

The effects of social desirability on self-reported environmental attitudes and ecological behaviour

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Abstract There are several claims in the literature that social desirability concerns affect people's response to self-reported measures of environmental attitudes and ecological behaviour. However, only a few empirical studies have *indirectly* evaluated the impact of social desirability on environmental issues measures, and those who did have found only a low impact. This article describes two studies that *explicitly* address whether socially desirable responding has direct and moderating effects on self-reported environmental attitudes and ecological behaviour. Results from correlational and moderated multiple regression analyses from both studies showed that social desirability had only a weak direct effect on environmental attitudes (but not ecological behaviour), and had no moderating effect on the environmental attitudes–ecological behaviour relationship. Implications of these findings for research on environmental issues are discussed.

Keywords Social desirability · Impression management · Environmental attitudes · Ecological behaviour

There is increasing evidence that human behaviour has been producing unprecedented environmental problems. For example, results indicate that humans have changed ecosystems faster and more extensively over the past 50 years than in any equivalent period of time in history

(Millennium Ecosystem Assessment 2005). It seems clear that environmental problems can only be solved if there is widespread recognition that such problems do exist, and also an agreement that all humans need to act to solve them. In a first glance, this recognition and willingness to act seems already in place, with high levels of support for environmental protection from countries around the world (Dunlap et al. 1993; Schultz 2002).

This widespread support for environmental protection might lead one to think that people hold high levels of environmental attitudes that then translate into ecological behaviour. However, research has shown only a weak relationship between environmental attitudes and ecological behaviour (e.g., Bamberg 2003; Grob 1995).¹ Research has also indicated that people evaluate environmental problems differently because there are variables that effect people's perception and evaluation of these problems (e.g., Dunlap and Jones 2002; Milfont and Gouveia 2006; Pawlik 1991; Uzzell 2000). One variable that seems to affect people's evaluation of environmental problems is social desirability concerns. Because, as noted by Beckmann (2005), "Who actually would dare to admit disinterest or even anti-environment attitudes?" (p. 281). Therefore, social desirability seems to be one factor that may explain why researchers have found very high self-reported

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¹ Environmental attitudes and ecological behaviour are standard terms in psychology. Environmental attitudes is employed here to refer to a "psychological tendency that is expressed by evaluating perceptions of or beliefs regarding the natural environment, including factors affecting its quality, with some degree of favour or disfavour" (Milfont 2007, p. 12). Ecological behaviour is employed here to refer to actions contributing to environmental preservation and/or conservation (Axelrod and Lehman 1993; Kaiser and Fuhler 2003).

environmental attitudes from people around the world, but at the same time a high attitude-behaviour gap.²

1 Socially desirable responding and environmental issues

Socially desirable responding (SDR) is formally defined as “the tendency of subjects to attribute to themselves in self-description, personality statements with socially desirable scale values, and to reject those with socially undesirable scale values” (Edwards 1957, p. vi). Along with acquiescence bias (tendency to agree or disagree with all or most of the questions asked) and extremity bias (tendency to choose extreme ratings in response-scale formats), SDR is one of the most common types of response bias (Paulhus 1991). Although there are some critics (e.g., Pauls and Stemmler 2003), Paulhus’ (1984) two-factor theory of SDR seems to be the most accepted in the literature (see, e.g., Bäckström 2007).

The theory posits that SDR comprises two components: self-deceptive positivity and impression management. The self-deception component characterizes personal threat and correlates positively with defence and coping measures, which indicates the expression of self-regard motives. In contrast, the impression management component characterizes socially desirable overt behaviours and correlates positively with lie measures, which indicates the expression of social approval motives. The theory therefore posits that SDR affects the way people present themselves: people’s self-presentation can be overly positive (i.e., self-deception) or tailored to an audience (i.e., impression management) (Paulhus 1991). Considering Paulhus’ (1984, 1991) theorizing and findings, and given that environmental attitudes and ecological behaviour do not imply personal threat, there is little reason to believe that self-deception is related to environmental issues. Hence, only impression management seems a concern for research on environmental issues.

In short, impression management expresses people’s tendency to give answers in survey questionnaires that make them look good (Paulhus 1991). For research on environmental issues, this tendency would make people indicate in a survey that they hold higher levels of environmental attitudes and perform more ecological behaviour than is in fact true. Hence, questions on environmental issues are believed to be highly affected by social

desirability concerns (e.g., Beckmann 2005). The general acceptance that peoples’ attitudes and behaviours related to environmental issues are strongly affected by SDR has important implications for research, especially because most studies measuring environmental attitudes and ecological behaviour tend to rely on self-reports. Hence, it would indicate that people’s answers to such measures would not be reliable.

However, although SDR seems to be theoretically linked to responses regarding environmental issues, there are three points worth noting. First, the two references (Stern and Oskamp 1987; Tarrant and Cordell 1997) commonly used in the literature to support the claim that social desirability concerns effect environmental issues (e.g., Halpenny 2006; Lam and Cheng 2002) do not explicitly refer to social desirability; rather the two references only point to limitations of self-report measures of environmental intentions and ecological behaviours as compared to objective measures. Second, although scholars tend to assume that social desirability concerns effect responding in environmental psychology research (e.g., Costarelli and Colloca 2004; Thøgersen and Ölander 2006), there are only six empirical studies actually testing this effect (discussed below).

Third, and more importantly, the known studies that have examined the effect of social desirability concerns have shown that this effect is low or even non-existent. Kaiser et al. (1999) found that social desirability was only marginally related to measures of environmental attitudes, intentions to engage in ecological behaviours and self-reported ecological behaviour, and that the relationship with environmental values was not significant. Hartig et al. (2001), Schahn (2002) and Wiseman and Bogner (2003) found only marginally significant correlations between social desirability and both environmental attitude and ecological behaviour measures. Finally, Mayer and Frantz (2004) and Pato et al. (2004) found no significant correlations. It therefore seems that the theoretical claim that social desirability concerns influence research on environmental issues does not have strong empirical support.

2 The present study

This paper describes two studies addressing whether SDR affect the way people answer questions on environmental attitudes and ecological behaviour. It focuses on impression management (IM) because this seems to be the only component of SDR related to environmental issues (see discussion above). Thus, the studies investigate the influence of IM on environmental attitudes and self-reported ecological behaviour. There are two possible IM influences. First, there is the possibility that IM influence both environmental attitudes and ecological behaviour directly.

² As correctly pointed by one anonymous reviewer, there are also other factors that may explain the attitude-behaviour gap, such as technological or policy barriers, and lack of effective knowledge or resources. Assuming that people are genuine in their self-reported environmental attitudes, these other factors can also limit the translation of environmental attitudes into ecological behaviour.

There is also the possibility that IM moderates the relationship between environmental attitudes and ecological behaviour. In this case, the attitude–behaviour relationship may differ at different levels of social desirability, indicating, for example, that environmental attitudes would predict ecological behaviour more under conditions of higher social desirability. Both Study 1 and Study 2 address these two possibilities. If IM is found to be a strong, direct predictor of both environmental attitudes and ecological behaviour and/or found to moderate the environmental attitudes–ecological behaviour relationship, then it would support the theoretical claim that SDR affects the way people answer questions on environmental issues. However, if IM does not have a direct or an indirect influence, then it would provide empirical support showing that SDR does not have a strong effect in environmental issues. This study will therefore test a null result. Testing the null hypothesis is uncommon in psychological research but may provide informative outcome (Greenwald 1975).

The present study goes beyond previous studies in three substantial ways. First, previous studies have only *indirectly* evaluated the impact of SDR on environmental issues measures, while the present contribution *explicitly* tests this impact in two empirical studies. Second, the focus of previous studies was to reject the null hypothesis (showing that SDR has an influence on environmental issues measures), while the focus of the present study is to support the null hypothesis. Finally, previous studies have only examined the direct impact of SDR on environmental issues measure, while the present study examines a direct as well as an indirect (moderate) impact of SDR.

3 Study 1

3.1 Method

3.1.1 Participants

An anonymous online questionnaire was administered to introductory psychology students at the Victoria University of Wellington, New Zealand. A total of 332 students (231 female and 92 male; 9 participants did not report their gender) completed the questionnaire for class credit. Their ages ranged from 17 to 45 ($M = 19$, $SD = 2.59$).

3.1.2 Instruments

Socio-demographic measures Age, gender, ethnic affiliation, and country of birth were controlled for in the regression analyses to examine whether IM would be related to environmental attitudes and ecological behaviour over and above these variables.

Impression management (IM) scale (Paulhus 1991) The IM scale contains 20 balanced items used to assess SDR. Participants rate each item on a 7-point scale anchored by *not true* and *very true*. Examples of items are: “When I was young I sometimes stole things” (item 11), “I never read sexy books or magazines” (item 14). Paulhus’ (1991) reported alphas ranging from .75 to .86. All the odd-numbered items were recoded so that higher scores indicate higher social desirability responses.

New ecological paradigm (NEP) scale (Dunlap and Van Liere 1978) The NEP scale measures the overall relationship between humans and the environment, and has been the most widely used measure of environmental attitudes (Hawcroft and Milfont 2008). The revised NEP scale (Dunlap et al. 2000) contains 15 balanced items (alpha of .83), and participants rate each item on a 5-point scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Examples of items are: “We are approaching the limit of the number of people the earth can support” (item 1), “Humans have the right to modify the natural environment to suit their needs” (item 2). All the even-numbered NEP items were recoded so that higher scores indicate pro-environmental attitudes responses.

Ecological behaviour scale This scale consists of eight items previously used by Milfont and Duckitt (2004), who reported alpha of .77. Participants were asked to indicate how often they had engaged in each of these eight specific behaviours in the last year on a 5-point scale from 1 (*never*) to 5 (*very often*). Examples of behaviours are: “looked for ways to reuse things”, “recycled newspaper”, “picked up litter that was not their own”.

3.2 Results and discussion

Table 1 presents the descriptive statistics for the measures used in Study 1. All scales had alpha above the optimum level of .70 (Nunnally 1978), and acceptable (i.e. <1.00) levels of skewness and kurtosis, suggesting no serious deviation from normality.

In order to examine the direct effects of IM on environmental attitudes and ecological behaviour, the correlations between the measures were examined. In line with other studies (e.g., Schultz 2001), environmental attitudes was strongly related ($r = .38$, $p < .001$) to ecological behaviour. More importantly, however, IM was only weakly related ($r = .13$, $p < .05$) to ecological behaviour, and its relation to environmental attitudes did not reach significance ($r = -.03$, $p = .62$). Because the content of one item of the IM scale (“I have never dropped litter on the street”) is weighted towards environmental content—and is in fact very similar to one ecological behaviour item—the significant correlation found might be a result of content overlap. Indeed, when this item was

Table 1 Descriptive statistics for the scales used in Study 1 and Study 2

| Scale | No. of items | α | Mean inter-item correlation | M | SD |
|----------------------------|--------------|----------|-----------------------------|------|------|
| <i>Study 1</i> | | | | | |
| New environmental paradigm | 15 | .81 | .22 | 3.59 | .51 |
| Ecological behaviour | 08 | .80 | .34 | 3.37 | .75 |
| Social desirability | 20 | .75 | .13 | 3.74 | .74 |
| <i>Study 2</i> | | | | | |
| Preservation | 70 | .95 | .20 | 4.83 | .65 |
| Enjoyment of nature | 10 | .87 | .41 | 4.88 | 1.01 |
| Conservation policies | 10 | .87 | .40 | 5.39 | .89 |
| Environmental activism | 10 | .89 | .46 | 4.56 | 1.06 |
| Environmental fragility | 10 | .87 | .40 | 5.05 | .89 |
| Personal conservation | 10 | .80 | .30 | 4.67 | .91 |
| Ecocentric concern | 10 | .88 | .43 | 5.40 | .88 |
| Population growth | 10 | .85 | .36 | 3.87 | 1.00 |
| Utilization | 50 | .91 | .17 | 3.64 | .60 |
| Anthropocentric concern | 10 | .74 | .22 | 3.81 | .82 |
| Confidence in science | 10 | .84 | .34 | 3.73 | .83 |
| Altering nature | 10 | .72 | .24 | 4.10 | .77 |
| Dominance over nature | 10 | .87 | .41 | 3.13 | 1.04 |
| Utilization of nature | 10 | .86 | .38 | 3.44 | .80 |
| GEA | 120 | .96 | .17 | 4.63 | .58 |
| Ecological behaviour | 08 | .69 | .22 | 3.30 | .67 |
| Social desirability | 10 | .67 | .17 | 3.34 | .89 |

Note Study 1, $N = 332$. Study 2, $N = 314$. GEA = generalized environmental attitudes (i.e., preservation and utilization combined)

removed from the IM scale, the correlation between IM and ecological behaviour dropped and became only marginally significant ($r = .10$, $p = .06$). These results suggest that both environmental attitudes and ecological behaviour are completely free from social desirability effects.

Moderated multiple regressions were then performed to test a two-way (environmental attitudes \times IM) interaction examining whether the relationship between environmental attitudes and ecological behaviour is moderated by SDR. Following the procedures outlined by Aiken and West (1991), the scores of the NEP and IM scales were centred, their multiplicative product computed, and the interaction examined through hierarchical multiple regression. All socio-demographic variables were entered at step one; the centred environmental attitudes and IM scores at step two; and the two-way interaction term between environmental attitudes \times IM at step three. IM did not interact with environmental attitudes to predict ecological behaviour (ΔR^2 for step three = .002; $F(6,315) = 12.11$, $p < .001$; $\Delta F = .92$, $p = .34$); only environmental attitudes ($\beta = .51$, $p < .001$) and age (being older) ($\beta = .05$, $p < .05$) predicted ecological behaviour. The analyses were repeated excluding the environmentally related item from the IM scale and the results were virtually identical. These results indicate that there was no moderating effect of IM on the relationship between environmental attitudes and ecological behaviour.

4 Study 2

This study aims to replicate the findings from Study 1 including a larger number of socio-demographic variables, using an independent sample, and another environmental attitudes measure based on a contemporary conceptualization of this construct. Replicating the findings of Study 1 in another sample and using a broader environmental attitudes measure would provide further evidence of the lack of influence of SDR on self-reported environmental attitudes and ecological behaviour.

Environmental attitudes are here considered in line with Wiseman and Bogner's (2003) Model of Ecological Values, in which environmental attitudes comprise two second-order factors, namely *Preservation* and *Utilization*. Recent studies expanding this model have demonstrated that these two second-order dimensions are correlated and are comprised by twelve first-order factors (Milfont and Duckitt 2004, 2006). Preservation comprises seven first-order factors, while Utilization five (see Table 1). Therefore, environmental attitudes have a multidimensional and hierarchical structure, in which 12 first-order factors comprise two higher order factors. Given that empirical studies have also proposed a single environmental attitudes higher order factor (see, e.g., Xiao and Dunlap 2007) and that research has not yet clearly shown whether

Preservation and Utilization, taken as distinct second-order environmental attitudes factors, are more empirically meaningful than a single higher order factor (Milfont 2007), a single second-order environmental attitudes factor was also considered. This factor was labelled “generalized environmental attitudes” and includes all 12 first-order factors described below.

4.1 Method

4.1.1 Participants

An anonymous questionnaire was administered to introductory psychology students at the University of Auckland, New Zealand. More than 95% of the students in the classes voluntarily agreed to participate, with no class credit involved. A total of 314 (215 female and 99 male) students completed the questionnaire. Their ages ranged from 16 to 51 ($M = 20.00$, $SD = 4.48$).

4.1.2 Instruments

Socio-demographic measures Several socio-demographic questions were included to be controlled for in some of the analyses: age, gender, ethnic affiliation, religiosity (on a 8-point scale anchored by *not religious at all* and *very religious*), Biblical literalism (Schultz et al. 2000), political conservatism (on a 7-point scale anchored by *extremely liberal* and *extremely conservative*), self-perceived family economic status (on a 9-point scale anchored by *lower income* and *upper income*), and connectedness with nature (Schultz 2001).

Shortened impression management (IM) scale Because of space constraints, only 10 balanced items from the IM scale were used. The items used were items 21, 22, 23, 24, 25, 26, 27, 28, 29, 32 from the original scale (Paulhus 1991).

Environmental attitudes inventory (EAI) (Milfont and Duckitt 2008) This measure is a culture-general and fully balanced tool developed to measure the multidimensional and hierarchical structure environmental attitudes. The EAI measures 12 specific facets, or first-order factors, that define the two-dimensional higher order structure of environmental attitudes (i.e., Preservation and Utilization). The EAI consists of 120 items, with five pro- and five con-trait items for each of the 12 scales. To assess the relationships between IM and environmental attitudes, all 70 Preservation items and all 50 Utilization items were computed to form scores. A general environmental attitudes score (i.e., GEA) was also computed by reversing the 50 Utilization items and then averaging responses to all 120 EAI items. Examples of the items are: Preservation: “It makes me sad to see forests cleared for agriculture”, “I do not believe that the environment has been severely abused by humans”

(reverse); Utilization: “Human beings were created or evolved to dominate the rest of nature”, “Modern science will NOT be able to solve our environmental problems (reverse)”.

Ecological behaviour scale This scale consisted of the same 8 items used in Study 1.

4.2 Results and discussion

Table 1 also presents the descriptive statistics for the measures used in Study 2. The IM and ecological behaviour scales had alphas slightly below the optimum level. Overall, however, all measures had either alphas higher than .60 or mean inter-item correlations higher than .15 (Briggs and Cheek 1986), indicating acceptable internal consistency and homogeneity for research purposes. The scales also had acceptable (i.e. <1.00) levels of skewness and kurtosis, suggesting no serious deviation from normality.

From the sixteen variables considered only five showed significant, but weak ($r < .30$), correlations with IM: Preservation ($r = .16$, $p < .01$), three of the Preservation scales [Enjoyment of Nature ($r = .16$, $p < .01$), Environmental Activism ($r = .20$, $p < .001$), and Personal Conservation ($r = .27$, $p < .001$)], GEA ($r = .12$, $p < .05$), and ecological behaviour ($r = .13$, $p < .05$). When the correlations were performed excluding the environmentally related item from the IM scale, only four correlations remained significant: Preservation ($r = .12$, $p < .05$), Enjoyment of Nature ($r = .15$, $p < .01$), Environmental Activism ($r = .17$, $p < .01$), and Personal Conservation ($r = .24$, $p < .001$). The significant correlations with the overall environmental attitudes score and ecological behaviour disappeared ($r = .08$, $p = .14$ and $r = .10$, $p < .07$, respectively). These results indicate that there was only a marginal direct influence of IM on some of the environmental attitudes dimensions, and that no influence was found for ecological behaviour.

Moderated multiple regressions were then performed to test a two-way (environmental attitudes \times IM) interaction using the same procedures as in Study 1. All socio-demographic variables were entered at step one; Preservation and IM at step two; and the two-way interaction term between Preservation \times IM at step three. IM did not interact with Preservation to predict ecological behaviour (ΔR^2 for step three = .002; $F(11,302) = 13.63$, $p < .001$; $\Delta F = .77$, $p = .38$); only Preservation ($\beta = .50$, $p < .001$), gender (being male) ($\beta = -.13$, $p < .05$), and self-perceived family economic status ($\beta = .11$, $p < .05$) predicted ecological behaviour. Identical analyses were conducted examining the two-way interaction term between both Utilization \times IM and GEA \times IM. Again, IM did not interact with either Utilization (ΔR^2 for step three = .002; $F(11,302) = 8.55$,

$p < .001$; $\Delta F = .65$, $p = .42$) or GEA (ΔR^2 for step three = .003; $F(11,302) = 13.14$, $p < .001$; $\Delta F = 1.34$, $p = .25$) to predict ecological behaviour. The direct predictors in these analyses were: Utilization ($\beta = -.35$, $p < .001$), age ($\beta = .11$, $p < .05$), being male ($\beta = -.17$, $p < .01$), and self-perceived family economic status ($\beta = .12$, $p < .05$), and GEA ($\beta = .50$, $p < .001$), being male ($\beta = -.13$, $p < .05$), and self-perceived family economic status ($\beta = .12$, $p < .05$). These results replicate those of Study 1 by showing that there was no moderating effect of IM on the relationship between environmental attitudes and ecological behaviour.

5 Discussion and conclusion

This paper reported two studies examining the direct and moderating effect of impression management, a component of socially desirable responding (SDR), on self-reported environmental attitudes and ecological behaviour. The findings from Study 1 provide evidence that SDR does not have a strong effect in the way people answer questions on environmental issues, and this was also replicated in Study 2. Overall, the findings indicated that SDR has only a weak direct effect on environmental attitudes (Study 2), and that SDR does not moderate the environmental attitudes–ecological behaviour relationship (Study 1 and Study 2). Therefore, this study has shown that social desirability concerns do not have a strong effect on the way people respond to questions addressing environmental issues.

That SDR is not a serious problem in environmental issues research is an important finding because there are several claims in the literature that social desirability concerns affect people's response to measures on environmental attitudes and ecological behaviour (see, e.g., Costarelli and Colloca 2004; Thøgersen and Ölander 2006). However, as discussed before, these claims do not seem to be based on empirical evidence since only a few studies have *indirectly* evaluated the impact of SDR on environmental issues measures, and those who did, have found only a low impact (see, e.g., Kaiser et al. 1999; Pato et al. 2004; Wiseman and Bogner 2003). Moreover, the focus of these empirical studies was to reject the null hypothesis, showing that SDR has an influence, albeit small, on environmental issues measures. However, the present study provides empirical evidence supporting the null hypothesis.

The only three Preservation scales related to SDR in Study 2 seem to share behavioural content (see Table 1), so this may indicate that the influence of social desirability is restricted to behavioural aspects within the environmental domain. However, even if this is the case, the impact of SDR seems minimal as the effective sizes of the

correlations were at most moderate (Cohen 1988; Hemphill 2003). Moreover, results from both studies showed that the correlations between SDR and ecological behaviour was low and became non-significant once the item from the IM scale sharing content overlap was excluded. Therefore, taking together all empirical evidence gathered so far, it seems clear that socially desirable responding is not a problem in measures assessing environmental attitudes and self-reported ecological behaviours.

The findings need to be considered in light of some limitations, however. The present study considered only psychology undergraduate students. Although this is a common sample in many environmental psychology studies, students are not representative of the general population. So it would be interesting to test whether the findings hold for a general population sample. Another expansion of the current study would be to consider broader measures of self-reported ecological behaviour. For example, it would be interesting to replicate the current findings using Kaiser's (1998) ecological behaviour measure. Given that the present study considered only self-reported ecological behaviour, future studies should also investigate the effect of social desirability concerns on actual behaviour. This seems an important direction for future studies because past research has found low correlations between self-reported and observed ecological behaviour (Corral-Verdugo 1997).

To conclude, this study focused on social desirability concerns because it has been theoretically and empirically related to measures on environmental issues research. Taking into account the findings of the two studies reported here, as well as previous results, it seems safe to conclude that SDR has no strong impact on the way people answer questions related to their environmental attitudes and ecological behaviours in anonymous questionnaires.

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References

- Aiken LS, West SG (1991) Multiple regression: testing and interpreting interactions. Sage, Newbury Park, CA
- Axelrod LJ, Lehman DR (1993) Responding to environmental concerns: what factors guide individual action? *J Environ Psychol* 13:149–159
- Bäckström M (2007) Higher-order factors in a five-factor personality inventory and its relation to social desirability. *Eur J Psychol Assess* 23:63–70
- Bamberg S (2003) How does environmental concern influence specific environmentally related behaviours? A new answer to an old question. *J Environ Psychol* 23:21–32
- Beckmann SC (2005) In the eye of the beholder: Danish consumer-citizens and sustainability. In: Grunert KG, Thøgersen J (eds)

- Consumers, policy and the environment: a tribute to Folke Ölander. Springer, Berlin, pp 265–299
- Briggs SR, Cheek JM (1986) The role of factor analysis in the development and evaluation of personality scales. *J Pers* 54:106–148
- Cohen J (1988) *Statistical power analysis for the behavioral sciences*, 2nd edn. Erlbaum, Hillsdale, NJ
- Corral-Verdugo V (1997) Dual ‘realities’ of conservation behavior: self-reports vs observations of re-use and recycling behavior. *J Environ Psychol* 17:135–145
- Costarelli S, Colloca P (2004) The effects of attitudinal ambivalence on pro-environmental behavioural intentions. *J Environ Psychol* 24:279–288
- Dunlap RE, Jones RE (2002) Environmental concern: conceptual and measurement issues. In: Dunlap RE, Michelson W (eds) *Handbook of environmental sociology*. Greenwood Press, Westport, CT, pp 482–524
- Dunlap RE, Van Liere KD (1978) The new environmental paradigm. *J Environ Educ* 9:10–19
- Dunlap RE, Gallup GH, Gallup AM (1993) Of global concern: results of the health of the planet survey. *Environment* 35:7–15
- Dunlap RE, Van Liere KD, Mertig A, Jones RE (2000) Measuring endorsement of the new ecological paradigm: a revised NEP scale. *J Soc Issues* 56:425–442
- Edwards AL (1957) *The social desirability variable in personality assessment and research*. Holt, Rinehart and Winston, New York
- Greenwald AG (1975) Consequences of prejudice against the null hypothesis. *Psychol Bull* 82:1–20
- Grob A (1995) A structural model of environmental attitudes and behaviour. *J Environ Psychol* 15:209–220
- Halpenny EA (2006) Environmental behaviour, place attachment and park visitation: a case study of visitors to Point Pelee National Park. Unpublished doctoral dissertation, University of Waterloo, Ontario, Canada
- Hartig T, Kaiser FG, Bowler PA (2001) Psychological restoration in nature as a positive motivation for ecological behavior. *Environment and Behavior* 33:590–607
- Hawcroft LJ, Milfont TL (2008) The use (and abuse) of the New Environmental Paradigm Scale over the last 30 years: a meta-analysis. (under review)
- Hemphill JF (2003) Interpreting the magnitudes of correlation coefficients. *Am Psychol* 58:78–80
- Kaiser FG (1998) A general measure of ecological behavior. *J Appl Soc Psychol* 28:395–422
- Kaiser FG, Fuhler U (2003) Ecological behaviour’s dependency on different forms of knowledge. *Appl Psychol Int Rev* 52:598–613
- Kaiser FG, Ranney M, Hartig T, Bowler PA (1999) Ecological behavior, environmental attitude, and feelings of responsibility for the environment. *Eur Psychol* 4:59–74
- Lam S-P, Cheng S-I (2002) Cross-informant agreement in reports of environmental behavior and the effect of cross questioning on report accuracy. *Environ Behav* 34:508–520
- Mayer FS, Frantz CM (2004) The connectedness to nature scale: a measure of individuals feeling in community with nature. *J Environ Psychol* 24:503–515
- Milfont TL (2007) Psychology of environmental attitudes: a cross-cultural study of their content and structure. Unpublished doctoral dissertation, University of Auckland, Auckland, New Zealand
- Milfont TL, Duckitt J (2004) The structure of environmental attitudes: a first- and second-order confirmatory factor analysis. *J Environ Psychol* 24:289–303
- Milfont TL, Duckitt J (2006) Preservation and utilization: understanding the structure of environmental attitudes. *Medio Ambiente y Comportamiento Humano* 7:29–50
- Milfont TL, Duckitt J (2008) The environmental attitudes inventory: a valid and reliable measure to assess the structure of environmental attitudes. (under review)
- Milfont TL, Gouveia VV (2006) Time perspective and values: an exploratory study of their relations to environmental attitudes. *J Environ Psychol* 26:72–82
- Millennium Ecosystem Assessment (2005) *Ecosystem and well-being: synthesis report*. Island Press, Washington, DC
- Nunnally JC (1978) *Psychometric theory*, 2nd edn. McGraw-Hill, New York
- Pato C, Rós M, Tróccoli B, Tamayo A (2004) Environmental beliefs: an empirical validation with Brazilian students. Paper presented at the 18th conference of the international association for people-environment studies, Vienna
- Paulhus DL (1984) Two-component models of socially desirable responding. *J Pers Soc Psychol* 46:598–609
- Paulhus DL (1991) Measurement and control of response bias. In: Robinson JP, Shaver PR, Wrightsman LS (eds) *Measurement of personality and social psychological attitudes*. Academic Press, San Diego, CA, pp 17–59
- Pauls CA, Stemmler G (2003) Substance and bias in social desirability responding. *Pers Individ Dif* 35:263–275
- Pawlik K (1991) The psychology of global environmental change: some basic data and an agenda for cooperative international research. *Int J Psychol* 26:547–563
- Schahn J (2002) The role of behavioral costs and social desirability as predictors of environmental attitudes and conservation behavior: an analysis on aggregate and on individual data level. *Zeitschrift für Differentielle und Diagnostische Psychologie* 23:45–54
- Schultz PW (2001) The structure of environmental concern: concern for self, other people, and the biosphere. *J Environ Psychol* 21:327–339
- Schultz PW (2002) Environmental attitudes and behaviors across cultures. In: Lonner WJ, Dinnel DL, Hayes SA, Sattler DN (eds.) *Online readings in psychology and culture* (Unit 8, Chapter 4). Department of Psychology, Center for Cross-Cultural Research, Western Washington University, Bellingham. Retrieved May 17, 2004, from <http://www.ac.wvu.edu/~culture/Schultz.htm>
- Schultz PW, Zelezny LC, Darymple NJ (2000) A multinational perspective on the relation between Judeo-Christian religious beliefs and attitudes of environmental concern. *Environ Behav* 32:576–591
- Stern PC, Oskamp S (1987) Managing scarce environmental resources. In: Stokols D, Altman I (eds) *Handbook of environmental psychology*, vol 2. Wiley, New York, pp 1043–1088
- Tarrant MA, Cordell HK (1997) The effect of respondent characteristics on general environmental attitude-behavior correspondence. *Environ Behav* 29:618–637
- Thøgersen J, Ölander F (2006) To what degree are environmentally beneficial choices reflective of a general conservation stance? *Environ Behav* 38:550–569
- Uzzell D (2000) The psycho-spatial dimension of global environmental problems. *J Environ Psychol* 20:307–318
- Wiseman M, Bogner FX (2003) A higher-order model of ecological values and its relationship to personality. *Pers Individ Dif* 34:783–794
- Xiao C, Dunlap RE (2007) Validating a comprehensive model of environmental concern cross-nationally: a U.S.-Canadian comparison. *Soc Sci Q* 88:471–493