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Green Surveys or Green People? Measuring Environmental Attitudes is not Affected by the Color of the Questionnaire

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This study examined the effects of questionnaire coloration on respondents' assessments of environmental attitudes. Because the color green is strongly associated with topics of environmental protection, it was assumed that green colored questionnaires may prime respondents for rating items in a more environment friendly way. Furthermore, the color of questionnaires may have an influence on respondents' transient mood state which in turn may affect the assessments of environmental attitudes. Thus, it was also tested whether the effect of questionnaire color was mediated by the mood state of participants. The results of the experiment suggest that questionnaire color does not lead to systematic error in measuring environmental attitudes. Yet, there is evidence that respondents' mood state may contribute to measurement bias.

General area of psychology: Social psychology

Specific area of psychology: Environmental psychology

Keywords for searches:

questionnaire color, environmental attitudes, measurement error

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Measuring environmental attitudes is at the heart of environmental psychology because they are often used as important independent or dependent variables throughout the field in experiments or survey-based studies (Fransson & Gärling, 1999). If valid inferences are to be drawn about the relationships between environmental attitudes and other constructs, the measurement of environmental attitudes needs to be unbiased. Therefore, researchers have investigated various potential sources of systematic measurement error in general (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003; Biemer, Groves, Lyberg, Mathiowetz, & Sudman, 2004) such as effects produced by respondents (e.g. social desirability or acquiescence), by item characteristics (e.g. item complexity, item wording or scale format), or by item context (e.g. item priming effects or item embeddedness). Also, researchers have investigated sources of measurement bias in measuring environmental attitudes specifically, such as the influences of the dependency of the survey context (Pienaar, Lew, & Wallmo, 2013).

Nevertheless, there are still several potential sources of measurement bias that have not been the object of systematic research so far. One of them is the color of the questionnaires used to measure environmental attitudes. The question of the effects of this potential source of bias is important because questionnaires designed for measuring environmental attitudes are frequently colored green. Yet the color green – at least in modern western societies – is strongly associated with the topic of environmental protection. This association is widespread: for example in several countries (e.g. Germany, Australia, the UK) there are *green parties* which are particularly concerned with environmental issues. Also, *green marketing* has become an important strategy of businesses in marketing *green products* to *green consumers* (Cronin, Smith, Gleim, Ramirez, & Martinez, 2011; Luo & Bhattacharya, 2006). Furthermore, when speaking of *green consumption*, people usually refer to sustainable and eco-friendly consumer behavior (Straughan & Roberts, 1999). Miller and Szekely (1995, p. 322) describe the use of the term *green* in this context as follows: “People who are concerned about the health of the planet have used and misused the label ‘green’ to describe any action, company, product, service, and attitude that damages the environment relatively less than prevailing practices. Green is one of those words that everyone seems to easily grasp and understand [...]” Because of this strong association between the color green and issues of environmental protection, I assumed that the green coloration of questionnaires might prime respondents to rate items in a more environmentally friendly way. In order to test this assumption, I conducted an experiment in which respondents were randomly assigned to three different color versions of a questionnaire featuring the ‘New Ecological Paradigm Scale’ (NEPS; Dunlap, Van Liere, Mertig, & Jones, 2000), and tested whether the color of the questionnaire had any effect on the assessments of the NEPS.

Furthermore, it is known that color hues in general may affect people’s emotional responses. For example, Akers, Barton, Cossey, Gainsford, Griffin, and Micklewright (2012, p. 8661) found “...that the color green, as a primitive feature of visual sensation, has a contributory effect toward positive green exercise outcomes.” Kaya and Epps (2004, p. 396) investigated whether or not different color hues affected the emotional responses of college students, and found that “the color green evoked mainly positive emotions such as relaxation and comfort because it reminded most of the respondents of nature.” Additionally, researchers have tested whether the color of questionnaires in particular affected the emotional responses of survey respondents. For example, Weller and Livingston (1988) found that questionnaire color affected the emotional responses of study participants, particularly with regard to their anger about violent acts such as rape

and murder. Because color hues in general and questionnaire color in particular seemingly affect people's emotional responses, I expected the color of the questionnaire to affect the mood state of study participants while they were completing the survey.

However, positive and negative affectivity and transient mood states may in turn influence participants' attitudinal judgments (Podsakoff et al., 2003; Schmidt & Hunter, 1996) because it is "possible that the transient mood states of respondents produced from any of a number of events [...] may also produce artifactual covariance in self-report measures because the person responds to questions [...] while in a particular mood" (Podsakoff et al., 2003, p. 883). In order to account for a potentially mediating effect, I also collected data relating to respondents' mood states during questionnaire completion by using the 'Brief Mood Introspection Scale' (BMIS; Mayer & Gaschke, 1988). In the report that follows, I present the methods and measures used for analysis, the results and limitations of the study, and its implications for research practice.

Method

Data Collection

In order to investigate the direct and mediated effects of questionnaire color on the assessment of environmental attitudes, I conducted an experiment with 313 participants, all of whom were members of the pool of the German crowdsourcing enterprise *WorkHub*. Because the reliability of such data is not presumed to be inferior to that of data gathered from university students, crowdsourcing portals are reasonable alternatives for conducting surveys (Behrend, Sharek, Meade, & Wiebe, 2011) if sampling randomly from the general population is not feasible.

Participants were assigned randomly to three different color versions of otherwise identical on-line questionnaires featuring socio-demographic measures as well as the BMIS and the NEPS. During all the stages of questionnaire completion, respondents were not aware of the purpose of the study. Members of the first group ($n = 106$) completed the green questionnaire (hex code: ADE696). I assumed that completing a green survey would lead to more positive assessments of environmental attitudes. The second group of respondents ($n = 103$) completed the white questionnaire (hex code: FFFFFFFF). Because this color is considered to be neutral (Kaya & Epps, 2004), I did not expect any systematic measurement error due to the white coloration. Finally, the third group ($n = 104$) was given the gray questionnaire (hex code: B2B2B2). Although gray is an achromatic (and neutral) color, I believe that in the context of environmental protection it is associated with industrialization, concrete / cement, smog or pollution. Thus I expected the assessments of the NEPS to be more negative than those of the other groups. The boxes in Figure 1 illustrate the exact colors of the three survey types.

Figure 1: *Colors of Questionnaires*



As regards the composition of the instrument, the questionnaire started with a section in which respondents had to provide information about four socio-demographic variables. Subsequently, they were asked to evaluate the items of the BMIS on seven-point rating scales, from 1 (*disagree absolutely*) to 7 (*agree absolutely*). The BMIS was put in place before the NEPS because this prevented the rating of the NEPS items from having any influence on that of the BMIS items. Finally, respondents had to evaluate the items of the NEPS using the same seven-point rating scales as before. In order to preclude question order effects, item orders of the BMIS and the NEPS were randomized (Bishop, 2008). All the questionnaires were issued in German.

Assuming an average group size of $n = 103$, post-experimental power analyses ($\alpha = .05$) revealed that a main effect of questionnaire color with an effect size of partial $\eta^2 = .05$ would have been detected at a power level of $1 - \beta = .958$.

Sample

Table 1 describes the total and grouped distributions of the socio-demographic characteristics education, net income, sex and age. As can be seen, randomization led to largely balanced distributions of the variables between the three groups. This impression is supported by the results of three χ^2 -tests for independence (education, net income, sex) and a one-way ANOVA (age). None of the tests revealed any significant group differences.

Measures

The BMIS is “a mood adjective scale with an item sample of 16 adjectives, 2 selected from each of eight mood states” (Mayer & Gaschke, 1988, p. 103). Whereas four

Table 1: Distribution of Demographic and Socioeconomic Characteristics

Variable	Value	Total	Green Survey	White Survey	Gray Survey
Education	Still in school	43 (13.7%)	16 (15.1%)	16 (15.5%)	11 (10.6%)
	Haupt-/Realschule	60 (19.2%)	21 (19.8%)	16 (15.5%)	23 (22.3%)
	In training	46 (14.7%)	15 (14.2%)	21 (20.4%)	10 (9.6%)
	Abitur	134 (42.8%)	47 (44.3%)	40 (38.8%)	47 (45.6%)
	University	26 (8.3%)	7 (6.6%)	9 (8.7%)	10 (9.6%)
	Other	4 (1.3%)	0 (0.0%)	1 (1.0%)	3 (2.9%)
Net income	< 500€	92 (29.4%)	37 (34.9%)	28 (27.2%)	27 (26.0%)
	500€ < 1,000€	62 (19.8%)	20 (18.9%)	26 (25.2%)	16 (15.4%)
	1,000€ < 1,500€	39 (12.5%)	11 (10.4%)	11 (10.7%)	17 (16.4%)
	1,500€ < 2,000€	37 (11.8%)	11 (10.4%)	16 (15.5%)	10 (9.6%)
	≥ 2,000€	36 (11.5%)	14 (13.2%)	7 (6.8%)	15 (14.4%)
	no answer	47 (15.0%)	13 (12.3%)	15 (14.6%)	19 (18.3%)
Sex	Female	74 (23.6%)	21 (19.8%)	27 (26.2%)	26 (25.0%)
	Male	239 (76.4%)	85 (80.2%)	76 (73.8%)	78 (75.0%)
Age	Mean	23.8	23.6	23.0	24.7
	S.D.	6.8	7.0	6.0	7.3
	<i>n</i>	313	106	103	104

Note: Haupt-/Realschule = German certificate of completion of compulsory basic secondary schooling and German intermediate school certificate. Abitur = German school examination approximately equivalent to the American SAT exam.

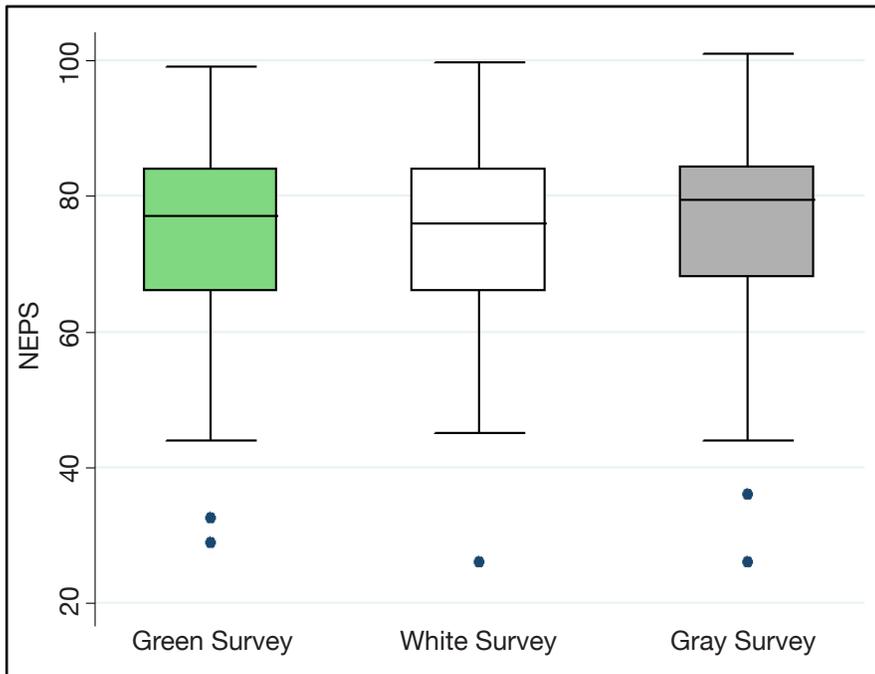
of these states represent positive moods (denoted as ‘happy’, ‘loving’, ‘calm’ and ‘energetic’) the remaining four represent negative moods (denoted as ‘fearful / anxious’, ‘angry’, ‘tired’ and ‘sad’). In the use of the BMIS to measure transient mood states, respondents were instructed to rate the items with regard to the mood state they were in at the moment when they completed the questionnaire. The total BMIS score was calculated by adding up the rating scores of all 16 items. Because all the items representing negative mood states were re-coded for the analyses, the total BMIS score represents participants’ mood states on a bipolar scale from negative mood to positive mood. Consequently, a high BMIS score stands for a positive mood state. Cronbach’s alpha coefficient of $\alpha = .87$ suggested internal consistency and thus reliable measurement.

The NEPS, developed by Dunlap, Van Liere, Mertig, and Jones (2000), is a revision of the preceding ‘New Environmental Paradigm Scale’ (Dunlap & Van Liere, 1978) and represents a very widely used measure of environmental attitudes in research practice (Hawcroft & Milfont, 2010; Dunlap, 2008). It consists of 15 items that relate to five different dimensions denoted as ‘reality of limits to growth’, ‘antianthropocentrism’, ‘fragility of nature’s balance,’ ‘rejection of exemptionalism’ and ‘possibility of an ecocrisis’. The total construct score was also calculated by adding up the rating scores of each single item. Negatively formulated items were re-coded for analysis. Therefore, the higher the NEPS score, the more environmentally friendly the respondent’s attitude. Cronbach’s coefficient of internal consistency was $\alpha = .84$.

Results

In the first step of the analysis I employed a one-factorial ANOVA to test the main effect of questionnaire color on assessing the NEPS items. As a dependent variable I used the total NEPS scores, as they reflect the overall environmental attitudes of the respondents. The grouped distributions of the total NEPS scores are presented in Figure 1. Levene’s test on homogeneity of variances ($F(2, 310) = .41; p = .665$) revealed that variances of NEPS were not significantly different between the groups. The ANOVA showed that the effect of questionnaire color was not significant with $F(2,310) = .55, p = .580$. Furthermore, the factor accounted for less than one per cent of variance in the NEPS ($\eta^2 = .00$). Thus, no direct effects on the ratings of the NEPS items between the groups with green ($M = 74.16, SD = 13.83$), white ($M = 74.35, SD = 13.81$) and gray questionnaires ($M = 75.95, SD = 13.07$) were able to be observed.

In the second step of the analysis I tested whether or not there was a mediated effect of questionnaire color on assessing environmental attitudes via the mediator ‘transient mood state’. I followed the ‘dummy coding’ approach of path analysis (Hayes & Preacher, in press) and constructed two dummy variables: ‘green’ and ‘gray’. In both dummy variables, participants who completed the appropriately colored questionnaire received the value 1; participants who completed a questionnaire of another color were coded with the value zero. In order to test the assumed mediation, two OLS regressions were estimated simultaneously using the software package SmartPLS (Ringle, Wende, & Will, 2005). The dependent variable of the first regression was the BMIS; the independent variables were the two dummy variables. As shown in Figure 1, there was no significant effect of questionnaire color on the transient mood state of participants at all. This result confirms the findings of previous descriptive analyses revealing that there were only marginal differences in respondents’ mood states between the three groups of questionnaire colors

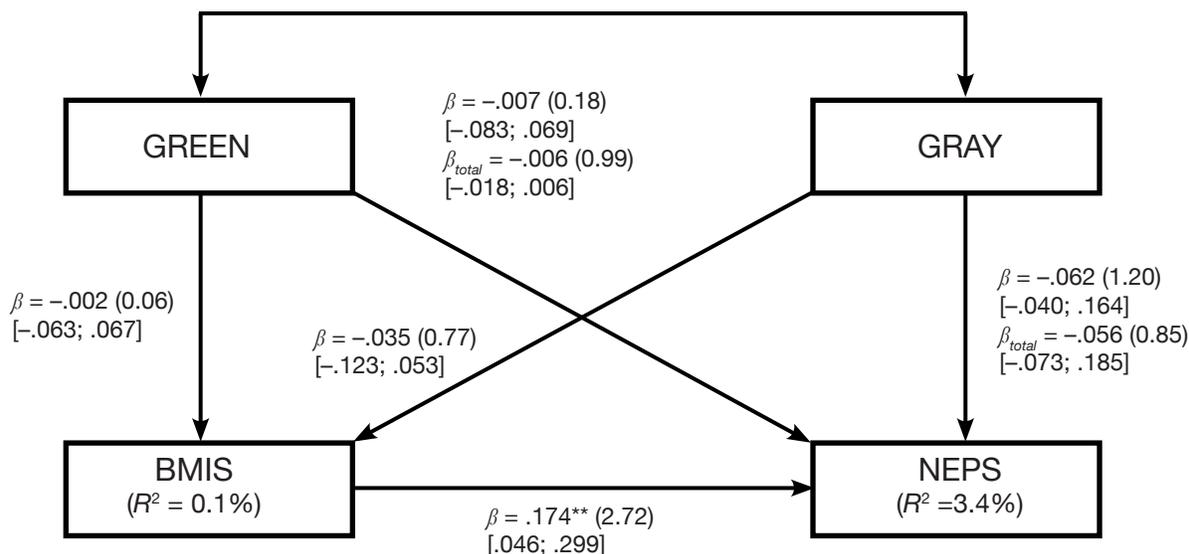
Figure 2: Distribution of total NEPS Scores

(green questionnaire: $M = 74.88$, $SD = 15.21$; white questionnaire: $M = 74.81$, $SD = 15.40$; gray questionnaire: $M = 73.66$, $SD = 16.01$). In the second regression, the NEPS was the dependent variable, whereas the two dummies and the mediator BMIS were included in the model as independent variables. As before in the ANOVA, there was no significant direct effect of questionnaire color on the assessments of the NEPS. However, there was a positive significant direct effect of BMIS on NEPS, accounting for about three per cent of the variance in the assessments of the NEPS (partial $\eta^2 = .03$). In other words, a more positive mood is accompanied by higher NEPS values. This finding supports the assumption that respondents' mood states may contribute to systematic error in measuring environmental attitudes.

Finally, the detection of significant indirect effects of questionnaire color on measuring environmental attitudes would require the detection of a significant influence of questionnaire color on the mediator 'mood state'. Yet this is not the case in the estimated path model. Consequently, it is not surprising that the total – i.e. direct plus indirect – effects of questionnaire color on respondents' assessments of the NEPS do not differ from the direct effects as regards the magnitude of the standardized regression coefficients.

Discussion

The research reported in this article was devoted to investigating the effects of questionnaire color on respondents' assessments of environmental attitudes. The results of an experiment have shown that the ratings of a popular environmental attitude scale did not depend on whether the questionnaires were colored green, gray or white. In addition to that, the color of the questionnaire did not have any effect on the transient mood state of participants. Yet there was a significant positive effect of respondents' transient mood state on their assessments of the environmental attitude scale. Because respondents' mood state was only measured and not manipulated, however, this result merely indicates that there is

Figure 3: Path Analysis

Note. $** = p < .01$ (two-tailed test). t -values (in parentheses) and 95%-confidence intervals of β (in brackets) were obtained by bootstrap resampling with 1,000 iterations.

a statistical correlation between the two constructs; it does not allow me to infer whether respondents' mood states affected the assessments of environmental attitudes causally.

There are two major limitations in the study. The first has to do with the restricted external validity of the results. Because participants received a monetary incentive of about 1 euro (about 1.34 USD) for completing the questionnaire, there may be some self-selection bias in the sample. In addition to that, the sample is not representative of the general population. Therefore, a replication of the results in a more representative sample would be desirable. The second limitation is concerned with the exclusive use of the colors green, white, and gray. Because no other questionnaire colors, such as blue, yellow or red were used, one cannot infer whether or not other colors would have had any effects.

Having said that, the results clearly showed that there was no systematic measurement error due to the questionnaire colors used. Thus, I assume that in most cases researchers should not have to worry about using green, white, or gray questionnaires in research practice. However, because a significant effect was had by respondents' mood state during questionnaire completion, researchers may consider including measures of participants' mood state in their instruments in order to check for this potential source of measurement bias.

I conclude with a look ahead. Although my assumptions did not find any support at all in terms of empirical evidence, the results may nevertheless be encouraging for further research. This is because the experiment provided evidence that the color of questionnaires – at least the variation between green, white and gray – does not lead to systematic error in measuring environmental attitudes. If researchers found out that the color of questionnaires in general does not lead to biased measurements in different areas of research, no one would ever have to worry again about systematic measurement error due to the color of questionnaires.

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