2	... if – in winter – you do not turn down the heat when you leave your apartment for more than 4 hours, you should keep the heat on so that you do not have to wear a sweater.	3.02	1.13	-0.68
2	... if you kill insects with a chemical insecticide, you should use natural substances for cleaning (e.g. soda, citric acid).	3.10	0.98	-1.35
4	... if you put empty glass or plastic bottles in the garbage, you should talk with friends about problems related to the environment.	3.10	0.96	-2.27
2	... if you buy a car with high fuel consumption (consuming more than 7 litres / 100 km), you should not drive it in or into the city.	3.11	1.20	-0.78
1	... if you use fabric softener with your laundry, you should wash dirty clothes without prewashing.	3.13	1.00	2.37
Nc	... if you drive to work in your own car, you should wash it only in a car wash.	3.15	1.13	0.08
4	... if you kill insects with a chemical insecticide, you should collect and recycle used paper.	3.15	0.97	-0.56
4	... if you put dead batteries in the garbage, you should talk with friends about problems related to the environment.	3.15	1.04	-2.54
3	... if – in winter – you do not turn down the heat when you leave your apartment for more than 4 hours, you should have a shower rather than have a bath.	3.16	1.00	1.16
3	... if you do not contribute financially to environmental organizations, you should read about environmental issues.	3.17	1.04	2.22
2	... if you do not bring empty bottles to a recycling bin, you should collect and recycle used paper.	3.48	1.02	-0.85
2	... if you do not drive in such a way as to keep your fuel consumption as low as possible, you should buy a fuel-efficient automobile (consuming less than 7 litres / 100 km).	3.53	1.11	-0.48
2	... if you do not wait until you have a full load before doing your laundry, you should turn the tap off while brushing your teeth.	3.60	1.04	-0.51
Nc	... if you have a bath rather than a shower, you should turn the tap off while brushing your teeth.	3.70	1.09	-0.06
1	... if you take a plastic bag you are offered in a store, you should reuse it.	4.01	0.96	3.84
1	... if you buy beverages in cans, you should crush the cans before putting them in the garbage.	4.18	0.91	1.27

*Note.* Behaviors highlighted in grey were classified as similar, that is belonging to the same pro-ecological subdomain. Difficulties are given in logits, and when highlighted in grey the compensatory behavior was more difficult than the compensated one. Numbers next to compensatory beliefs indicate the group.



**Figure 2. Mean and standard deviation of the agreement with four types of compensatory beliefs**

Note: Vertical bars represent 95% confidence intervals.

The qualitative study showed that spontaneously-generated compensatory behaviors mostly fall under the same pro-ecological subdomain. For example, respondents declared that buying products with excessive packaging can be compensated for by recycling, or that driving an inefficient car can be neutralized by walking or using public transportation. Remarkably, the most popular suggested behavior that was from a different domain than a given target behavior was recycling. This is a relatively easy behavior that does not involve significant sacrifice or effort. The relative easiness of recycling has been confirmed in numerous studies (e.g. (Kaiser, Midden, & Cervinka, 2008)). Recycling is possibly the most popular way to compensate for failing to engage in pro-ecological behavior. In a qualitative study with respondent-generated responses, however, the popularity of recycling could alternatively be explained by the cognitive salience of that behavior. This saliency, in turn, could be an effect of numerous pro-environmental campaigns that frequently target illustrative and universal behaviors.

Research by Gawronski and Strack (2004) tells us that cognitive similarity of behaviors serves as a trigger for sequential behavioural changes, but this occurs mostly when information is being processed in a conscious and deliberate mode. Some behaviors are performed automatically, however, and in such cases similarity could play a less significant role. Similarity might be important at the declarative level when we ask people how they would compensate for some behaviors. When it comes to real actions, many constraints and external barriers may hinder people from undertaking certain behaviors.

In the quantitative study, alongside cognitive similarity of behaviors, person-independent difficulty was analyzed in a more systematic way. The highest agreement with green compensatory beliefs was observed for statements in which compensatory behaviors were relatively easier than target behaviors while belonging to the same pro-environmental

subdomain. It appears that endorsement of compensatory beliefs can be explained both in reference to consistency theories as well as to the Campbell paradigm.

The challenge in the presented research, as in all studies about similarity of behaviors, is the operationalization of this variable (Burger, 1999). We judged similarity based on previous research and the general consensus in the field that conservation domains comprise a few logical subdomains such as recycling, water saving, energy conservation and eco-consumption (McKenzie-Mohr, 2000). For simplicity's sake, in the quantitative study we arbitrarily categorized behaviors as being similar or dissimilar. Obviously, similarity does not have to be dichotomous, but rather continuous and relative. For example, using public transportation might be considered by some as more similar to buying a fuel-efficient car than to taking a shower instead of a bath. Nonetheless, all these behaviors can be perceived as somehow similar as they all refer to saving resources. Although similarity seems an important element of the structure of compensatory beliefs, it is a rather vague construct that is context dependent. Because of these limitations it could be difficult to employ similarity in campaigns fostering engagement in compensatory behaviors.

Kaiser, Byrka, & Hartig (2010) argue that it is not the semantic or logical proximity of behaviors that matters in predicting likelihood of performance, but rather the relative difficulty. A given compensatory behavior must be relatively easier than the target behavior, as people generally prefer the least demanding way of achieving their goals. The second characteristic of compensatory beliefs – difficulty – is by contrast well-defined in the Rasch model. Estimates of difficulty are characteristics of behaviors and not of people, and within a given sample they are relatively stable. Noteworthy, in the mentioned study objective, person-independent difficulty affected compensatory beliefs

which are subjective. These results are in line with previous research in which people quite accurately estimated the objective difficulty of behaviors (Kaiser & Schultz, 2009).

Noticeably, the way compensatory beliefs are formulated in questionnaires might affect the level of their endorsement and how they are related to behaviors. We analyzed association between all compensatory beliefs we measured and people's attitude measured with GEB. The correlation equaled  $r = 0.35$  and was in an opposite direction than in the study by Kaklamanou et al. (2015). This result can be attributed to the fact that we included formulation such as "you should" in compensatory statements. Undoubtedly, a moral component plays a role in formation of compensatory beliefs and likely affects performance of compensatory behaviors.

Though some rules concerning compensatory beliefs were identified we are aware that more studies in this area are necessary. Future research involving more elaborate designs will probably show, that knowledge about similarity of behaviors and their relative difficulty can translate into effective promotion of compensatory behaviors. For example, pro-ecological campaigns promoting very difficult behaviors such as resigning from a car a might promote simultaneously easier compensatory behavior such as leaving TV on stand-by.

In conclusion, the present studies offer new insights into the green compensatory beliefs focusing on their structure and possible patterns of their formulation. The logic of endorsing such beliefs is consistent with predictions concerning the way people might endorse potential compensatory behaviors and our results can serve as gateway for exploration of compensatory overt actions.

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