WHAT ARE THE CRITICAL DETERMINANTS OF PRO-ENVIRONMENTAL BEHAVIOR?

A Meta-Analysis looking at the Theory of Planned Behavior, Value Belief Norm Theory, Affect, Habit and Self-Identity

Within Environmental Psychology there exists presently a myriad of different models which purport to have distilled the key drivers of human pro-environmental behaviour. These span the gamut from relatively parsimonious models such as 'The Theory of Reasoned Action[1],' within which behaviour is governed by a subject's attitudes and subjective norms, to more complex integrated models such as 'Triandis' Theory of Interpersonal Behaviour[2]' in which behaviour is the result of a web of congruent and competing motivations, emotions and habits. The research presented here uses a meta-analysis methodology to examine the correlations between the predicted antecedents of human behaviour from across a range of models, with either intentions to perform a pro-environmental action or self-reported pro-environmental behaviour.

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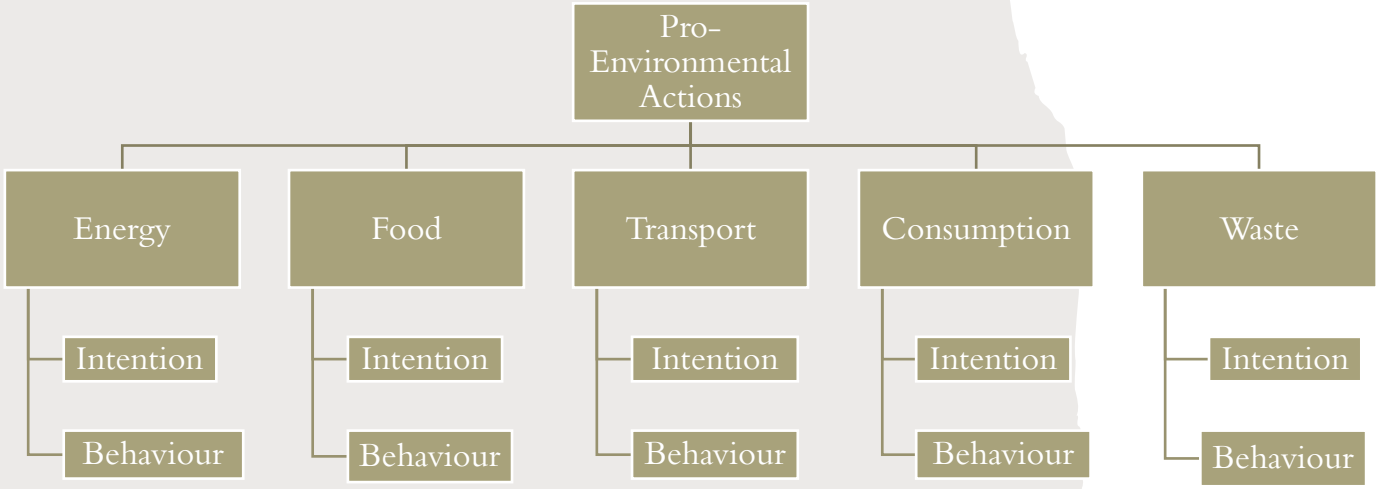
AIMS



This research has been conducted to elucidate which key antecedent variables are most positively correlated with different pro-environmental actions. The research is novel in that it pulls predictor variables from across a range of different behavioural models and examines them in parallel.

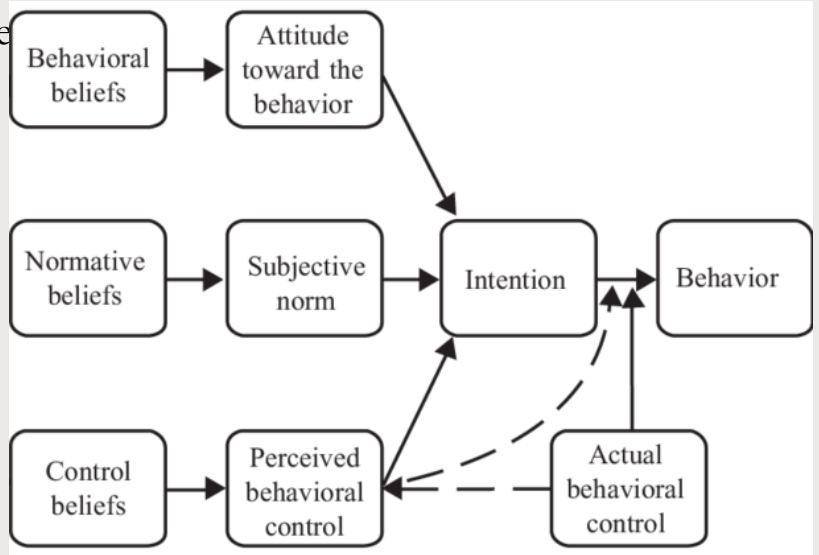
The pro-environmental actions have been broken down into the key domains of energy, transport, food, consumption, and waste. This has been done to determine whether different predictor variables are relevant for different actions across these heterogeneous sectors of daily life.

Additionally, studies included in the meta-analysis have been categorised according to whether they evaluated participants intentions to engage in a particular action, or their self-reported behaviour. This has been done to investigate whether intentions or self-reported behaviours are more positively correlated with the examined predictor variables.

THEORIES AND VARIABLES

The multiple theories from which predictor variables have been taken provide a comprehensive depiction of the key avenues of research into patterns of pro-environmental behaviour within environmental psychology. Some theories, such as 'Self-Perception Theory' have not been included in this research, as the predictor variables were either sub-conscious or not amenable to assessment using a survey methodology, and thus incompatible with the meta-analysis approach used to calculate effect sizes in this research. **Terms in bold are the predictor variables included in this research.**

The Theory of Planned Behaviour[3]: **Behavioural Beliefs** (these differed between domains and were categorised accordingly, sometimes they included beliefs about the environmental benefit of a behaviour, sometimes they were in regard to the health aspects of a dietary choice); **Attitudes; Subjective norms** (in accordance with Cialdini's Theory of Normative Conduct[4], these were categorised as either injunctive or descriptive); **Perceived Behavioural control** (this was supplemented with measures from the consumption/marketing literature regarding **perceived ease of use**, and **perceived consumer effectiveness**; and finally **Intention.**



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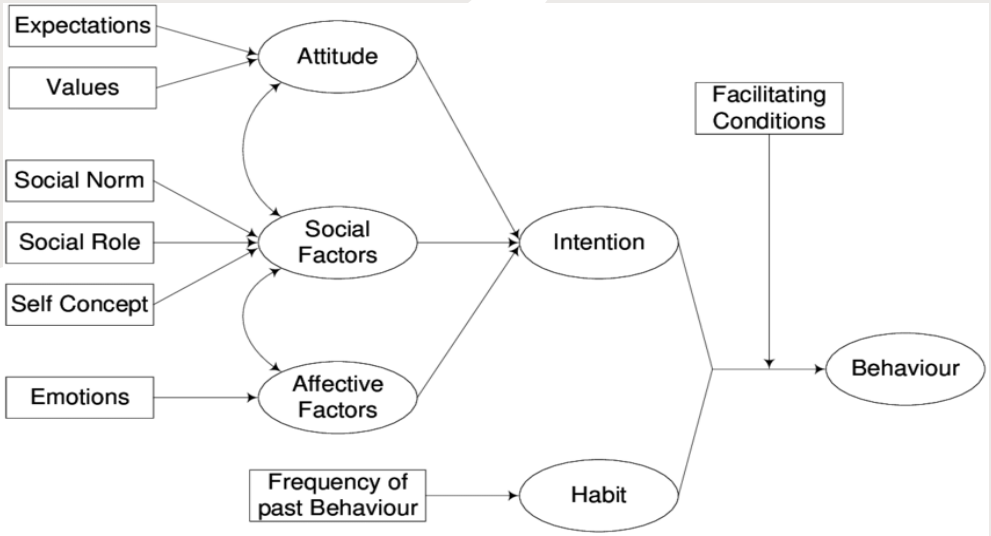

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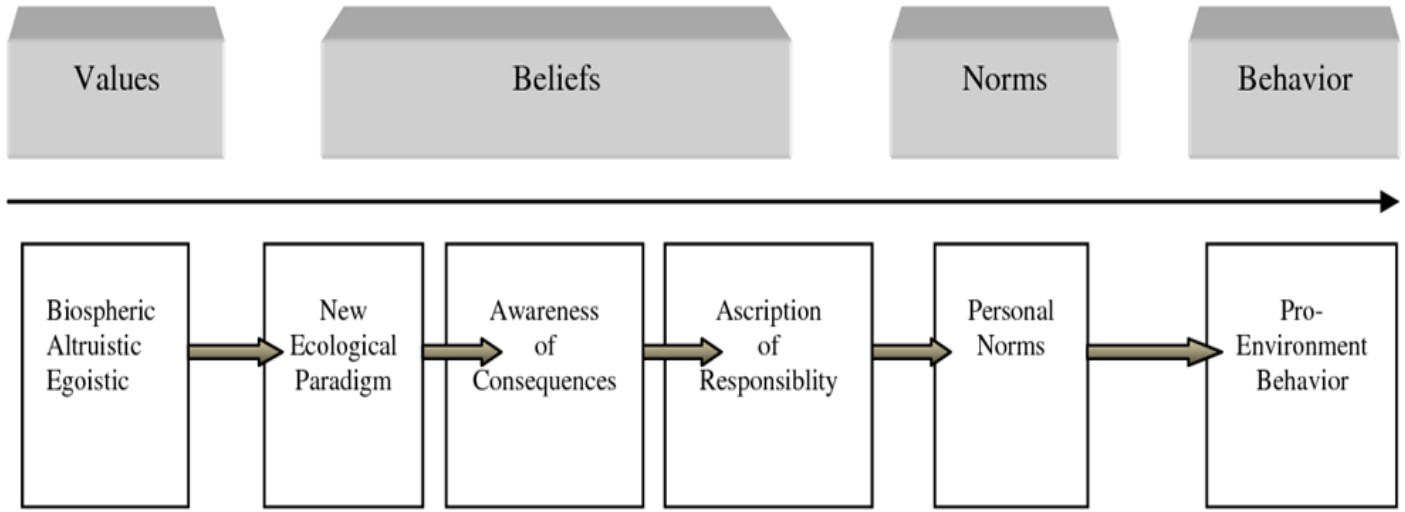
Affect and Habit: The Theory of Reasoned Action is supplemented in Triandis's Theory of Interpersonal Behaviour[5] with Affective and Habitual predictors. This meta-analysis included two measures for Habit: **Self-reported Past behaviour**, and a **Habit specific variable** (most commonly measured within studies using the self-reported habits index). It also included measures **of positive and negative anticipated affect.**

Value Belief Norm[6]: Stern's Value Belief Norm theory is similar to Triandis's theory in that it is a composite of multiple behavioural theories. Within the Value Belief Norm model, Schwarts's Norm Activation Theory (which includes measures for **Awareness of Consequences, Ascription of Responsibility and Personal Norms**) is combined with variables that capture and individuals' values (**Biospheric, Altruistic and/or Egoistic**) and beliefs about the environment (measured using the **New Ecological Paradigm**). Additionally, within this meta-analysis a variable measuring **Environmental Concern** was included. This was often used in studies as synonymous with the NEP (and vice versa), however the questionnaire items used to measure the two were distinct.

THEORIES AND VARIABLES



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Identity: Slightly more idiosyncratic are the behavioural theories that posit a connection between identity and behaviour or intentions. For example, in Higgins's Self-discrepancy Theory[7] individuals' are motivated to act in alignment with their internalised beliefs about their own identity to avoid uncomfortable cognitive dissonance. In this research two predictors were included pertaining to an individual's self-reported general '**Pro-environmental Identity**' or specific '**Behaviour Based Identity**' (e.g. recycling/energy conservation/Vegetarianism is an important part of my identity).

Summary of Variables: Beliefs, Attitudes, Injunctive and Descriptive Norms, Perceived Behavioural Control, Perceived Ease of Use, Perceived Consumer Effectiveness, Intention, Past Behaviour, Habit, Positive Anticipated Affect, Negative Anticipated Affect, Awareness of Consequences, Ascription of Responsibility, Personal Norm, Biospheric Values, Altruistic Values, Egoistic Values, New Ecological Paradigm, Environmental Concern, Pro-environmental Identity, Behaviour Based Identity.

META-ANALYSIS

- DATABASE: Web of Science(Primary), Google Scholar (Supplementary: used for searching for papers cited within selected studies)

- SEARCH TERMS:
  Theory names used: Theory of Reasoned Action; Theory of Planned Behaviour; Habit; Past Behaviour; Affect; Norm Activation Model; Value Belief Norm; Ecological Values Theory; Schwartz Values; Self-identity
  Theory Name (capitalised) AND: ***General***: ecological behaviour; pro-environmental behaviour; environmentally friendly behaviour; environmental protection; environmental problems. ***Energy***: energy saving; energy conservation; green energy; renewable energy; energy efficiency. ***Food***: food waste; eat local; plant-based diet; meat consumption. ***Transport***: travel mode choice; travel behaviour; car use; bus use; public transportation; cycling; walking; travel demand; car free; air travel; flight. ***Consumption and waste***: Recycling; waste reduction; ethical consumer; environmental consumer; ecological consumer; sustainable consumption; green consumer; reduce consumption

- NUMBER OF PAPERS: Search returned over 15,000 studies. Refined by title and abstract: 2,167 After Applying Inclusion Criteria: 373

- INCLUSION CRITERIA: Studies were included that employed a survey methodology to evaluate participants scores on any of the assessed predictor variables and reported the correlations between these scores and either participants self-reported intentions or pro-environmental behaviours. In addition, studies were included only if they also reported the sample size and used **appropriate questionnaire items** for measuring the variable of interest★. Questionnaire Items were also checked to ensure these showed high construct validity.

- INFORMATION EXTRACTED: In addition to the correlational information extracted from each study, data on the location, the gender balance and the date of the study was obtained. This enabled the use of meta-regression to evaluate the potential impact of these variables on the obtained effect sizes.

- SOFTWARE: Separate meta-analyses were run for each of the assessed predictor variables within each domain. The meta-analyses were run in RStudio using the 'meta' package metacor function. Random rather than fixed effects models were used due to the levels of heterogeneity found between studies. Influence and Outlier analyses were conducted using the find.outliers function in the 'dmetar' package, and the InflunceAnalysis function from the 'meta' package, and these were used to determine if any studies should be excluded. In addition separate meta-regressions were run to evaluate the impact of: location, year or publication and proportion of male participants on the effect size of each meta-analysis (not reported here).

Figure 1: Forest plot showing the calculated effect size (0.40) for 'Injunctive Social Norm' on 'Intention' to perform a pro-environmental behaviour within the domain of Energy. (Outliers included)

The forest plots shown in figures 1 and 2 have been included as visual examples to represent the individual meta-analyses that were conducted for all the variables shown on the y-axis of Figure 3.

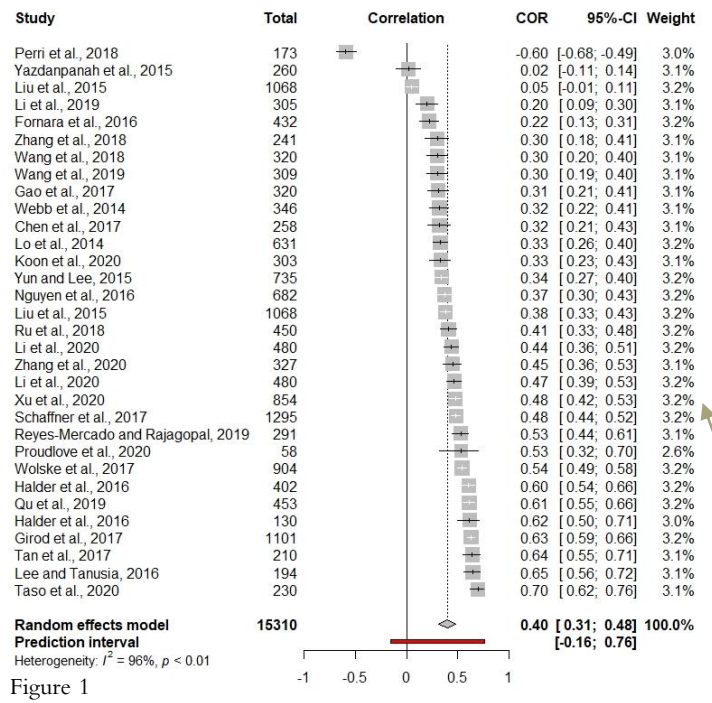

Figure 1

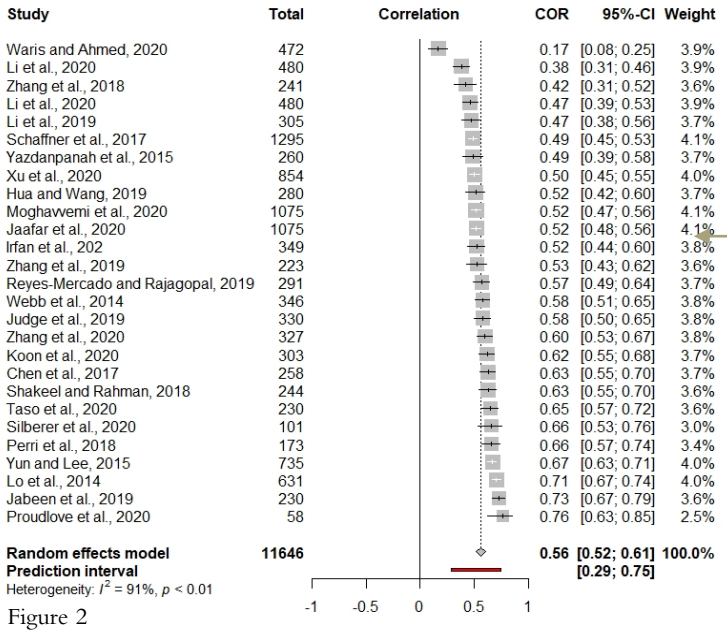

Figure 2

Figure 2: Forest plot showing the calculated effect size (0.56) for 'Attitude' on 'Intention' to perform a pro-environmental behaviour within the domain of Energy. (Outliers included)

RESULTS: ATTITUDES VS. NORMS

Shown here are the individual forest-plot results of the independent meta-analyses for 'Injunctive Social Norm' (Figure 1) and 'Attitude' (Figure 2) on 'Intention' to perform a pro-environmental behaviour within the domain of energy. These have been mapped onto a scatter plot showing all the meta-analyses conducted on predictor variables within the domain of energy (Figure 3). Across all domains attitudes were found to display higher effect sizes than social norms (both descriptive and injunctive); this reached statistical significance within the domains of energy and food. (Red dotted line demonstrates no overlap of error bars.)

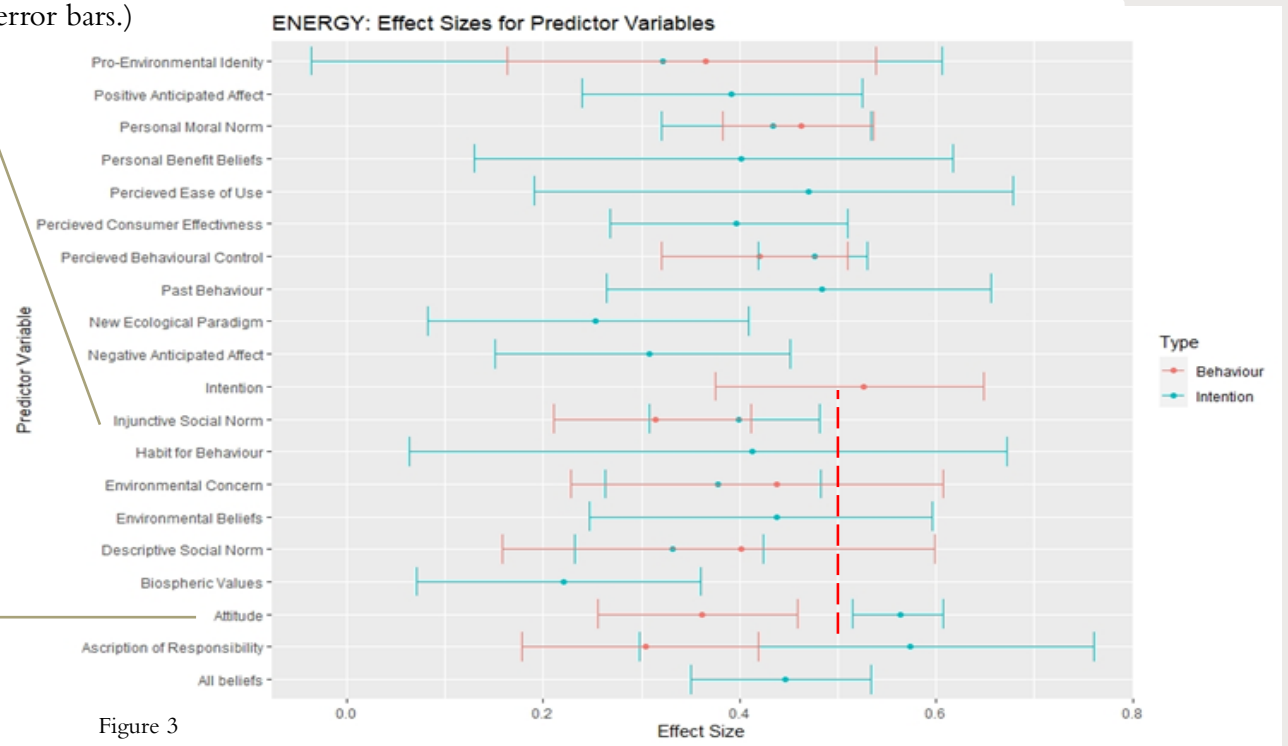

Figure 3

Figure 3: Scatter plot showing the effect sizes reported from all the meta-analyses conducted on predictor variables within the domain of energy, differentiated with respect to either 'Intention' to perform a behaviour or self-reported 'Behaviour'. The data displayed here is without any exclusion of outliers for completeness. The large length of the error bars is a result of not excluding outlying or highly influential studies in this graph. Error bar length also reflects the paucity of studies for some behavioural variables. For example, fewer studies existed for measuring 'Negative Anticipated Affect' and thus the error bars are significantly wider for this variable in comparison with a more highly studied variable such as 'Attitude'. The effect sizes for attitude were greater than for other variables, including norms, beliefs and values, however as indicated by the length of the error bars this often did not reach significance.

RESULTS: INTENTIONS VS. BEHAVIOUR

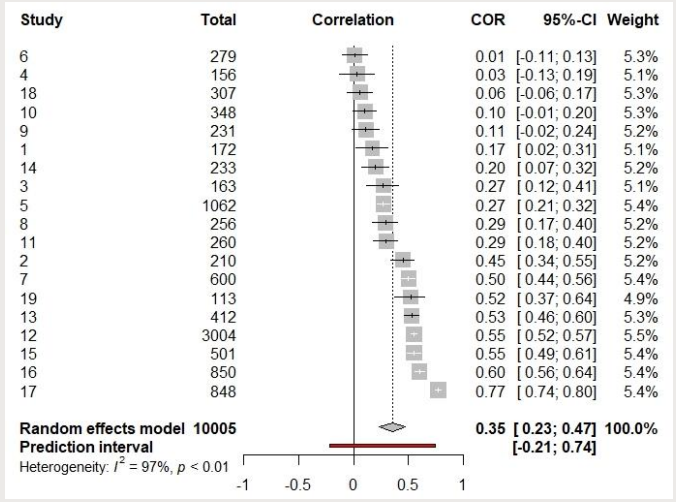

Figure 6

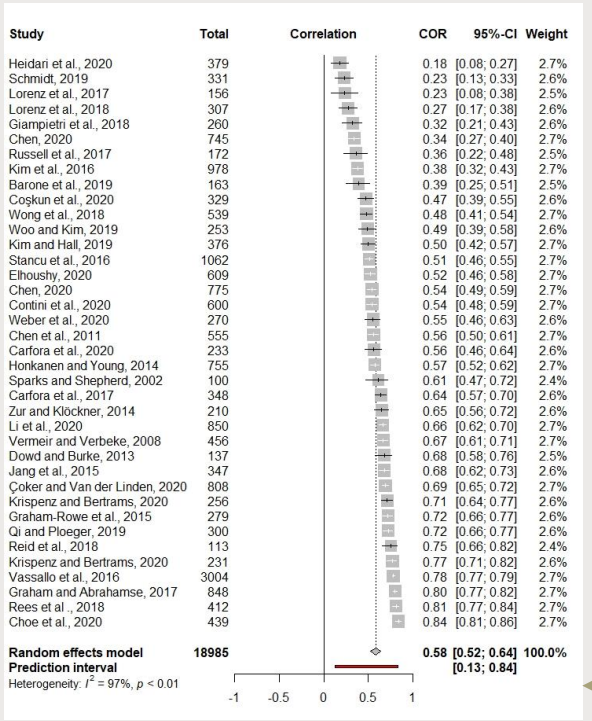

Figure 7

Figure 6 ('Self-reported Behaviour') and Figure 7 ('Intention' to perform a behaviour): Forest plots showing the calculated effect sizes for 'Attitude' on either 'Intention' to perform a pro-environmental behaviour or 'Self-reported Pro-environmental Behaviour' within the domain of Food. Across almost all predictor variables intentions showed higher effect sizes than behaviour. (Outliers included)

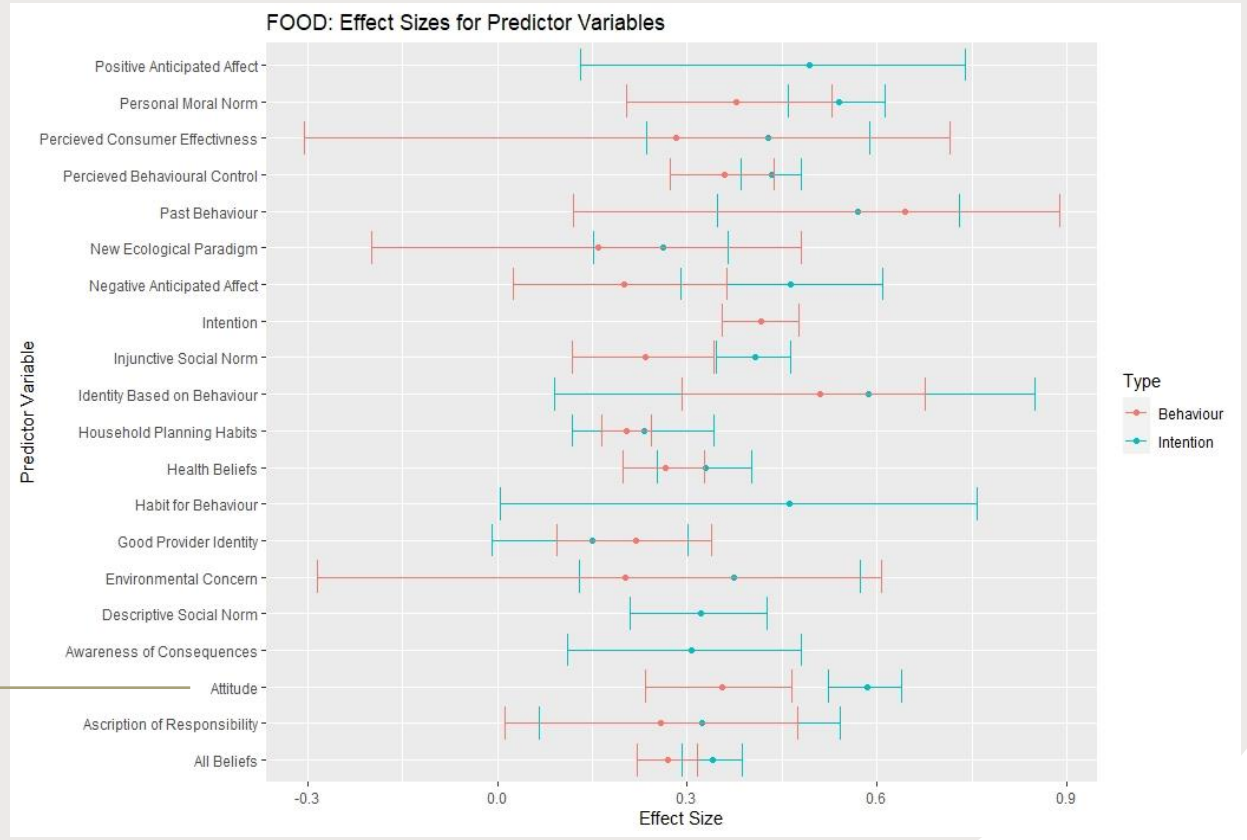

Figure 10

Figure 10: Scatter plot showing the effect sizes reported from all the meta-analyses conducted on predictor variables within the domain of food, differentiated with respect to either intention to perform a behaviour or self-reported behaviour. The data shown here is without any exclusion of outliers for completeness. Different domains had greater or fewer studies reporting different variables; for example, within the domain of food health beliefs were relevant and more studies reported these in comparison to environmental beliefs. Across predictor variables intention to perform a behaviour demonstrated higher effect sizes, however again this often did not reach significance.

Figure 8

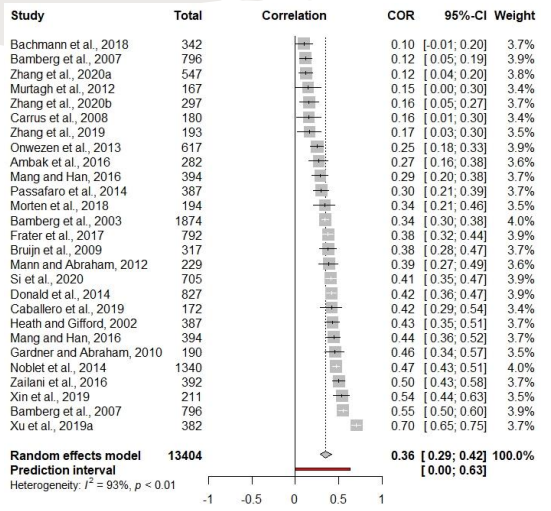

Figure 9

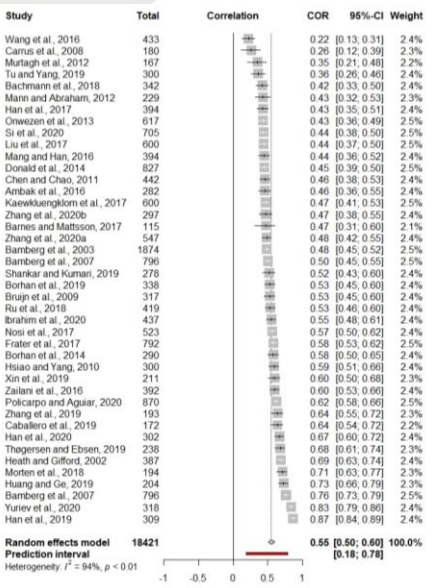

Figure 8 ('Self-reported Behaviour') and Figure 9 ('Intention' to perform a behaviour): Forest plots showing the calculated effect sizes for 'Attitude' on either 'Intention' to perform a pro-environmental behaviour or 'Self-reported Pro-environmental Behaviour' within the domain of **Transport**. Demonstrating the finding that intentions displayed higher effect sizes than behaviour across domains. (Outliers Included).

DISCUSSION

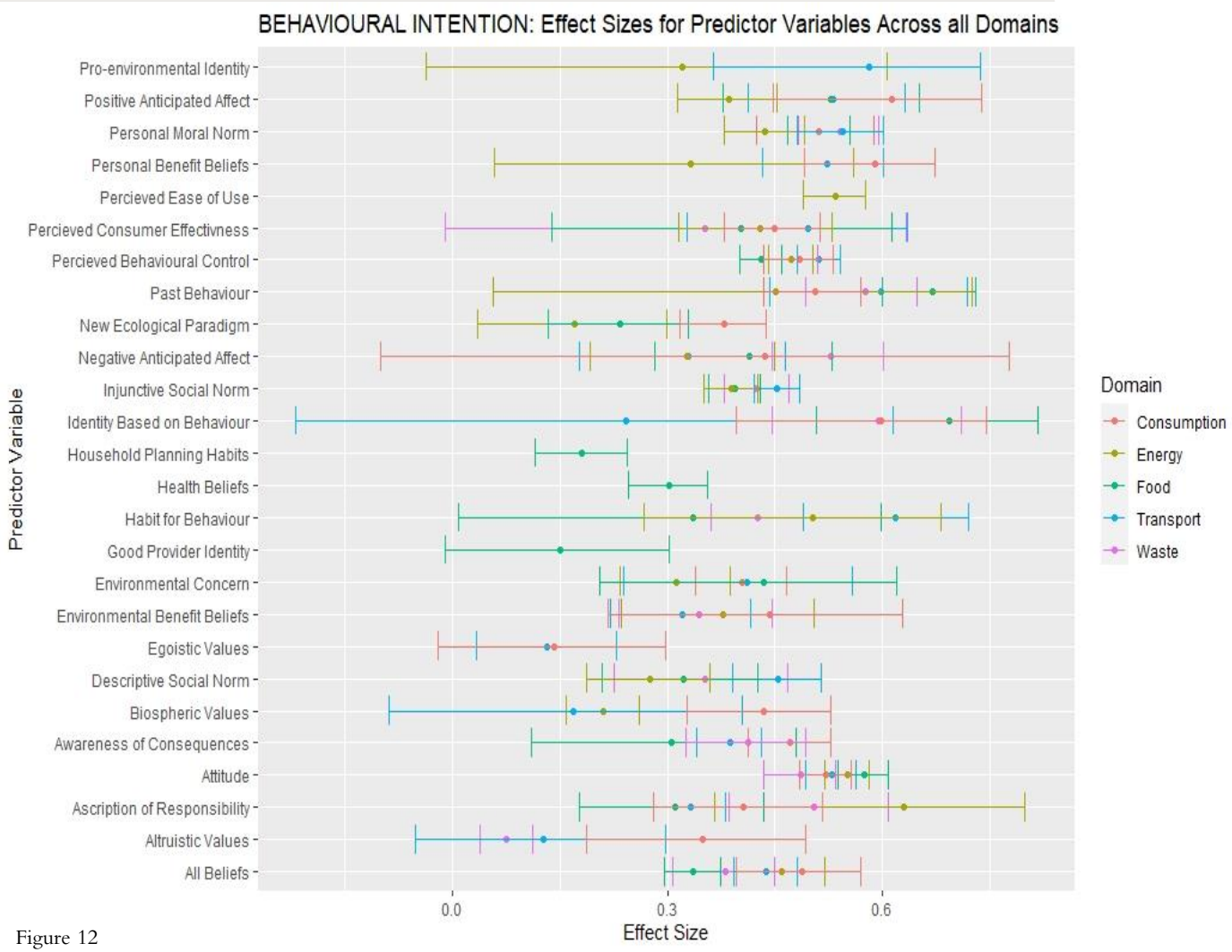

Figure 12

Figure 12: Scatter plot showing the effect sizes reported from all the meta-analyses conducted on predictor variables across the domains of: consumption, energy, food, transport and waste. Looking only at **intention** to perform a behaviour. The data shown here is **with** the exclusion of outlying studies.

The results of the meta-analyses have demonstrated that across domains effect sizes are greater for intention to perform a pro-environmental behaviour than for self-reported substantive behaviours. Additionally, across domains attitudes consistently demonstrated higher effect sizes than other variables such as beliefs, values and norms, however these reported differences did not always reach statistical significance(see Figure 12).

The inability to reach statistical significance when attempting to distinguish between the effect sizes for different predictor variables may be due in part to the lack of 'best practice' guidelines with respect to the design of questionnaire constructs used to measure different variables. Despite the careful coding of questionnaire items used to measure variables in this investigation, it was impossible to ensure a variable was measured in the same way across all studies. Additionally, variables such as attitudes, beliefs and values commonly included similar question items (often measuring something akin to environmental concern), creating a blurring of the distinction in the definition of these concepts across studies.

Additionally, the large error bars for some variables are in part due to the small number of investigations that have looked at certain variables, creating a low sample size of individual studies. Thus, investigations into the impacts of variables such as affect and identity on pro-environmental behaviour would be productive avenues for future environmental behaviour research.