

Review

The relationship between materialistic values and environmental attitudes and behaviors: A meta-analysis

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ABSTRACT

A growing body of evidence suggests that materialistic values may be negatively associated with pro-environmental attitudes and behaviors. This research used meta-analytic techniques to assess: the mean effect size of the correlation between materialistic values and pro-environmental attitudes and behaviors; the 'true effect size' adjusting for the reliability of the measures; and the effects of gender, age, population type and publication year on the size of the correlation. A significant, medium-sized association was found between materialistic values and both environmental attitudes and behaviors; these relationships were moderated by population type and publication year, but not by gender or age. Adjusted for reliability, the effects increased considerably, largely due to the low reliability of both types of environmental measures. The implications for future research are discussed, particularly with regard to the importance of using more reliable environmental measures and collecting data from more cultures. Practical applications are also highlighted, particularly as they might apply to environmental campaigns.

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1. Introduction

The concept of values is not new to the field of environmental psychology: the value that participants attach to the environment has been extensively studied, with ecospheric values or concerns, which focus on the innate value of nature, contrasted with more anthropocentric concerns, where importance is placed on the natural world in relation to its worth to humans (Stern & Dietz, 1994). These environmental values are predictive of a host of environmental attitudes and behaviors, from car use to the reduction and re-use of household waste (Barr, 2007; De Groot & Steg, 2007). These domain-specific values may be excellent predictors of environmental outcomes, but evidence is mounting that broader personal values may also have a place in predicting individuals' environmental behaviors and attitudes. It is within this context that we consider the personal value of materialism: a set of values, goals or expectancies relating to the acquisition of wealth and material goods (Kasser & Ryan, 1996; Richins & Dawson, 1992).

Materialistic values are important to consider in relation to environmental attitudes and behavior for two reasons: first, there is

considerable theoretical and empirical support that this particular value may be negatively related to environmental outcomes, and second, it is an individual difference which may be more readily influenced than personality variables. Furthermore, there is as yet no systematic review of the growing body of studies examining the association of materialism with environmental attitudes and behaviors. A meta-analysis can synthesize this literature and examine potential moderating factors.

1.1. Materialism, the environment and value systems

The fundamental opposition between the pursuit of economic success and pro-environmental behavior is a common theme. In 2005, President Bush cited the US economy as his primary reason for not signing the Kyoto agreement, and a recent survey found that a sizeable minority of Americans believed their country could not afford to reduce its impact on global warming given its struggling economy (43%; Leiserowitz, Maibach, Roser-Renouf, & Hmielowski, 2012). Others argue that the global and national pursuit of economic growth has placed substantial and unsustainable strain on the planet's resources (Hamilton, 2010; Jackson, 2009; Speth, 2008). At the individual level, materialism can be considered the personal endorsement of this national drive for economic growth and of the values of capitalism. Theory suggests (Kasser, Cohn, Kanner, & Ryan, 2007) and studies show (Kasser, 2011a; Schwartz, 2007) that to the

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extent nations pursue de-regulated, free-market forms of capitalism, their citizens are more likely to endorse values that concern wealth, social standing and competition between individuals. Further, Kasser (2011b) reported that countries whose citizens place relatively higher priority on these types of values (i.e., for Hierarchy and Mastery) also had higher levels of CO₂ emissions, providing empirical support for the claims of Speth and others (2008; Jackson, 2009) that the pursuit of economic success at a national level may contribute to environmental damage.

But even given these links between economic systems, values, and the environment at a national level, it is important to understand why the *personal* value of materialism might have negative associations with *individual* environmental attitudes and behaviors, similar to those reported at a national level. One possible explanation may be provided by research into value conflict, where studies have consistently shown that some personal values are compatible and associated, and some are in opposition (Grouzet et al., 2005; Schwartz, 1992). These value structures are rather similar at both a national and individual level, lending further support to our extrapolation from the national to the individual (Schwartz, 1992, 2006). Schwartz's (1992, 2006) circumplex of values is a key demonstration of both of these findings, and has been validated on data from over 80 countries. In a circumplex model, values that are compatible are located adjacently, while those in conflict are located on opposite sides of the circumplex. Power and Achievement are adjacent values in this model, and fall directly opposite to the value of Universalism, which relates to valuing social justice, the environment and equality. This means that it is relatively difficult and uncommon for individuals to endorse both of these sets of values. As for materialism, Burroughs and Rindfleisch (2002) analyzed materialism measures alongside the Schwartz values, and found that materialism fell next to Power and Achievement, and opposite to Universalism. Further cross-cultural research (Grouzet et al., 2005) has found that materialism consistently falls with other self-interested values, in opposition to values that may be associated with environmental concern. Interestingly, experimental work by Maio, Pakizah, Cheung, and Rees (2009) shows that there is a dual process at work here, suggesting that materialistic values could have a doubly negative impact on environmental outcomes: priming related and environmentally detrimental values, such as Power, simultaneously *increases* their rated importance and *decreases* the importance rating given to the opposing value of Universalism, which is positively associated with environmental behavior.

Evidence supporting this conflict between self-interested values, such as materialism, on the one hand and pro-environmental attitudes and behaviors on the other, as well as the strong association of pro-environmental and altruistic values, can also be seen outside of this values conflict literature. Research into domain-specific, environmental values has also suggested an association between pro-social concerns and concern for the environment. Specifically, studies have found strong links between ecospheric and altruistic environmental values, with some exploratory factor analyses yielding a single factor composed of the items from both these scales (De Groot & Steg, 2007; Nordlund & Garvill, 2002; Stern & Dietz, 1994; Swami, Chamorro-Premuzic, Snelgar, & Furnham, 2010).

Furthermore, environmental crises have frequently been characterized by environmental psychologists as social, or commons, dilemmas (Hardin, 1968). In such crises, there is a clear personal benefit to consuming more, or 'defecting', but if all involved were to behave this way, the overall outcome would be less beneficial than if all 'cooperated' and reduced their consumption to sustainable levels. Research using commons dilemma paradigms has found interesting results relating to pro-social behavior, further supporting the suggestion that environmental and altruistic values are closely related

(see Kopelman, Weber, & Messick, 2002, for a full review). These studies suggest that people with pro-social, as opposed to pro-self, orientations behave more cooperatively and harvest less in environmental resource dilemmas, but also that participants with higher levels of environmental concern behave more pro-socially in general, both in real life situations and in simulated commons dilemmas that are not directly related to the environment (Kaiser & Byrka, 2011; Van Lange, 1999). These findings provide further evidence that pro-social and environmental values may be related, whereas self-interest runs in conflict with these aims.

Therefore, if, as Maio et al.'s (2009) work suggests, materialistic values have the ability to decrease the importance individuals place on the positively associated, pro-social value of Universalism, and at the same time increase the importance of the environmentally damaging values of Power and Achievement, they have further potential to be a strong and negative influence on environmental attitudes and behaviors at the individual level, by reducing pro-social tendencies as well as pro-environmental ones.

1.2. Goal pursuit behavior

Another reason for expecting an association between materialism and environmental behaviors in particular is that different behaviors stem from different values or goals. The purchase of 'ethical' goods, such as fair-trade foods, has been associated positively with the Schwartz value of Universalism, and negatively with Power (Doran, 2009). If our values can influence what type of item we buy, they may also influence how environmentally damaging our purchases or behaviors are. Brown and Kasser (2005) argue that individuals pursuing intrinsic goals, such as personal growth, close relationships with family, and community well-being, are likely to engage in less harmful environmental behavior simply because these goals are not dependent on material goods or wealth for fulfillment. In contrast, pursuit of the materialistic goals of financial success, image and fame is grounded in conspicuous consumption and the accumulation of high status goods, such as sports cars with low fuel economy or high energy widescreen televisions; by necessity, pursuit of the materialistic 'dream' involves an increased negative impact on the environment, whereas the pursuit of self-fulfillment and connection to others does not.

From the different literature outlined above, it becomes clear that materialistic values may have an association with environmental behavior and attitudes that is worth considering in more detail. Although a brief glance at the available research would suggest that materialism is indeed negatively associated with environmental behaviors and attitudes, there is considerable variation between studies, both in effect sizes and in the measures used. A meta-analysis will allow a synthesis of the studies available, and enable us to consider the 'true' correlation between materialism and environmental outcomes.

1.3. Potential moderators

An additional benefit of a meta-analysis is that it enables the consideration of potential moderators that might be difficult to assess within a single study. Identifying moderator variables is important, as doing so helps determine the conditions under which materialism is most influential on people's environmental behavior and thus who might benefit most from any interventions. Previous research into environmental concern highlights two potential individual level moderators. Specifically, studies have suggested effects for gender and age on environmental concern and attitudes (Ewert & Baker, 2001; Swami et al., 2010), with women and older participants exhibiting more pro-environmental attitudes. It is possible that these differences may also have an

influence on the link between materialism and environmental outcomes.

Elements of the studies themselves may also influence the size of effect found between materialism and environmental attitudes and behaviors. Year of publication is a potentially interesting moderator, as it may provide insight into changes in environmental views over the years. If, overall, environmental attitudes and behaviors have improved over time and become more similar across the population, we might expect that the association with materialism could also decrease, as the variability in environmental scores limits the size of the correlation. Another study-level moderator could be the population from which the sample is drawn. Research often relies on student samples, as they are a convenient and accessible population, but previous work has found that student samples are often more homogeneous than community samples, with effect sizes from student samples often differing in both size and direction from those found in community samples (Peterson, 2001). As such, a consideration of the differences between student and community samples could be important for the progression of future research.

A final moderator of interest is whether environmental behaviors or environmental attitudes are more strongly associated with materialism. Models relating attitudes to behavior, such as the theory of planned behavior (Ajzen, 1991), typically take the form of values influencing attitudes, which then inform behavior. Under such models we would expect a stronger association between materialism and attitudes than between materialism and behaviors. However, as outlined in Section 1.2, the link between materialism and environmental behavior more be more direct, and not simply occur through a joint association with attitudes. By establishing the strength of materialism's association with both attitudes and behaviors, we can begin to consider the multiple ways in which materialism might be linked with environmental outcomes.

1.4. The present study

The overall aim of the present study was to provide a synthesis of the research currently available linking materialistic values and goals with environmental attitudes and behaviors. We conducted a multivariate meta-analysis to assess the magnitude of the link between materialism and these constructs, assessing associations with behavior separately from attitudes to allow comparisons between the strength of the link with each outcome. Materialism was expected to be negatively associated with both pro-environmental attitudes and behaviors, in line with the theoretical predictions outlined above. We also aimed to consider potential moderators of the link between materialism and environmental outcomes by assessing how the size of the association varied depending on the proportions of female participants, mean age of participants, year of publication, population type, and the type of environmental outcome measured (behavior or attitude). In addition to these empirical goals, we aimed to locate and highlight gaps in the existing literature in order to guide future research. By assessing not just the research available, but the answers it could not provide, we hoped to be able to suggest new areas of research that might be particularly fruitful for understanding this link.

2. Method

2.1. Literature search and inclusion criteria

We used four strategies to locate reports of relevant studies. First, we searched the online databases *PsychInfo*, *Web of Knowledge*, and

Index to Theses by pairing a materialism search term with an environmental search term using the Boolean AND operator. Examples of materialism search terms are *materialism*, *material values* and *financial success*,¹ and for environmental search terms we used *environment**, the asterisk signifying a wild card. Databases were searched up to 30th September 2010 and we stopped taking unpublished datasets on 31st December 2010. Secondly, we conducted ancestor searches by scrutinizing the reference lists of review articles and the reports located from our database searches. Third, we carried out a descendancy search by checking for articles citing materialism papers (e.g., Kasser & Ryan, 1993) using *Web of Knowledge*. Fourth, we wrote to 21 prominent researchers in the field of materialism requesting any unpublished work; this resulted in one unpublished masters dissertation that provided two samples for the analysis.

In order to be included, the report had to include at least one study in which there was a measure of materialism and a measure of environmental attitudes or behavior, and in which either the zero-order correlation between these measures was directly reported or there was sufficient information to derive or closely estimate that correlation (see Lipsey & Wilson, 2001, Appendix B). All reports except two that we located had sufficient information to be included in the meta-analysis; we wrote to both of these authors requesting the zero-order correlations and were successful in contacting one of these. Of the reports that did provide the required information, only one necessitated the calculation of the zero-order correlation from summary data (Clump, Brandel, & Sharpe, 2002); all other reports included the zero-order correlations.

Given that this meta-analysis defined materialism as *individual differences in people's long-term endorsement of values, goals, and associated beliefs that center on the importance of acquiring money and possessions that convey status*, we excluded studies examining beliefs about the goals a society should pursue (e.g., Inglehart, 1990; Inglehart, Basanez, & Moreno, 1998), or attitudes towards money that did not match this materialistic outlook (e.g., the importance of budgeting money, from Tang, Luna-Arocas, Sutarso, & Tang, 2004). The majority of reports utilized the Aspiration Index (AI, Kasser & Ryan, 1996), the Materialistic Values Scale (MVS, Richins & Dawson, 1992), or a derivative of one of these measures (e.g., the MVS short version; Richins, 2004). We decided to treat these as similar measures and analyze the data in combination, as previous research has shown that these measures are strongly correlated (Kasser & Ahuvia, 2002). Furthermore, these scales are similar in their interpretation of materialism, as they measure not only the importance placed on money but also on associated values and beliefs such as status or image.

For environmental behavior, we included any measure that assessed behaviors with specific environmental impacts. The behavior measures were predominantly multi-item Likert scale ratings by participants regarding how frequently they engaged in costly or pro-environmental behaviors (e.g., Brown & Kasser, 2005, Study 1; Unanue, 2010). We also chose to include intentions to engage in pro-environmental behavior (e.g., Hirsh & Dolderman, 2007), but where a study also provided a measure of current behavior we selected that correlation for use in the analysis instead (e.g., Banerjee & McKeage, 1994).

For environmental attitudes, we included measures that assessed participants' attitudes towards the truth of claims about environmental crises (e.g., 'The so-called "ecological crisis" facing humankind has been greatly exaggerated', New Ecological Paradigm, Dunlap, Van Liere, Mertig, & Jones, 2000) and attitudes towards

¹ The full set of materialism search terms was: materialism, financial success, extrinsic goals, materialistic values, material values, materialistic aspirations, financial aspirations, financial goals, and love of money.

protecting the environment; all of the scales included were multi-item scales such as the New Ecological Paradigm scale (NEP, Dunlap & Van Liere, 1978; Dunlap et al., 2000). We decided to exclude measures that were concerned with identity or self-image (Ecological Self Scale: Hirsh & Dolderman, 2007; Ecological Identification: Hinds & Sparks, 2008) as these did not explicitly focus on attitudes towards the environment.

We aimed to include studies reported in any language, but retrieved only studies in English from our searches.

2.2. Coding of studies

Our dataset was hierarchically structured with the research reports identified from the literature search, such as journal articles, book chapters or theses, at the highest level. Some of these reported more than one study, so the study was the next level, nested within report. A study could include more than one sample so, where possible, we coded effects separately for different samples in order to investigate possible moderators of effect size. Thus, we treated each sample as our independent unit of analysis, but these may be nested within study and in turn nested within report. Also, each sample could include multiple effect sizes, given that several materialism or environmental measures may have been used. We coded all of these correlations, although in Section 2.3 (Data Analysis) we discuss how we dealt with several correlations from a single sample. As necessary, correlations were reverse scored so that a negative correlation always indicated that higher materialism was associated with less concern for protecting the natural environment or with less pro-environmental behaviors.

For each correlation, we recorded the sample size for that effect size (N), the materialism measure, the environmental measure, and the reliability of each of these when this information was reported. For the purposes of moderation analyses, we recorded, where possible: (a) percent female respondents; (b) mean age of the sample (or, if not available, age group); (c) the publication year of the report; and (d) the population type (student or community sample). We also coded the study design, data collection method and type of publication (e.g., journal article, book chapter, thesis or unpublished report) in our coding, but found that our database included cross-sectional questionnaire studies only, and overwhelmingly published journal articles (there was one unpublished masters thesis), preventing moderator analyses with these variables.²

This coding approach was developed as part of a larger meta-analysis of materialism and its correlates. All of the reports included in this meta-analysis were coded by two of the authors and yielded high initial agreement (93.3% agreement; 14 errors from a possible 208) which rose above 95% when obvious errors, such as typos, were removed (10 remaining errors).

2.3. Data analysis

Because several studies included measures of both environmental attitudes and environmental behavior, we chose to carry out a multivariate meta-analysis that allowed us to summarize simultaneously the relationship of each type of measure with materialism (Berkey, Anderson, & Hoaglin, 1996; Cheung, 2013a; Kalaian & Kasim, 2008; Kalaian & Raudenbush, 1996). Studies that used only one type of environmental measure are also included, and the correlation of the

other environmental outcome with materialism is treated as missing data. No study could provide more than two effects, namely, a correlation between materialism and environmental attitudes and between materialism and environmental behaviors. One study (Unanue, 2010) used both the Material Values Scale (MVS; Richins & Dawson, 1992) and the Aspiration Index (AI; Kasser & Ryan, 1993) as measures of materialism; we chose to use correlations with the MVS as it was the measure most commonly used by other studies. For studies that used two measures of either environmental attitudes (e.g., Hodgkinson & Innes, 2000) or environmental behaviors (e.g., Brown & Kasser, 2005), we averaged these effect sizes, as can be seen in Table 1.³ This multivariate approach also required that we recorded the correlation between the measures of environmental attitudes and environmental behaviors, as well as their correlation with materialism.

In line with the Hedges and Olkin (1985) method of meta-analysis (for a general introduction see Borenstein, Hedges, Higgins, & Rothstein, 2009 or Lipsey & Wilson, 2001), we used the Fisher z (hyperbolic arctangent) transformation ($z = \tanh^{-1}(r)$) of the Pearson correlation coefficients for the analysis, and used formulas given in Stieger (1980) to find the variance and covariance of z -transformed correlations. We employed an integral z -to- r transformation for converting our results back to the r metric (Hafidahl, 2009, 2010; Hafidahl & Williams, 2009; see also Schulze, 2004). We ran random-effects models and hence treated our studies as a sample from a heterogeneous population to which we wish to make an inference (Borenstein, Hedges, Higgins, & Rothstein, 2010; Hedges & Vevea, 1998). Analyses were carried out using Cheung's (2013b) metaSEM package available in R (Cheung, 2011; R Core Development Team, 2013) and we used maximum likelihood estimation to fit a random-effects model (Viechtbauer, 2005).⁴ Heterogeneity in effect size is likely and we estimated the variability in population effect sizes, reporting both confidence intervals and credibility intervals. Confidence intervals reflect the precision of our estimate of the mean – the values between which we can feel confident that the true mean effect size falls. Credibility intervals reflect the variability of the size of the effect in the population – the values between which the majority of effect sizes fall (Whitener, 1990).

2.3.1. Scale reliability

We analyzed raw correlations and also correlations corrected for attenuation due to scale reliability.⁵ Hunter and Schmidt (2004) have argued that meta-analysts should seek to estimate the relationship between variables free from artefacts, such as measurement error, and thus estimate the true correlation between the constructs. It is also possible that differences in scale reliability may be confounded with moderators of the relationship and therefore should be controlled for. Hence, we recorded the reliability of measures (Cronbach's alpha) and, where reliability was

² We set out to code a number of other characteristics of the sample, including the average income of the participants, the percent White participants, the proportion who did not complete High School or equivalent and, for those in higher education, the subject studied. However, we were unable to code these details for all but a few studies. We discuss the implications of this in Section 4 (Discussion).

³ Thus the 11 effect sizes for attitudes were reduced by 3, to 8 effect sizes: one correlation removed from each of Unanue's (2010) samples, and two correlations aggregated from Hodgkinson and Innes (2000). The 15 effects sizes for behaviors were reduced from 15 to 11: one correlation removed from each of Unanue's (2010) samples, one correlation removed from Banerjee and McKeage (1994, intentions measure), and two correlations aggregated from Brown and Kasser (2005, study 2). Two further correlations were removed (Richins & Dawson, 1992) as these were partial correlations involving income and thus not comparable with the other effect sizes, leaving 9 effect sizes from the behavior measures.

⁴ Cheung (2013a) describes how it is also possible to estimate a multivariate meta-analysis using structural equation modeling software. We used Mplus Version 7.11 (Muthén & Muthén, 2012) to check our results.

⁵ The estimate of the true correlation, $\hat{\rho}_{xy}$, obtained by the formula, $\hat{\rho}_{xy} = r_{xy} / \sqrt{r_{xx}r_{yy}}$, where r_{xx} is the reliability of x and r_{yy} is the reliability of y , with x representing the materialism measure and y representing the environmental measure for any given effect size.

Table 1

Studies included in the meta-analysis: effect sizes and study characteristics.

Study	N ^a	<i>r</i>	$\hat{\rho}$ ^b	Materialism measure	Outcome measure	Type of publication	Country	Percent female	Average age/age group (years)	Population
<i>Environmental attitudes</i>										
Banerjee and McKeage (1994)	309	-.20	-.22	MVS-18 [.83]	Environmentalism Scale [.92]	Journal article	USA	N/A	Over 18	Student
Clump et al. (2002)	271	-.20	-.23	MVS-18 [.87]	ECOSCALE [.80]	Journal article	USA	69.00	21.7	Student
Hirsh and Dolderman (2007)	107	-.14	-.17	MVS-18 [.87]	NEP [.85]	Journal article	USA	69.16	21.0	Student
Hodgkinson and Innes (2000)	391	-.29	-.34	MES-1 [.90]	NEP [.80]	Journal article	Australia	60.40	21.5	Student
	*	-.35	-.42	MES-1 [.90]	EAS [.77]					
Average		-.32	-.38	[.90]	[.79]					
Unanue (2010) – UK sample	949	-.14	-.18	MVS-9 [.83]	NEP [.73]	Masters thesis	UK	58.69	44.6	General
Unanue (2010) – Chilean sample	259	.09	.12	MVS-9 [.82]	NEP [.69]	Masters thesis	Chile	52.90	34.7	General
Saunders and Munro (2000) – Study 2	87	-.56	-.87	MVS-18 [.87*]	Voluntary Simplicity Scale [.48]	Journal article	Australia	62.07	27.7	Student
Saunders and Munro (2000) – Study 4	101	-.37	-.43	MVS-18 [.87*]	Rays's environmentalism Scale [.85]	Journal article	Australia	78.22	25.9	Student
<i>Environmental behaviors</i>										
Banerjee and McKeage (1994)	309	-.15	-.18	MVS-18 [.83]	Pro-environmental Purchasing [.80*]	Journal article	USA	N/A	Over 18	Student
Brown and Kasser (2005) – Study 1	206	-.21	-.31	Kasser-4 [.68]	Environmentally Responsible Behavior [.67]	Journal article	USA	44.17	14.2	U-18
Brown and Kasser (2005) – Study 2	400	-.31	-.43	AI-rel [.64]	Eco-Footprint [.80*]	Journal article	USA	65.50	43.7	General
	*	-.43	-.56	AI-rel [.64]	Pro-Environmental Behavior [.92]					
Average		-.37	-.50	[.64]	[.87]					
Hirsh and Dolderman (2007)	107	-.11	-.12	MVS-18 [.87]	Pro-Environmental Goals [.94]	Journal article	USA	69.16	21.0	Student
Unanue (2010) – UK sample	949	-.32	-.44	MVS-9 [.83]	Costly Environmental Behavior [.65]	Masters thesis	UK	58.69	44.6	General
Unanue (2010) – Chilean sample	259	-.33	-.48	MVS-9 [.82]	Costly Environmental Behavior [.57]	Masters thesis	Chile	52.90	34.7	General
Richins and Dawson (1992)	205	-.21	-.31	MVS-18 [.83]	Donations to Ecological Organisations (1 item) [.57*]	Journal article	USA	N/A	Over 18	General
Sheldon and McGregor (2000) – Study 1	80	-.32	-.40	AI-rel [.82]	Communal Resource Use (game) [.80*]	Journal article	USA	70.00	Over 18	Student
Sheldon and McGregor (2000) – Study 2	152	-.17	-.21	AI-rel [.82*]	Communal Resource Use (game) [.80*]	Journal article	USA	63.16	Over 18	Student

Key to Materialism Measures.

MVS-18: 18 item original Materialistic Values Scale; MVS-9: Short version of the Materialistic Values Scale; MVS-adapt: 8 item scale by Kasser (2005), MVS-adapted items; MES-1: Tang's Money Ethics Scale (1992), Factor 1, from Hodgkinson and Innes (2000) factor analysis; AI-rel: Aspiration Index, extrinsic – intrinsic; Kasser-4: 4 item measure, value of money.

Key to Environmental Measures.

Environmentalism Scale: Banerjee and McKeage (1994) Environmentalism Scale; ECOSCALE: Scale by Stone, Barnes & Montgomery (1995); EAS: Environmental Attitudes Scale, Forgas & Jolliffe (1994); NEP: New Ecological/Environmental Paradigm, Dunlap and Van Liere (1978) and Dunlap et al. (2000); Rays's Environmentalism Scale (Ray, 1975); Voluntary Simplicity Scale: Importance of reducing material consumption, Saunders and Munro (2000);

Pro-Environmental Purchasing: Banerjee and McKeage (1994) measure; Environmentally Responsible Behavior: Brown and Kasser (2005) measure; Eco-Footprint: Ecological-Footprint Questionnaire, Dholakia and Wackernagel (1999); Pro-Environmental Behavior: Green-Demers, Pelletier, and Menard (1997) measure; Pro-Environmental Goals: Hirsh and Dolderman (2007) measure; Environmental Resource Conservation Behaviors: Brown and Kasser (2005) measure; Costly Environmental Behaviors: Kaiser and Wilson measure (2004).

Notes: N/A = not available. Reliabilities for scales are provided in square brackets []. Asterisks (*) within these brackets indicate an imputed value.

^a Rows with an asterisk in this column record effect sizes using a different outcome measure. Where samples have more than one measure, effect sizes are aggregated to ensure that the analysis is based on independent measures. The effect size used in analysis for these samples is reported in the row below, marked 'Average'.

^b $\hat{\rho}$ = correlation corrected for reliability of the materialism measure and the outcome measure.

Table 2
Measures of materialism and environmental attitudes and behavior.

Measure	Number of samples
<i>Materialism measures</i>	
Material Values Scale (Richins & Dawson, 1992) ^a	15
Aspiration Index (Kasser & Ryan, 1996)	7
Money Ethic Scale (Tang, 1992)	2
Other Material Values Scales (4 items; Brown & Kasser, 2005); (8 items, Kasser, 2005)	2
<i>Environmental attitudes</i>	
New environmental paradigm (Dunlap & Van Liere, 1978)	6
Environmental attitudes (Ray, 1975)	1
Environmental Attitudes Scale (Forgas & Jolliffe, 1994)	1
Environmentalism Scale (Banerjee & McKeage, 1994)	1
Ecoscale (Stone et al., 1995)	1
Voluntary simplicity (Saunders & Munro, 2000)	1
<i>Environmental behaviors</i>	
The Ecological Footprint Questionnaire (Dholakia & Wackernagel, 1999) ^b	2
Environmental goals (Hirsh & Dolderman, 2007)	1
Material simplicity (Leonard-Barton, 1981)	1
Ecological awareness (Leonard-Barton, 1981)	1
Costly environmental behavior (Kaiser & Wilson, 2004)	4
Resource dilemma (Sheldon & McGregor, 2000)	2
Positive environmental behavior (Green-Demers et al., 1997)	1
Pro-environmental consumption patterns (Banerjee & McKeage, 1994)	1
Single item measures (intention for pro-environmental behavior, how much give to ecological conservation organisations)	2

^a In two samples, a shortened 9-item version of the MVS (Richins, 2004) was used.

^b In one sample, a shortened version adapted for use with adolescents was used.

not reported, we estimated a reasonable reliability for the particular measure using recognized methods.⁶ We did not use Fisher's *z* transformation for the analysis of correlations corrected for attenuation since formulas for the asymptotic variance and covariance are not available,⁷ but instead analyzed the corrected correlations.

3. Results

3.1. Samples included in the meta-analysis

In total, we located 13 independent samples, which contained 11 correlations between materialism and environmental attitudes (across 8 independent samples), and 15 correlations between materialism and environmental behavior (across 9 independent samples). Table 1 details the studies included in the meta-analysis, along with the correlations and various characteristics of the studies that were used in the moderation analyses. Table 2 details the measures of materialism, environmental attitudes and environmental behavior used in these studies. Regarding measures of materialism, the majority of samples used the Material Values Scale

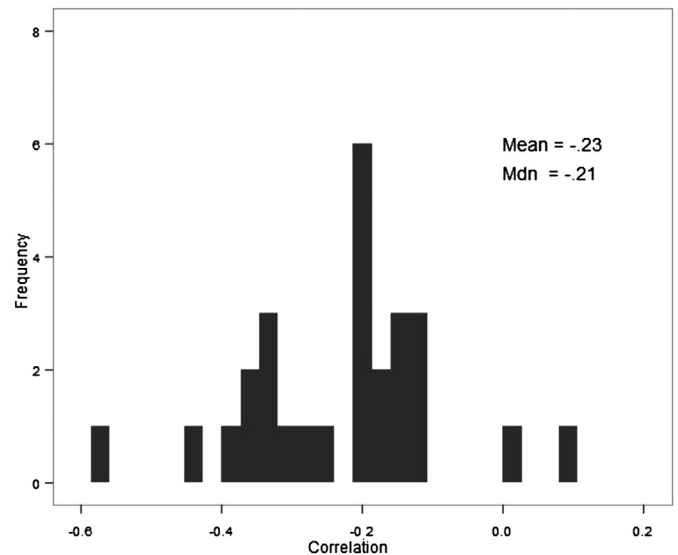


Fig. 1. Distribution of correlations between materialism and environmental attitudes and behavior ($k = 26$).

(MVS; Richins & Dawson, 1992) or the Aspiration Index (AI; Kasser & Ryan, 1996). The most widely used measure of environmental attitudes was the New Environmental Paradigm (Dunlap & Van Liere, 1978). Measures of environmental behavior were more varied, as Table 2 details.

The distribution of all 26 correlations is given in Fig. 1. The median is $-.21$, the 25th percentile is $-.32$ and the 75th percentile is $-.14$. Only two correlations were not negative. As the figure shows, the distribution is broadly symmetrical (skewness = $-.03$) and kurtosis is moderate (kurtosis = $.78$). Overall, then, the correlation of materialism with environmental attitudes and behaviors is small to medium-sized. The range of effect sizes from all the studies we located can be seen in the forest plot in Fig. 2 for studies correlating materialism with environmental attitudes and in the forest plot in Fig. 3 for studies correlating materialism with environmental behavior.

Characteristics of the 13 independent samples are given in Table 3. Most studies were reported in journal articles published after 2000. Typically, the sample size was around 200, a somewhat higher proportion of women than men participated, and participants were primarily in their mid-twenties. One sample used adolescent participants. About half of the participants were in higher education and the majority of the studies were conducted in the United States. Although not shown in the table, all studies were cross-sectional and used questionnaire measures.

3.2. Environmental attitudes and behaviors

The results of the multivariate meta-analysis on the raw correlations are presented in Table 4. Materialism was negatively associated with both environmental attitudes ($r = -.22$, $p < .05$) and behaviors ($r = -.24$, $p < .05$). Thus, more materialistic individuals held more negative attitudes about the environment and engaged in less positive and more negative behaviors related to the environment. Table 5 gives the analysis for correlations corrected for reliability. When the correlations were adjusted for the reliability of the materialism and outcome measures, the two effect sizes increased considerably, from small-medium to medium correlations (attitudes $\hat{p} = -.28$; behaviors $\hat{p} = -.32$; as categorized by Cohen, 1988). This increase is due particularly to the fact that the reliability of some measures of environmental attitudes and

⁶ Of the 26 correlations, only one came from a study that did not report the reliability of the materialism measure: Sheldon & McGregor (2000, study 2). The reliability for the materialism measure for this study was fixed at $.80$, as this was the median reliability value and it was a validated, multi-item measure. For the environmental outcomes, 6 correlations came from studies that did not report the reliability of these measures. For one using a single item, we fixed the reliability at $.57$, as this was the average reliability for a single item measure of job satisfaction estimated by Wanous, Reichers, and Hudy (1997). For the remaining five correlations, the reliability was fixed at $.80$, the median reliability.

⁷ We are grateful to an anonymous reviewer for a discussion of this issue.

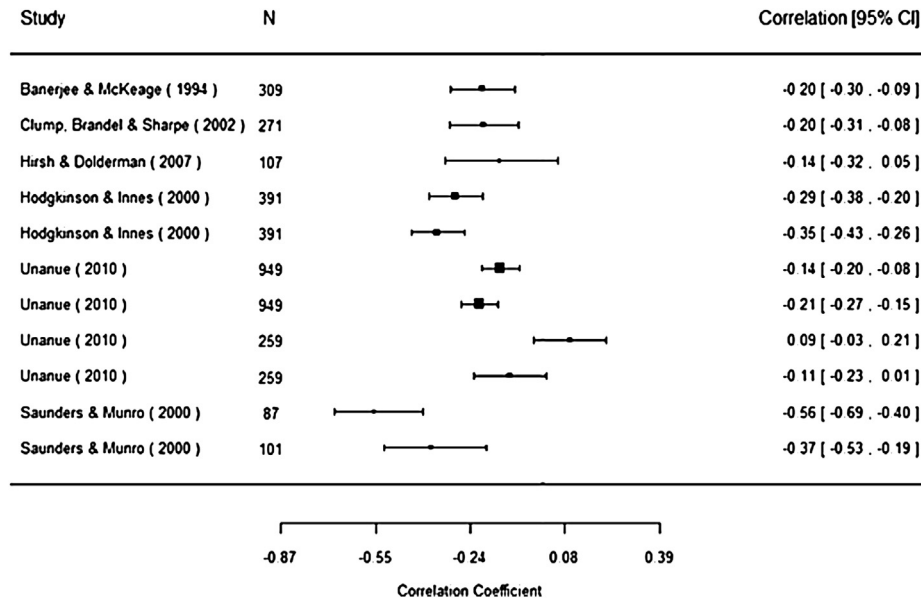


Fig. 2. Forest plot of samples reporting correlation between materialism and environmental attitudes. *Note.* N = sample size, CI = confidence interval. The figure shows the correlation, the sample size of each study and the limits of the 95% confidence interval. The size of the mark indicating each correlation is proportional to the sample size of that study: the larger the mark, the larger the sample. The lines either side of each mark indicate the size of the 95% confidence interval for that effect size. Figure created in the Metafor package for R (Viechtbauer, 2010).

environmental behavior was quite low, as can be seen from Table 1; for example, the Voluntary Simplicity Scale (Saunders & Munro, 2000) had a reliability of .48. The lower the reliability of a scale, the greater the increase in the size of the correlation when it is corrected for reliability. The relationship between materialism and environmental attitudes and that between materialism and environmental behaviors are of very similar magnitude, and a likelihood ratio test indicates that there is no significant difference between the size of these correlations ($\chi^2 = 0.05$, $df = 1$, $p > .05$, for the raw correlations; $\chi^2 = 2.75$, $df = 1$, $p > .05$, for the corrected correlations).

There is significant heterogeneity in the size of correlations, as indicated by the significant Q statistics for each of the analyses. For the analysis of the raw correlations, $Q = 78.08$, $df = 15$, $p < .01$; for correlations corrected for reliability, $Q = 97.94$, $df = 15$, $p < .01$. The I^2 statistic quantifies the proportion of the total variance due to variability in study effect size and, as is shown in Table 4, this proportion is high for environmental attitudes, but a good deal lower for environmental behaviors. This difference is most likely due to one positive correlation between materialism and environmental attitudes (Unanue, 2010, Chilean sample), in strong contrast to the trend of negative effect sizes. For both attitudes and

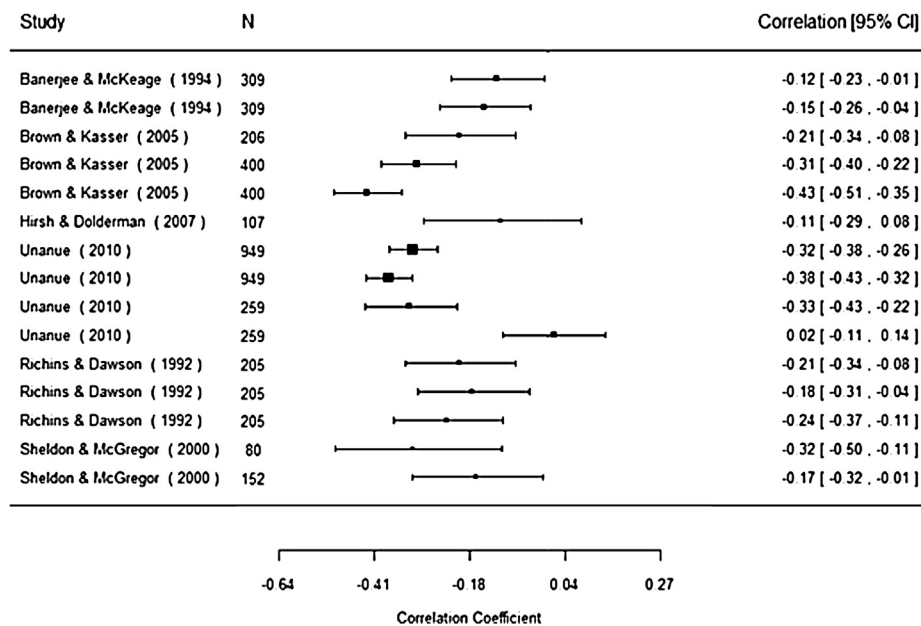


Fig. 3. Forest plot of samples reporting correlation between materialism and environmental behavior. *Note.* N = sample size, CI = confidence interval. The figure shows the correlation, sample size of each study and the limits of the 95% confidence interval. The size of the mark indicating each correlation is proportional to the sample size of that study: the larger the mark, the larger the sample. The lines either side of each mark indicate the size of the 95% confidence interval for that effect size. Figure created in the Metafor package for R (Viechtbauer, 2010).

Table 3
Sample characteristics ($k = 13$ unless otherwise indicated).

Characteristic	k	Characteristic	k
Report characteristics		Participant characteristics	
Type of publication		Percentage female ($k = 11$)	
Journal article	11	Median = 63.2%	
Dissertation	2	Range: 44.2%–78.2%	
Year of publication		Average age ($k = 9$)	
1990–1999	2	Median = 25.9	
2000–2009	9	Range: 14–45	
2010 onwards	2		
Study characteristics		Age group	
		18 years and under	1
Sample size		Over 18 years	10
Median = 206		Both over and under 18	2
Range: 80–949			
Reliability of materialism measure		Whether in higher education	
Median = .87		All in higher education	8
Range: .64–.92		General population	4
Reliability of environmental measure		Under 18 years old	1
Median = .80		Country study conducted in	
Range: .48–.92		USA	8
		Australia	3
		UK	1
		Chile	1

behaviors, the 95% confidence interval does not include 0, and thus the average effect size is significantly different from zero at the .05 level. The confidence interval and the 80% credibility interval for the corrected correlation both indicate at least a small effect, but one that could be medium to large. There is, however, heterogeneity in the size of the correlation in the population of studies, suggesting the importance of looking for moderators of the size of correlation.

3.3. Moderator analysis

Given this heterogeneity, we extended the analysis to include moderator variables. In addition to the moderators reported in Table 6, there were several other variables that we coded because they might be expected to moderate the effect size; unfortunately, an insufficient number of studies reported enough relevant information to enable us to conduct these moderator analyses. Specifically, few studies provided any data that might be used to estimate the socio-economic status of the participants, with only two reporting personal income or the educational attainment of the sample.⁸ Percentage of white participants was recorded by only three studies, all of which reported figures in the 90–100% range, demonstrating either a limited consideration of ethnicity by researchers or poor reporting of this demographic information. Additionally, with the exception of a single sample from Chile (Unanue, 2010), the samples came from Westernized, Anglo countries (UK, USA, Australia), thus preventing any assessment of variation between countries on potentially relevant indices such as country-level wealth or values.

We were, however, able to assess the potential moderating effect of the year of publication (ranging from 1992 to 2010), the percentage of women participants in the sample (which ranged from 44 to 78 percent), the mean age of participants (which ranged

Table 4
Correlations between materialism and environmental attitudes and behavior.

Measures	N	k	r	95% CI for r		τ^2	I^2
				LL	UL		
Attitudes	2474	8	-.22	-.33	-.11	.0266	88.0%
Behaviors	2667	9	-.24	-.30	-.17	.0054	59.1%
Overall		13					

Note. N = sample size, k = number of studies, r = estimated correlation, CI = confidence interval, LL = lower limit, UL = upper limit, τ^2 = estimated variance of population effect sizes, I^2 = proportion of total variance due to variance in population effect sizes (Higgins & Thompson, 2002). The estimated population correlation between the effects for attitudes and those for behaviors was $-.89$.

Table 5
Correlations corrected for reliability between materialism and environmental attitudes and behavior.

Measures	N	k	$\hat{\rho}$	80% credibility interval		τ^2	I^2
				LL	UL		
Attitudes	2474	8	-.28	-.57	.01	.0518	91.6%
Behaviors	2667	9	-.32	-.46	-.18	.0121	68.2%
Overall		13					

Note. N = sample size, k = number of studies, r = estimated correlation, CI = confidence interval, LL = lower limit, UL = upper limit, τ^2 = estimated variance of population effect sizes, I^2 = proportion of total variance due to variance in population effect sizes (Higgins & Thompson, 2002). The estimated population correlation between the effects for attitudes and those for behaviors was $-.89$.

from 14 to 45 years), and the population from which the sample was drawn (student or community) on both the relationship between materialism and environmental attitudes and the relationship between materialism and environmental behaviors. We found no evidence that the relationship between materialism and either attitudes or behaviors was moderated by percentage of women participants or by the mean age of participants ($ps > .05$). For year of publication, we found contrasting results for attitudes and behaviors: the relationship between environmental attitudes and materialism was less negative the more recently the study was published ($b = .02$, $p < .05$), whereas the relationship between environmental behaviors and materialism was not affected by publication year.⁹ For the contrast between studies using student samples vs. those using community samples, we found a significant moderation of the relationship between materialism and environmental attitudes, with community samples showing a weaker negative link between materialism and environmental attitudes than student samples ($b = -.27$, $p < .05$). For environmental behaviors, we found the opposite: community samples showed a stronger negative link compared to student samples ($b = .15$, $p < .05$).

3.4. Publication bias

A major concern in any meta-analysis is that estimation of the effects is biased by the fact that studies that find non-significant effects, or effects in the opposite direction to what was expected, tend not to get published and therefore are not included in the

⁸ The two studies that reported income clearly sampled similar populations, as the three samples they provided had a small range of incomes, from \$33,900 to \$50,800. The two studies reporting educational achievement also had similar and high levels, with two samples from one report (Unanue, 2010) having 100% completing higher education and the second study having 77% attaining this level.

⁹ The b values reported here represent the unstandardized regression weights from the moderation analysis, where the outcome variable is the effect size of the study. Thus, a b value of .02 for publication year means that for each year later a study was published, the effect size for environmental attitudes changes by +.02. In the case of our effect sizes, this means a reduction in magnitude, as the mean effect size is negative (attitudes: $r = -.22$).

Table 6
Moderators of effect size.

Moderator		k	Estimate	se	z	95% CI		Q _E
						LL	UL	
Year of publication	Attitudes	17	0.02	0.01	2.14*	0.00	0.038	24.01 (df = 14)
	Behavior		−0.01	0.01	−1.46	−0.02	0.003	
Proportion female participants	Attitudes	14	−1.36	1.86	−0.73	−5.00	2.29	29.61 (df = 11)
	Behavior		−0.08	0.45	−0.18	−0.96	0.80	
Mean age of participants	Attitudes	12	0.01	0.05	0.20	−0.08	0.10	7.58 (df = 9)
	Behavior		−0.01	0.00	−1.26	−0.01	0.00	
Population (community vs. students)	Attitudes	16	−0.27	0.12	−2.18*	−0.51	−0.03	15.48 (df = 13)
	Behavior		0.15	0.07	2.15*	0.01	0.29	

**p* < .05.

Note. Population variable is dummy coded as 0 = community sample, 1 = student sample.

Some confidence intervals for significant effects may appear to include zero due to rounding. Moderator estimates marked with * are significant.

review (Rothstein, Sutton, & Borenstein, 2005). To examine this possibility, we applied funnel plot asymmetry techniques separately to environmental attitudes and to environmental behaviors. Both Begg and Mazumdar's (1994) rank order correlation (Attitudes: Kendall's $\tau = -.21$, $p > .05$; Behaviors: Kendall's $\tau = .17$, $p > .05$) and Sterne and Egger's (2005) regression test (Attitudes: $t = -1.49$, $df = 6$, $p > .05$; Behaviors: $t = 0.88$, $df = 7$, $p > .05$) were non-significant for both sets of studies, indicating that there is no appreciable 'funnel plot asymmetry'. That is, there is no indication that studies with low precision (higher standard error) and showing a positive correlation between environmental outcomes and materialism are 'missing' from the published literature. Using Duval and Tweedie's (2000) 'trim and fill' method we came to the same conclusion. We found no studies were 'missing' from one side of the funnel plot and therefore that trim and fill estimates were not necessary.

4. Discussion

Our analyses clearly demonstrate that materialism is negatively associated with both pro-environmental attitudes and behaviors. Materialists are less likely to believe that humans need to change their behavior to protect the environment and are more likely to engage in higher levels of environmentally-damaging behavior themselves. These relationships are not moderated by either gender or age, the two participant variables we considered. Thus, it seems that materialistic values are equally damaging to the environment regardless of who endorses them, and that materialists may represent a particularly important-to-reach, but relatively obstinate, population: the more materialistic people are, the worse their environmental behavior is likely to be, but the less likely they are to believe that the world is in danger and that they should alter their behavior to protect the environment.

The similarity of the effect sizes for environmental attitudes and behaviors is noteworthy. If materialism's association with environmental behavior is due solely to the two constructs' joint links with attitudes, it would be reasonable to expect a smaller correlation of materialism with behaviors than with attitudes. The fact that the correlation of materialism with behaviors is not significantly smaller than that with attitudes provides tentative evidence that materialism has a direct association with environmental behavior, possibly through differences in the goal pursuit behaviors of materialists and non-materialists, as suggested by Brown and Kasser (2005). Future research could clarify this by including measures of both environmental behaviors and attitudes and performing mediation analyses. This finding in particular not only has interesting theoretical implications, but important practical ones for environmental charities and agencies hoping to use public information campaigns to prevent environmental crises. At present,

many campaigns revolve around increasing awareness of specific issues (e.g., "The greatest wonder of the sea is that it's still alive", Greenpeace) or emphasizing the responsibility of individuals to engage in specific behaviors (e.g., "If you don't preserve nature by using low wattage light bulbs, who will?", EDF Energy). Our findings suggest that materialists are simultaneously engaging in more damaging behaviors whilst not believing there to be a need to change these behaviors, meaning that they may be even less responsive to these messages of awareness and responsibility than the rest of the population. The suggestion from the results that materialistic values may be linked directly to environmental behaviors raises the possibility of different kinds of campaigns aimed at reducing materialistic values, which could be beneficial for a range of environmental and social causes (see Crompton, 2010, for an overview of such values-based campaigning). Support for the benefits of such values-based campaigns can be found in recent experimental research where priming intrinsic, rather than extrinsic, values resulted in higher levels of concern for global problems, more willingness to take personal responsibility, and better ecological policy recommendations (Chilton, Crompton, Kasser, Maio, & Nolan, 2012; Sheldon, Nichols, & Kasser, 2011). Strikingly, the Chilton et al. (2012) study specifically recruited extrinsically-oriented, or materialistic, participants, highlighting the promise of values-based campaigns even among those with the most environmentally damaging values.

The lack of a moderating effect on the relationship between materialism and environmental measures by the mean age of the samples may initially seem surprising given the rising prominence of environmental concerns in recent years. However, it is worth considering the restricted range of age in these samples before drawing any firm conclusions. The studies in our analysis were by and large lacking older cohorts, as the range of mean sample ages varied from 14 to 45. It may therefore be beneficial for future research to consider the association between materialism and environmental attitudes and behaviors in older age groups.

The effect of population type (student or community) on the relationship of materialism to environmental attitudes and behaviors is a difficult one to explain. This finding is potentially important, given that many psychological studies use university students as a proxy for the population at large; our findings suggest that generalizability may not be a good assumption, as the correlation of materialism with both of the environmental outcomes varied considerably between students and community samples. That said, it is important to note that of the 17 effect sizes of materialism with environmental attitudes and behaviors, only four of these came from non-student samples, and two of these were from the only sample from a non-Western country (Unanue, 2010, Chilean sample); one of these effect sizes also happens to be the only positive effect size between materialism and attitudes.

As such, it may be that the reported moderating effect of student vs. community samples is actually due to some other confounding factor concerning culture.

Publication year also moderated the size of the correlation between materialism and environmental attitudes, but not behaviors: the correlation between materialism and attitudes becomes less negative the more recently a study was published. Perhaps consensus has grown in the global community concerning the reality of climate change and other environmental crises to such an extent that even people scoring high in materialism find it difficult (though not impossible) to deny this reality when questioned about it in an environmental attitudes survey: if this is so, it would result in reduced variability in environmental attitudes across the samples, leaving less variance for materialist values to explain. In contrast to these results for attitudes, it appears that materialism's association with negative environmental behaviors has not weakened over time. Such a pattern is difficult to reconcile, but again suggests the importance of considering the many ways that attitudes and behaviors are not consistently associated with each other. However, these conclusions should be treated quite tentatively, given that the relatively small size of our sample makes it vulnerable to the influence of outliers: a single large effect size from an early or late study could have easily influenced the results of this analysis.

When we adjusted for the reliability of the materialism and environmental measures in order to calculate a 'true' effect size, the magnitude of the correlations between materialism and both environmental attitudes and environmental behaviors increased considerably. This adjustment is important for two reasons. First, it takes both correlations from small-medium to medium size ($-.22$ to $-.29$, and $-.24$ to $-.32$). In the context of other individual traits and environmental attitudes and behaviors, such as the Big Five personality traits (e.g., McCrae & Costa, 1989), these materialism effect sizes are considerably larger than the effect sizes associated with personality traits, which tend to vary between a small to small-medium effect size, when they are present at all ($-.10$ to $-.20$; e.g., Hirsh, 2010; Milfont & Sibley, 2012; Wiseman & Bogner, 2003). Such a comparative result suggests that materialistic values and goals are relatively strong individual predictors of environmental attitudes and behaviors. The true size of the correlations provides further support for the potential for increasing pro-environmental attitudes and behaviors by targeting materialistic values and goals, as not only does materialism appear to be more strongly associated with these variables than are other individual differences, but it is also potentially more malleable: whereas personality traits are relatively stable variables that are difficult to change, materialism is an individual difference that can be successfully decreased, as has been demonstrated in two experimental studies with children and adolescents (Chaplin & John, 2007; Kasser et al., 2013).

This leap in the reliability-adjusted coefficient is also important because it reveals that the environmental measures used in the research studies we included have less-than-optimal reliabilities, which leads to underestimations of the actual correlation between these environmental measures and other variables. Hawcroft and Milfont's (2010) meta-analysis of the use of the NEP also highlighted this problem with reliability, reporting that over half of their 139 studies did not report reliability, and those that did had surprisingly low reliabilities, with a mean alpha of only .68. An important goal for environmental research in general could therefore be to develop scales with higher reliabilities so as to more accurately estimate the size of associations between these measures and other variables of interest.

Another finding from Hawcroft and Milfont's (2010) meta-analysis of the NEP mirrored in our research was that reporting of important demographic variables was often poor or non-existent:

Hawcroft and Milfont found that almost a third of their 139 studies failed to report even basic demographic descriptive statistics such as mean age or sample gender composition for their samples. Although the basic demographic details were better reported in the studies we included in this meta-analysis, only two studies reported income or level of education. These variables are important to consider as both have previously been associated with differing levels of willingness to make personal sacrifices for the environment and of engagement in pro-environmental behavior (Clark, Kotchen, & Moore, 2003; Kemmelmeier, Krol, & Young, 2002), and thus could be potential moderators of the relationship between materialism and both environmental attitudes and behaviors. However, with so few studies reporting these variables, it was unfortunately not possible to assess the potential moderation of the link between materialism and the environmental measures by income or education in our sample of studies. Therefore it may be worthwhile for researchers in this field to ensure that they record these variables so future meta-analyses can consider such effects.

The composition of our dataset also highlights the dearth of cross-cultural research in this area. In our collection of studies, we found only one sample from a non-developed, non-Western country: a masters dissertation that had collected data from Chilean participants (Unanue, 2010). With little variation in where our samples came from, it was not possible to assess country-level differences in the link between materialism and environmental outcomes, but the data from our Chilean sample suggest the importance of considering other areas of the world, as, for these Chilean participants, materialism had a non-significant association with environmental attitudes. Although this is only one sample from one country, these results highlight the possibility that materialism and environmental outcomes may not be as conflicting as theory and evidence from Western developed countries suggests. This is particularly interesting as previous research has found that nations with lower GDP and lower scores on the Human Development Index (HDI) have citizens with reduced levels of willingness to make sacrifices for the environment (Haller & Hadler, 2008). Chile, with a GDP of approximately USD 14,000 and a HDI (excluding income) score of .862 (World Bank, n.d.; United Nations Development Programme, n.d.), ranks considerably lower on both of these indicators than do the other countries included in the meta-analysis (UK, USA, and Australia), and yet the relationship between materialism and environmental attitudes was not negative there. If this non-significant finding was replicated across several other countries, it could call into question the universality of the idea so predominant in Western thought that personal and national economic growth are at odds with protecting the environment.

It may, in fact, be the case that materialistic values have a different meaning in less developed countries. Research on income and well-being has shown that higher levels of country-level income have a greater effect in increasing subjective well-being among poorer countries (e.g., Inglehart, Foa, Peterson, & Welzel, 2008). It may be that the pursuit of additional wealth by individuals within these countries, perhaps spurred in part by personal materialistic values, may be positively related to important well-being factors, such as the satisfaction of basic psychological needs. This, in turn, may have a consequent effect on environmental behavior and attitudes for individuals in these countries. Future research should consider expanding to encompass a wider range of countries so that it is possible to more fully understand the link between materialistic values and environmental outcomes. However, our finding that materialistic values and environmental outcomes are associated in these three developed countries is still important, even if it is found to be the case that it is not replicated in

less developed countries: Stern (2007) reports that OECD (Organisation for Economic Co-operation & Development) countries consume on average *eight times* as much energy per capita as do developing countries in Africa and Asia. Given the environmental and political power of the wealthier countries, understanding factors associated with environmental attitudes and behaviors of their citizens may be critical in reducing environmental harm in coming years.

A final suggestion for future research is that researchers might consider more closely the components of their environmental attitude measures. Upon close consideration of the items included within these measures in our sample of studies, this super-ordinate category is more varied than would be ideal. There are clearly different types of attitudinal items, but individual scales often combined these types of items. Hawcroft and Milfont's (2010) meta-analysis of the NEP highlights this as a problem in the case of the NEP, which is often used as a single measure without validating its purported unidimensionality. These combinations of highly varied items may be partially responsible for the poor reliabilities mentioned earlier in this section, but they also prevent a full understanding of precisely how materialism is related to environmental attitudes. Several scales, for example, include items measuring a belief in the existence of a 'trade off' between the environment and the economy, mirroring the common concept that protecting the environment will cost humans economically and reduce quality of life. Very few studies separate these items from the main attitude scale, but the two studies that did provide separate correlations for these specific trade-off items (Banerjee & McKeage, 1994; Hodgkinson & Innes, 2000) demonstrated higher correlations between materialism and these items than between materialism and the overall scale,¹⁰ raising the possibility that it is these particular attitudes that drive the association between materialism and environmental attitudes. There are other distinct sets of items within the literature, such as items relating to denial of environmental threats or nature's purpose in supporting humanity, that may provide support for other explanations of the link between materialism and environmental attitudes, such as materialists holding objectifying views of the environment (Kasser, 2002) or denying environmental crises in a defensive response to reduce feelings of guilt due to their lifestyle. It is of course unlikely that only one of these processes linking materialism and environmental attitudes is occurring, but greater consideration by researchers in this area of the scales they use, and how they analyze particular items within them, would help in disentangling the web of potential processes.

In sum, the limitations of this meta-analysis reflect in part the limitations of the literature available, as outlined above. Due to the correlational nature of the research, we cannot draw any conclusions from our mean effect sizes about causality. These findings may only be applicable to the countries from which samples were available and can provide only a rough outline of the associations due to the lack of reported moderator variables and undivided environmental attitude scales.

Another particularly important limitation that deserves consideration is the issue of the nature of environmental behavior measures used by the reports we sampled. All the measures included were either self-reported behaviors or in the case of one effect size, self-

reported behavioral intentions. The lack of objective behavioral measures is important, as the discrepancy between self-report and objective measures of environmental behavior is a well-documented phenomenon (Corral-Verdugo, 1997; Fuji, Hennessy, & Mak, 1985; Hamilton, 1985). Beliefs about re-using and recycling have been more strongly linked to self-report measures of these behaviors than to objective measures (Corral-Verdugo, 1997), and it may be that materialism similarly shares a stronger link with self-reported pro-environmental behavior than with actual behavior. As with the other limitations of our work, this missing knowledge highlights the importance of future work investigating whether materialism is as strongly linked to objective measures of environmental behavior.

In spite of its limitations however, we hope that this meta-analysis is a significant step in bringing together the literature on materialistic values and their links with environmental attitudes and behaviors, and in highlighting areas where more research needs to be done in this particular field, and in that of environmental psychology more generally. Additionally, we hope that the strength of this link between materialism and environmental outcomes may provide a new way for researchers to increase pro-environmental attitudes and behaviors by targeting the pernicious value of materialism.

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¹⁰ The two studies were Banerjee and McKeage (1994; External Environmentalism subscale) and Hodgkinson and Innes (2000; Environmental Attitudes Scale – Trade-Off Subscale). In both cases, the specific 'trade-off' subscale correlated more strongly with the measure of materialism than the full scale. This was particularly striking in the Hodgkinson and Innes (2000) study, where the correlation with materialism for the trade-off scale was $-.42$, compared to $-.24$ with the full scale.

* denotes reports which provided samples for the analysis.

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