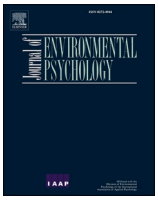
Journal of Environmental Psychology 97 (2024) 102311

Contents lists available at ScienceDirect

Journal of Environmental Psychology

journal homepage: www.elsevier.com/locate/jep



Betwixt and between: A systematic review on the role of ambivalence in environmental behaviours

Marije J. Van Gent [a,c,*], Marleen C. Onwezen [b], Reint Jan Renes [a], Michel Handgraaf [c]

[a] Research Group Psychology for Sustainable Cities, Amsterdam University of Applied Sciences, Wibauthuis, Wibautstraat 3b, 1091 GH, Amsterdam, the Netherlands
[b] Wageningen Economic Research, Wageningen University & Research, Prinses Beatrixlaan 582 - 528, 2595 BM, Den Haag, the Netherlands
[c] Urban Economics, Wageningen University and Research, Hollandseweg 1, 6708 KN, Wageningen, the Netherlands

ARTICLE INFO

Handling Editor: W. Schultz

Keywords:
Ambivalence
Environmental behaviours
Environmentally friendly attitudes
Behaviour change
Systematic review

ABSTRACT

Many citizens experience ambivalence – having simultaneously positive and negative evaluations – about changing their behaviour towards a more environmentally friendly lifestyle. Based on 36 studies, this study identifies and synthesises the current evidence on how ambivalence impacts environmental behaviours. In most studies, ambivalence is shown to be directly and negatively associated with environmental behaviours, i.e., higher levels of ambivalence are linked to lower levels of environmentally friendly and unfriendly behaviours. This applies to both types of ambivalence: objective (OA) and subjective (SA). Mediator analyses show, in line with the theory, that SA, not OA, drives behavioural change. In addition, results indicate that ambivalence moderates the relationship between independent–dependent variables mainly negatively, for example, by weakening attitude–behaviour relationships. This review shows the potential of ambivalence to facilitate behaviour change: SA about environmentally friendly behaviour can hinder, whereas SA about environmentally unfriendly behaviour can motivate, behaviour change. In addition, this review highlights some significant knowledge gaps in this body of research. A lack of validated standardised measurements of ambivalence makes it challenging to compare studies and reach conclusions about underlying theoretical constructs. Methods, research designs, and theoretical underpinnings need improvement to fully understand ambivalence and progress towards the transition of environmentally friendly behaviours.

1. Introduction

Our planet's temperature is rising, and there is strong scientific consensus that human activities are responsible for climate change (IPCC, 2021). Changing citizens' environmentally unfriendly into environmentally friendly behaviours is a crucial mitigation strategy to reduce greenhouse gas (GHG) emissions (Dubois et al., 2019; IPCC, 2018). Citizens worldwide are aware of global warming and concerned about the climate (Flynn et al., 2021) but still engage in environmentally unfriendly behaviours, such as meat and dairy consumption, fossil-fuel-based energy use, car use, and air travel; and households' footprints remain a significant contributor to GHG emissions (Institute for Global Environmental Strategies et al., 2019; Nejat, Jomehzadeh, Taheri, Gohari, & Muhd, 2015).

Attitudes – how people evaluate a particular behaviour with some degree of either favour or disfavour – are important in guiding behaviour. In the Theory of Planned Behaviour (TPB) – one of the most prominent frameworks for studying environmental behaviours – attitude is an important predictor explaining behaviour (Ajzen, 1991, 2011). Most studies that research environmental behaviours with the TPB, approach attitudes towards environmental behaviours mainly from a unidimensional bipolar perspective, i.e., as either positive or negative (for example, Klöckner, 2013; Yuriev, Dahmen, Paillé, Boiral, & Guillaumie, 2020) and do not take into account that people often have both positive and negative evaluations of environmental behaviours simultaneously, i.e., ambivalence (Onwezen, Reinders, & Sijtsema, 2017; Povey, Wellens, & Conner, 2001).

Indeed, the experience of conflict is inextricably linked to environmental behaviours (Buttlar, Löwenstein, Geske, Ahlmer, & Walther, 2021; Steg, Bolderdijk, Keizer, & Perlaviciute, 2014). Even more so, this might explain the occurrence of the intention–behaviour gap, the distance between what one intends to do and one's actual behaviour

* Corresponding author. Amsterdam University of Applied Sciences, Wibauthuis, Wibautstraat 3b, 1091 GH, Amsterdam, the Netherlands.
E-mail addresses: m.j.van.gent@hva.nl (M.J. Van Gent), marleen.onwezen@wur.nl (M.C. Onwezen), r.j.renes@hva.nl (R.J. Renes), michel.handgraaf@rvo.nl (M. Handgraaf).

https://doi.org/10.1016/j.jenvp.2024.102311
Received 11 September 2023; Received in revised form 26 April 2024; Accepted 27 April 2024
Available online 29 April 2024

(Sheeran & Webb, 2016). Particularly for environmental behaviours, the gap between intentions and behaviour – also called the green gap – seems wide: although people have environmentally friendly attitudes and intentions, they often still behave in an environmentally unfriendly way (Elhaffar, Durif, & Dub, 2020). Experiences of conflict, and more precisely ambivalence, might explain why intentions are not always congruent with actions (Puteri, Buttlar, & Jahnke, 2022; Wang, Weisstein, Duan, & Choi, 2021). When one feels ambivalent about a specific behaviour, there is both a push from and a pull towards that behaviour, making it less certain that one will perform the behaviour.

The goal-framing theory is a more recent framework that integrates conflicting attitudes in understanding environmental behaviours. This theory can support the understanding of ambivalence. The theory asserts that people act from three different goal frames (Lindenberg & Steg, 2007) and predicts that people continuously face trade-offs between feeling good (hedonic goal), saving resources (gain goal), and doing the right thing (normative goal) (Steg et al., 2014). Ambivalence can manifest in many behavioural choices as a result of conflicting goal frames, giving rise to conflicting attitudes. For example, someone can have positive feelings towards a foreign holiday but simultaneously experience negative associations about the emissions from travelling by plane.

Although ambivalence about environmental behaviours is a common experience (Lertzman, 2015; Peeters, Diependaele, & Sterckx, 2019), insights from various cognitive consistency theories also show that humans generally are averse to inconsistencies and strive for consistency in attitudes (Awa & Eze, 2013), making it also a human predicament. It is essential to understand the role of ambivalence in environmental behaviour to narrow the green gap and accelerate the transition to more environmentally friendly behaviours.

1.1. Definition and theories on ambivalence

Ambivalence is defined as the coexistence of positive and negative evaluations of an attitude object (Priester & Petty, 1996; van Harreveld, Nohlen, & Schneider, 2015). The ambivalence construct is related to cognitive dissonance, the discomfort people experience when behaviour does not align with attitudes (Festinger, 1957). The former, however, assumes pre-decisional conflict, and the latter assumes post-decisional conflict (Buttlar, Van Harreveld, & Pauer, 2023). The literature on ambivalence distinguishes two types: subjective and objective (Priester & Petty, 1996; van Harreveld, Van Der Pligt, & De Liver, 2009). Objective ambivalence (OA) measures whether mixed evaluations are present in a person without that person necessarily being aware of those mixed evaluations (Thompson, Zanna, & Griffin, 1995). Subjective ambivalence (SA) refers to conscious and conflictive awareness of the contrasting positive and negative evaluations (Priester & Petty, 1996). Research suggests that OA and SA are distinct constructs because of their moderate correlation (Newby-Clark, McGregor, & Zanna, 2002; Nordgren, van Harreveld, & van der Pligt, 2006; Priester & Petty, 1996; Thompson et al., 1995).

1.1.1. Effects of ambivalence

The most comprehensive and recent theoretical model of ambivalence is the ABC model, which predicts the affective, behavioural and cognitive consequences of ambivalence (van Harreveld et al., 2015). In general, as humans prefer to be consistent (Festinger, 1957), the conflictive feeling of SA is perceived as unpleasant (Newby-Clark et al., 2002; van Harreveld et al., 2009). Thus, behaviour is affected by the induced negative affect associated with the conscious conflictive awareness of mixed evaluations (SA) and not by evaluatively incongruent associations (OA) (van Harreveld et al., 2009; van Harreveld et al., 2015). DeMarree, Christian Wheeler, Briñol, and Petty (2014) empirically investigated the relationship between OA and SA and concluded that SA, and not OA, is likely to be a proximal causal variable for behaviour. Although OA is thought to precede SA, they are only moderately correlated. Other attitudinal discrepancies can also stimulate feelings of SA, such as the gap between actual and desired behaviour (DeMarree et al., 2014), being torn between two alternative behaviours (van Harreveld et al., 2009), or desired behaviour and the efficacy of achieving those outcomes (Bui, Droms, & Craciun, 2014).

van Harreveld et al. (2015) state that OA turns into SA only when both components of the attitudes are accessible and a person experiences conflict. Schneider and Schwarz specify that the unpleasantness of SA increases when an individual needs to make a decision and is forced to choose sides, when the conflict is salient, and when the issue is highly relevant to that person (Schneider & Schwarz, 2017).

As a result of the negative affect induced by SA, people engage in cognitions and actions to reduce discomfort. Cognitive actions are, for example, information-seeking and processing (Clark, Wegener, & Fabrigar, 2008; Sawicki et al., 2013), observing peers (Hodson, Maio, & Esses, 2001) or using moral disengagement strategies (Buttlar & Walther, 2018; Onwezen, Bouwman, Reinders, & Dagevos, 2021). On a behavioural level, the ABC model speaks mostly of changes in motor behaviour (body movements, e.g., side-to-side movements) and choice delay. Indeed, research shows that the conflictive feeling of ambivalence can lead to inaction (Durso, Briñol, & Petty, 2016) and procrastination (Itzchakov et al., 2020). Beyond the theoretical studies, more recent empirical studies, such as Pauer, Rutjens, Ruby, and Perino (2022), add to the theory of ambivalence by demonstrating that anticipating ambivalence reduction through behavioural avoidance can regulate the aversive state of recurring ambivalence.

1.1.2. Ambivalence and environmental behaviours

Exploration of the literature on this topic reveals three broad categories of associations between ambivalence and environmental behaviour: a direct, a mediator, and a moderator effect. Although recent theories on ambivalence argue that SA and not OA influence behaviour, the empirical research below does not always follow this thinking; both SA and OA are employed, and the theoretical arguments often fail to differentiate between them.

First, ambivalence is hypothesised as having a negative direct effect on (environmental) behaviour: an increase in ambivalence about a particular behaviour is related to a decrease in that behaviour (e.g., Berndsen & Van Der Pligt, 2004; Lipkus, Feaganes, Green, & Sedikides, 2001; Puteri et al., 2022). The first hypothesis explaining this effect considers ambivalence as a measure of weak attitude strength being less predictive of behaviour (Costarelli & Colloca, 2004; Horng & Liaw, 2018; van Harreveld et al., 2015; Wang et al., 2021). It remains unclear why a negative effect would arise (a null effect would be more appropriate) and for which type of ambivalence this applies. Although not explicitly labelled as such, the hypothesis seems to point to OA with the argumentation that the coexistence of positive and negative attitude components causes uncertainty about which component to prioritise, resulting in behaviour delay or avoidance. The second more likely hypothesis, in line with the most recent theories on ambivalence, asserts that SA, because of its unpleasant nature, stimulates a person to resolve internal inconsistencies (van Harreveld et al., 2009; van Harreveld et al., 2015) by reducing the behaviour (Mouro, Lomba, & Patr, 2021; Pauer et al., 2022).

Second, studies research the mediator effects of ambivalence (e.g., Costarelli & Colloca, 2004; Oser, McKellar, Moos, & Moos, 2010); this can be seen as a conceptual extension of the direct effect. As ambivalence has a direct effect on behaviour, and the negative affect associated with SA triggers people to resolve this ambivalence, a consequential step is to hypothesise ambivalence as a causal variable that influences behaviour. For example, Berndsen and Van Der Pligt (2004) show that people's ambivalence about meat consumption, not their attitude, mediates future meat consumption intention.

A third line of research refers to the moderating role of ambivalence in the attitude–(environmental) behaviour association (e.g., Cooke & Sheeran, 2004; Hohman, Crano, & Niedbala, 2016; Ziegler, Hagen, &

Diehl, 2012) and, here, results seem conflicting. Some authors conclude that ambivalence moderates the attitude–behaviour relationship negatively (Conner, Povey, Sparks, James, & Shepherd, 2003; Smith & Louis, 2009; Sparks, Harris, & Lockwood, 2004): when ambivalence increases, the linkage between attitude and behaviour weakens. These studies hypothesise that ambivalence can be seen as a measure of weak attitude strength, weakening the relation between attitudes and behaviour. Although most of these studies do not differentiate between the types of ambivalence, the line of reasoning suggests OA. Other studies argue that ambivalence strengthens the attitude–behaviour relationship (Castro, Garrido, Reis, & Menezes, 2008; Jonas, Diehl, & Brömer, 1997) or the intention–behaviour relationship (Armitage & Conner, 2000), as information processing increases (Benningstad & Kunst, 2020; Jonas, Broemer, & Diehl, 2000; van Harreveld et al., 2009). These studies refer to the additional cognitive elaboration as an effect of ambivalence, leading to intensifying relationships between attitudes and behaviour or intention and behaviour. This seems to point to SA. Overall, the findings imply different moderating effects of SA and OA on the attitude behaviour association, but so far, conclusive results are lacking.

In short, researchers study ambivalence and environmental behaviours in different ways; some focus on the direct effect, some on the mediating role of ambivalence, and others on the moderator effect or a combination of possible associations. In Fig. 1, we present a visual presentation of how ambivalence – according to the literature - is associated with environmental behaviours; the solid lines follow the earlier theoretical models (Pauer et al., 2022; van Harreveld et al., 2015) with the core assumption that SA, and not OA, influences behaviour negatively. The mediating role of SA can be understood as the extension of the direct effect. The dotted lines visualise supplementary hypotheses from empirical research, with OA having a direct negative effect on behaviour and unspecified moderating effects of OA and SA.

This review examines environmental behaviours, which refer to actions that impact the natural environment (Klöckner, 2013; Stern, 2000) and encompass both environmentally friendly and unfriendly behaviours. Despite their differences, research on ambivalence tends to treat these behaviours similarly, expecting similar hypotheses. However, whereas environmentally unfriendly behaviours are habitual, embedded in routines and social practices and supported by a society that is yet predominantly unsustainable, environmentally friendly behaviours are, in contrast, new behaviours that are much less supported by the prevailing environment (Verplanken, 2012). This review will, therefore, also explore whether ambivalence similarly affects both types of behaviours.

1.2. Limitations of the current research

So far, academic knowledge about ambivalence and environmental behaviours (i.e., operationalisation, approach, and theories) is fragmented over the diverse types of environmental behaviours and remains inconclusive regarding how ambivalence influences environmental behaviour. Our first conclusion is that a comprehensive overview based on research findings on the different associations of ambivalence on environmental behaviour is lacking.

Second, the most up-to-date theoretical study refers to motor behaviour and choice delay as possible behavioural consequences of ambivalence, neglecting behaviour change (van Harreveld et al., 2015). Although the authors describe the conflicting results on the moderating role of ambivalence and mention its direct effect on behaviour, they do not specify these relations explicitly in their model. In addition, the mediator role of ambivalence is not mentioned. Therefore, our second takeaway is that the theory on ambivalence may be extended with advances in the field.

An earlier literature review on ambivalence and sustainable consumption (Sipilä, 2021) aimed to understand why people felt ambivalent and described negative and positive reactions towards sustainable consumption behaviours. It did not address the relationship between ambivalence and behaviours or elaborate on the theoretical underpinnings of ambivalence. We add to that review in two ways. First, our review includes the most recent studies and any behaviour with an environmental impact, such as recycling or mobility behaviours, and has a broader scope than sustainable consumption. Second, our review focuses in detail on the association between ambivalence and environmental behaviours, providing a more comprehensive and in-depth understanding of whether and how ambivalence impacts environmental behaviour. This more in-depth and rigorous review is needed for the construct's operationalisation and the theorising of the associations between ambivalence and environmental behaviours to truly advance the field.

1.3. The present investigation

To systematically analyse and synthesise the role of ambivalence in environmental behaviour, we conducted an in-depth systematic review of the current literature to answer the following research questions: 1) In what ways and contexts has ambivalence towards environmental behaviours been studied? 2) How is ambivalence operationalised in studies of environmental behaviours? 3) What is the relationship between ambivalence and environmental behaviours? This article is structured around these three questions. We will use Fig. 1 to map and understand the empirical research findings of the included studies. This review contributes scientifically by systematically integrating research on ambivalence and environmental behaviour and by reflecting on how the empirical results relate to the theoretical understanding of ambivalence. Given the impact of climate change on citizens, the review has significant societal added value for understanding whether ambivalence might positively or negatively impact the transition towards more environmentally friendly lifestyles.

2. Methods

2.1. Defining scope

A systematic review protocol with a step-by-step process outline was developed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2015).[1] We used Stern's (2000) definition of environmental behaviours – behaviours that change and impact the environment – and his classification, i.e., private-sphere behaviours, nonactivist behaviours in the public sphere, and environmental activism. As Stern's private-sphere behaviours category is extensive, we split this category – based on the academic literature – into four types of private-sphere behaviours with environmental impact, namely, food, mobility, housing, and consumption (Dubois et al., 2019; Environmental Strategies et al., 2019; Faber et al., 2012; Institute for Global; IPCC, 2018; OECD, 2008; van de Ven, González-Eguino, & Arto, 2018). In addition, a seventh category, environmental behaviours in general, was added to identify studies that addressed more generic or multiple environmental behaviours. The search strategy was executed along those seven environmental behaviour categories (see Appendix A).

2.2. Development of the search strategy

Search terms for the seven environmental behaviour categories were developed based on a four-step process. First, keywords of previously found key articles on ambivalence regarding a specific environmental behaviour were listed to get a first idea of relevant search terms (see Appendix A). Second, one or two systematic literature reviews were

[1] A written review protocol was developed before the start of the project and included review questions, the search strategy, the inclusion/exclusion criteria, and how to prevent biased assessment.

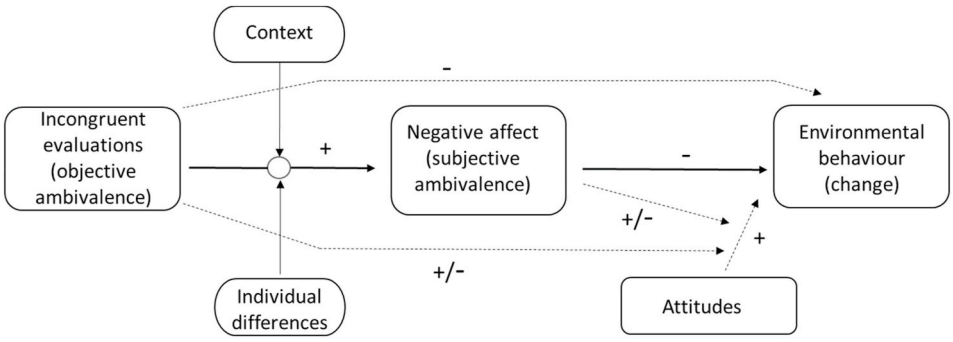


Fig. 1. Visual representation of relations between ambivalence and behaviour.

identified for each of the seven environmental behaviour categories to get an overview of validated search terms per category. Third, once the search terms per category were identified, the search terms for the seven distinct categories were more consistent to allow comparisons across categories. Fourth, the draft search terms combined with the search term ambivalen* were tested per category to check whether previously identified key articles on ambivalence were found through the developed search terms. Using these steps, we developed the final search strings. See Appendix A for a complete overview of search strings per category.

2.3. Selection of relevant studies

The literature search was conducted in November 2023 in Scopus, Web of Science, and PsychInfo databases.[2] Peer-reviewed articles in English, published before October 31, 2023, were considered, leading to 3155 articles. After deduplication, 2026 titles and abstracts were entered in the web tool Rayyan and screened independently by two reviewers assessing the inclusion criteria: 1) containing empirical data[3] and 2) whether ambivalence was studied about an environmental behaviour; studies with behavioural intention as a dependent variable were also included. We excluded studies on ambivalence about (opinions on) climate change and segmentation studies that included an ambivalent segment. Inter-rater agreement was high (99%). After discussion, the reviewers disagreed about 12 cases but agreed to exclude them; in 12 cases, as the reviewers continued to disagree, a third independent reviewer decided to include two and exclude ten articles.

Thirty-two articles were included for an in-depth full-text investigation, and, through forward and backward referencing of the initial selected studies, three new articles were identified matching the inclusion criteria. Eleven of those 34 articles were excluded, as no clear conclusion was drawn on the association between ambivalence and behaviour, leading to 24 articles. Twelve of those 24 articles included more than one study, but studies that did not match the inclusion criteria (for example, studies on health behaviour) were excluded, leading to 36 studies from 24 articles being included in this review. See Fig. 2 regarding the search process.

2.4. Data extraction process

Data extraction in Excel was conducted by two researchers, with the principal investigator checking all data input. Data extraction included a methodological part collecting all relevant information on study characteristics, and a second, more substantive part that collected evidence regarding the association between ambivalence and behaviour. We examined all analyses in the 36 studies studying ambivalence and behaviour. We distinguished three types of analyses: ambivalence employed as a predictor, a moderator, and a mediator. Any analysis that researched the relationship between ambivalence and behaviour/behavioural intention was included (see Appendix B for criteria for the selection of analyses). In the last step, all effects found were coded in four categories: positive effect, negative effect, effect unknown, and no effect found.

3. Results

This section is structured around the three research questions specified in the introduction: 3.1 describes the research designs employed, 3.2 gives an overview of the types of ambivalence and operationalisations, and 3.3 presents the evidence regarding the association between ambivalence and environmental behaviours and distinguishes three types of relationships: a direct, a moderation, and a mediation effect. In the last subsection, we compare the effects of ambivalence about environmentally friendly and unfriendly behaviours.

3.1. Descriptive overview studies

This section addresses research question 1: In what ways and contexts has ambivalence towards environmental behaviours been studied?

3.1.1. Study designs

All studies employed a quantitative research design, with surveys (19) and survey experiments (11) being the most commonly used method. The 36 studies were mainly convenience sampled (21) or used research panel samples (14). Samples comprised research panels (14) and general public samples (12). Ten studies used student or pupil samples.

3.1.2. Ambivalence in the studies

Of the 36 studies included in this review, SA was slightly more studied than OA: 16 studies focused on SA, 11 studies focused on OA, and nine studies measured both (see Table 1). The results show that ambivalence was studied more in certain environmental behaviour categories, such as food and consumption, than in other domains, e.g., mobility or nonactivist behaviours in the public sphere (e.g., petitioning, volunteering, donating). Overall, studies focusing on ambivalence about environmentally friendly behaviours were more prevalent (25) than environmentally unfriendly behaviours (11). The only exception is within the domain of food, where ambivalence about meat consumption was more studied than meat alternatives.

In most studies, ambivalence towards an environmental behaviour was considered a fixed characteristic rather than a contextual attribute that can be situationally activated. Fourteen studies activated ambivalence through manipulation. Lastly, most studies measured behavioural intention rather than actual behaviour.

[2] A first search was conducted in March 2021 and updated in November 2023 to include the latest studies.

[3] All types of research methods were included, qualitative and quantitative methods (randomised and non-randomised studies).

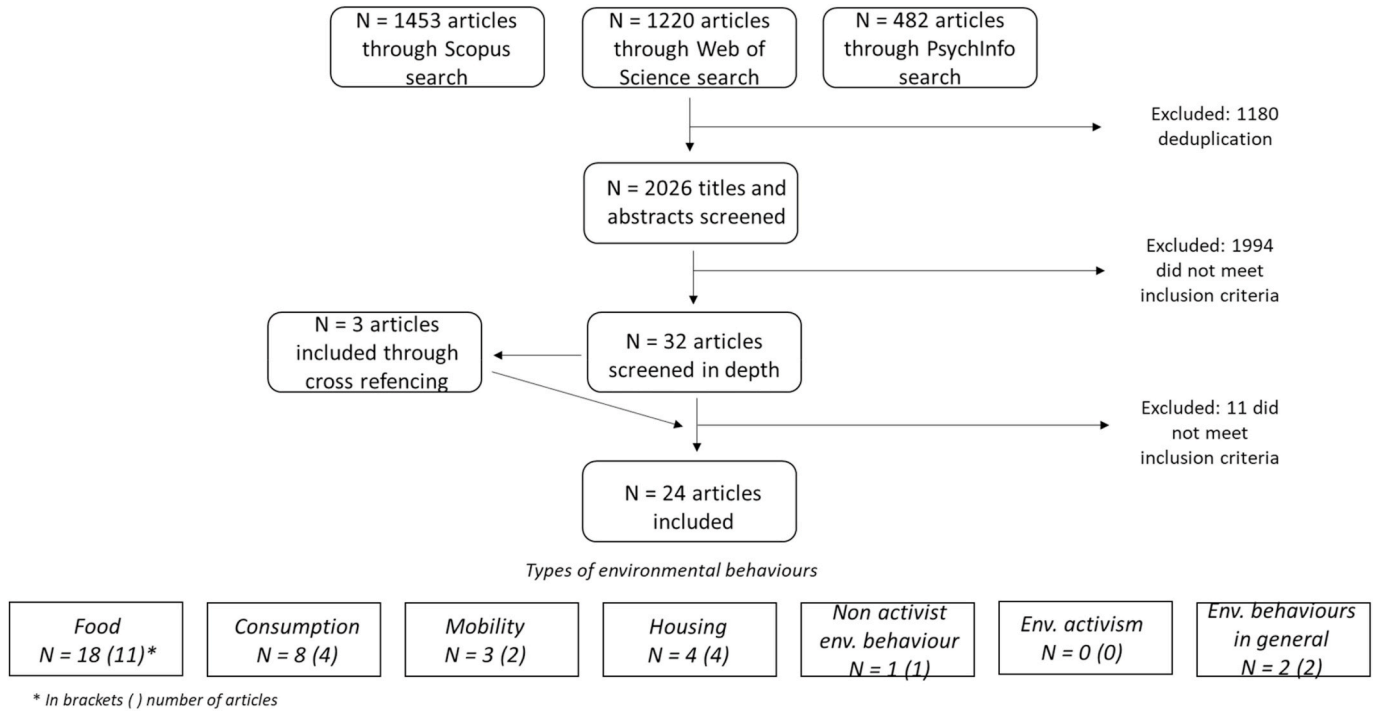


Fig. 2. Flowchart of search process.

Table 1
Overview of operationalisation of ambivalence and environmental behaviours in studies (N = 36).

Domains	Types of behaviour	Types of ambivalence	
Food (19)	Meat consumption (10) Environmentally friendly food choices (5) [a] Consumption suboptimal food (4)	Objective ambivalence	11
Mobility (3)	Low carbon travel (3)	Subjective ambivalence	13 + 3 indirect
Housing (4)	Recycling (4)	Both	9
Consumption (8)	Luxury consumption (1) Green consumption (7)		
Nonactivist behaviours in the public sphere (1)	Conservation behaviour (1)	**Ambivalence manipulation**	14
Environmental activism	–		
Environmental behaviours in general (2)	Multiple green behaviours (2)	**Dependent variable(s)** [b]	
		Self-reported current behaviour	7
Ambivalence about …		Intentions	25
Environmentally friendly behaviours	25 [a]	Behavioural choice	7
Environmentally unfriendly behaviours	11		

b Type of ambivalence was coded based on the operationalisation of the construct, as different authors use different terms to describe objective or subjective ambivalence; see also Appendix C.

[a] In one study, ambivalence was measured towards meat as well as meat alternatives (veg*ans).

[b] In some studies, two dependent variables were measured.

3.2. Operationalisations of ambivalence

This section answers research question 2: How is ambivalence operationalised in studies of environmental behaviours? The 36 studies differed significantly in how ambivalence was measured; 23 methods were employed in 36 studies. In this section, we give an overview of the terminology used, the operationalisations of both types of ambivalence, and the application of ambivalence in environmental behaviours.

3.2.1. Terminology

A first finding from the review of the 36 studies is a difference in terminology between studies: OA was also labelled as (attitudinal) ambivalence, structural ambivalence, indirect ambivalence, potential ambivalence, mixed emotions, and overall ambivalence (which is further distinguished into cognitive and affective ambivalence). SA was also called (attitudinal) ambivalence, felt ambivalence, self-reported ambivalence, and experienced ambivalence (see also Appendix C, which gives an overview of labels, operationalisations, and measurement of ambivalence in all included studies).

3.2.2. Operationalisation

As using validated scales is common practice in social psychology (Boateng, Neilands, Frongillo, Melgar-Quiñonez, & Young, 2018), it is notable that no standardised and validated operationalisation seems to exist for OA and SA. Not only did the number of items (OA was measured by 2–12 items, SA was measured by 1–25 items) and the answering options differ (from a 4-point to an 11-point Likert scale, and a visual analogous scale from 0 to 100), but also the content of the employed items was diverse.

3.2.2.1. Subjective ambivalence. SA seemed slightly more standardised than OA: half of the studies measuring SA based their items on – amongst other things – Priester and Petty's (1996) operationalisation relating to the tripartite attitudinal model with an affective (feeling), cognitive (beliefs), and behavioural (indecision) component of ambivalence. One study, part of an article on developing a domain-specific measurement of subjective meat ambivalence, employed a new Meat Ambivalence

Questionnaire. This operationalisation gives – more than Priester and Petty's scale – insights into the reasons for experiencing meat ambivalence by measuring different dimensions that can evoke conflict: animal, health, sustainability, social, or sensory-based dimensions (Buttlar, Pauer, et al., 2023). In addition, three studies in two articles (Buttlar et al., 2021; Puteri et al., 2022) employed a relatively new method to measure SA through mouse tracking: respondents are asked to evaluate a behaviour by choosing either a positive or a negative response option (Schneider et al., 2015; Schneider & Schwarz, 2017). The mouse-movement trajectory – available online as open-source software in Qualtrics (Mathur & Reichling, 2019) – is recorded, and the characteristics of these trajectories give insight into the ambivalence experienced. The authors conclude that this indirect measure of ambivalence taps mostly into the subjective experience of ambivalence, as respondents can visually be shown to go back and forth between two sides.

3.2.2.2. Objective ambivalence. In the 21 studies on OA, all OA operationalisations shared two common denominators: 1) both positive and negative aspects or attitudes were surveyed, and 2) in most cases, the Griffin formula was used to calculate OA: (positive evaluation (P) + negative evaluation (N)/2-(|P–N|) (Thompson et al., 1995). However, we identified two main differences concerning the formulation of OA items.

First, we noted a wide variety in OA measurement. For example, some studies surveyed two items, asking whether respondents had a positive or a negative attitude towards a particular behaviour. Other studies formulated content-driven items using semantic differential half-scales. For example, 'this behaviour is meaningful' versus 'this behaviour is meaningless' and 'we do not need much space for recycling' versus 'we need a lot of space for recycling'. Nevertheless, other studies employed positive and negative items that were not contrasting – for example, a positive item, 'Do you avoid travel behaviours harmful to the environment?' and a negative item, 'It is unimportant to use low-carbon transportation during my travels'. In addition, one study started with an open question to note diverse beliefs/thoughts and feelings and then asked respondents to rate these beliefs as positive or negative.

A second difference in OA operationalisation concerns a difference in instructions. Some studies gave specific instructions. For example, in Costarelli and Colloca's (2007) study, respondents were asked: 'Considering only the unfavourable qualities of waste recycling and ignoring the favourable characteristics, how unfavourable is your evaluation of waste recycling?'. Other studies did not provide instructions (for example, Barata & Castro, 2013; Buttlar, Rothe, Kleinert, Hahn, & Walther, 2020; Costarelli & Colloca, 2004).

3.2.3. Ambivalence in the domain of environmental behaviours

A third observation concerns the adaptation of the operationalisation of ambivalence to the domain of environmental behaviours. Compared with the SA operationalisations, the OA operationalisations gave more insight into why people feel conflicted and whether there is a linkage with the environmental impact of the behaviour. For example, Horng and Liaw's (2018) study asked respondents whether they avoided travel behaviours that were harmful to the environment. Apart from the MAQ questionnaire, SA items did not shed light on why people felt conflicted and whether the environmental impact of the behaviour was a reason for conflict.

3.3. Evidence on the relation between ambivalence and environmental behaviours

This section answers research question 3: What is the relationship between ambivalence and environmental behaviours? Most studies investigated the direct effects of ambivalence on behaviour, and some studies (also) examined the mediator and/or moderator effects of ambivalence on behaviour. The results below are described along these three angles: the direct effects of ambivalence on behaviour (3.3.1), ambivalence as a mediator (3.3.2), and ambivalence as a moderator (3.3.3). In addition, we compare findings for environmentally friendly and unfriendly behaviours (3.3.4).

3.3.1. Direct effects of ambivalence

Theoretically, as described in the introduction, ambivalence would affect behaviour directly and negatively, either because it is seen as a measure of weak attitude or because the negative feelings induced by SA would cause action to resolve them. Fifteen out of 25 studies indeed hypothesised a negative direct relationship between ambivalence and environmental behaviours. For example, Berndsen and Van Der Pligt (2004) predicted that ambivalent meat eaters would eat less meat than low-ambivalent meat eaters. Two studies predicted a positive effect. The other half either did not specify the direction of the effect or did not hypothesise about the direct effect, even though this was studied. Of the 25 studies that looked at the direct effects of ambivalence on environmental behaviour or behavioural intention, 45 direct effects were coded (see Table 2). Twenty-eight of these 45 effects confirmed a direct negative relation between ambivalence and behaviour. However, a positive effect was found in eight cases, and in nine cases, no effect.

In general, an increase in ambivalence was associated with a decrease in behaviour/behavioural intention and applied not only to SA – as recent theories on ambivalence assume- but also to OA. Studies focusing on ambivalence regarding environmentally friendly behaviour showed that increased ambivalence led to less environmentally friendly behaviour; For example, ambivalence towards recycling (Castro et al., 2008; Costarelli & Colloca, 2007; Ojala, 2008), low carbon travel (Horng & Liaw, 2018), and green consumption (Wang et al., 2021) led to fewer environmentally friendly behaviours. Similarly, ambivalence had a negative direct effect on environmentally unfriendly behaviours. For example, highly ambivalent meat eaters ate less meat, or chose fewer meat products (Berndsen & Van Der Pligt, 2004; Buttlar, Pauer, et al., 2023; Pauer et al., 2022; Venema, Kroese, Benjamins, & de Ridder, 2020), or had a lower intention to eat meat in the future (Berndsen & Van Der Pligt, 2004; Povey et al., 2001). Thus, ambivalence can act as a barrier (in the case of ambivalence about an environmentally friendly behaviour) and as a stimulator (in the case of ambivalence about environmentally unfriendly behaviour) in the transition towards a sustainable lifestyle.

Eight of the 45 found effects were positively associated with ambivalence and environmental behaviour: the higher the ambivalence, the more frequent the behaviour/intention. As these results differed from the bulk of the analyses, we looked at these findings in more detail to understand these outliers. Two studies hypothesised – in contrast to the other studies – that ambivalence would lead to an increase in behaviour. Ki et al.'s (2017) study differed significantly in how ambivalence was operationalised compared with the other studies. Ambivalence was interpreted as having mixed emotions, not attitudes, and was

Table 2
Overview of effects of ambivalence as an explanatory variable on behaviour or intentions.

Relation with dependent variable	Objective ambivalence (number of studies)	Subjective ambivalence (number of studies)	Total effects (number of studies)
Negative effect	14 (11)	14 (11)	28 (22)
Positive effect	1 (1)	7 (4)	8[a] (5)
No effect found	4 (3)	5 (5)	9[b] (7)
Total	20 (12)	26 (15)	45 (25)

[a] Six out of eight positive effects are from one article with three studies. In the regression analyses, two other negative affect variables (disgust and negative emotions) were included that might have suppressed the negative loading of ambivalence.

[b] Three of the nine 'no effect found' were derived from analyses that included both SA and OA, and only one of those types was significant.

operationalised as an interaction effect between guilt and pleasure. Buttlar, Van Harreveld, and Pauer (2023) found that, although ambivalent meat eaters ate less meat, ambivalent vegetarians ate more meat. A possible explanation might be a difference in baseline: ambivalent vegetarians might be ambivalent about their aim of eating no meat, leading to a decrease in dietary strictness. The other six positive effects were found in one article with multiple studies (Onwezen, van den Puttelaar, Verain, & Veldkamp, 2019). Compared with the studies that showed negative effects, Onwezen et al.'s studies differed in that – in addition to ambivalence – two other negative affect variables (disgust and negative emotions) were included as explanatory variables in the regression analyses. These other negative affect variables might suppress the negative effect of ambivalence (Mosteller & Tukey, 1977).

Lastly, nine of the 45 coded effects did not show an association between ambivalence and behaviour or intention. Three of the 'no effect found' came from analyses that included both types of ambivalence. In those analyses, ambivalence did play a role, but only one type of ambivalence was significant, and the other type was not; some show that only SA had a significant effect, whereas other analyses show that only OA had an effect. Looking in more detail at the other six 'no effect found' analyses, we found that, in Horng and Liaw's (2018) study, the manipulation of 'responsibility sharing information' did not activate the intended ambivalence, thus impeding analysis of the association between ambivalence and intention. Furthermore, in Onwezen et al.'s (2019) studies, ambivalence (SA) did not significantly predict the consumption intention of in-vitro meat and processed insects compared with fresh and dried insects. The authors suggested that these specific types of alternative protein sources had higher acceptance levels (and thus evoked fewer conflictive feelings), as they were perceived as either less innovative (in-vitro meat) or less obviously insect-based (processed insects). Lastly, in two studies, ambivalence had a negative effect on behaviour, but this direct effect of ambivalence on behaviour became non-significant after interaction effects were added to the regression model; instead, the interaction effect of ambivalence with a second independent variable became significant (Mouro et al., 2021; Povey et al., 2001).

Summarising, the evidence demonstrates that ambivalence had a negative direct effect on behaviour/behaviour intention in most cases. In some cases, a positive effect or no effect was found. In contrast to our theoretical model, no distinct differences between OA and SA were found when the direct effects were compared.

3.3.2. Ambivalence as mediator

The uncomfortable feeling of SA activates the desire to resolve this feeling, as described in the introduction. Thus, SA can be seen as a causal variable that influences behaviour. In one-third of the studies, 15 mediator analyses were conducted, looking at whether ambivalence mediated the independent variable–dependent variable (IV–DV) relationship. In most studies, clear hypotheses were formulated regarding the mediating role of ambivalence. Ten out of 18 mediation analyses demonstrated a (partial) mediating role of ambivalence (see Table 3), and, in line with recent theories on ambivalence, SA and not OA was mostly studied as a mediator.

Six analyses showed a full mediation effect of SA, with one of those using an indirect SA measure of ambivalence. This study showed that ambivalence mediated the consumption of suboptimal food (Buttlar et al., 2021). Berndsen and Van Der Pligt (2004) demonstrated that a stronger intention to reduce meat consumption in the future was mediated by ambivalence and not by attitude. In line with this finding, Pauer et al. (2022) and Ye and Mattila (2021) showed that meat ambivalence mediated meat-reduction intentions or plant-based choices in four mediation analyses. Ye and Matilla's study showed this mediating effect of ambivalence only in the social cost manipulation (environment and animal welfare) and not in the health message manipulation.

Four of the 15 mediation analyses showed a partial mediation, with two of those analyses employing OA and two employing SA. Lastly, eight of the 18 mediating analyses did not confirm the mediating role of ambivalence. In an article by Buttlar et al. (2020) with two studies, a manipulation of a dialogue with anti-meat activists was studied; ambivalence did not mediate intentions to reduce meat. In another article by Buttlar et al. (2021) with three studies on ambivalence about consumption of suboptimal food, five of the six mediator analyses were not confirmed.

In sum, data confirmed the hypothesis that ambivalence mediates behaviour; ten out of 18 mediation analyses showed that ambivalence (partly) drove behaviour change. In line with recent theories on ambivalence, SA and not OA was mainly studied as mediator. Also, mediator analyses employing SA were more often confirmed than those using OA. Overall, the results point to SA as an underlying mechanism for behaviour change.

3.3.3. Ambivalence as moderator

As described in the introduction, the theoretical reasoning regarding the direction of the moderating role of ambivalence is ambiguous in the literature. Ambivalence as a measure of weak attitudes could have a negative moderating role, whereas the additional cognitive elaboration resulting from ambivalence could have a positive moderating role between attitudes and intention. Indeed, in most studies, hypotheses regarding the moderator effect were less clear than hypotheses on direct effects or were not stated. Eight studies explicitly hypothesised a negative moderating role of ambivalence in the IV–DV relation, e.g., ambivalence weakening the relationship between attitudes and behaviour. Two studies hypothesised a positive moderating role. The other seven studies either did not formulate distinct moderating hypotheses or did not clarify the direction (i.e., positive or negative) of the moderating role of ambivalence. For example, a full design was employed in three studies that tested all interaction effects of the IV with ambivalence without very distinct hypotheses (Barata & Castro, 2013; Costarelli & Colloca, 2004; Povey et al., 2001).

In addition, there was a large variety in the types of IV–DV relationships studied. The attitude–behaviour or the attitude–intention relationship was most frequently studied (Barata & Castro, 2013; Berndsen & Van Der Pligt, 2004; Castro et al., 2008; Costarelli & Colloca, 2007; Jylhä, Ojala, Odisho, & Riise, 2023; Povey et al., 2001; Puteri et al., 2022), but the IVs varied between risks and benefits (Onwezen et al., 2017), subjective norm, perceived behavioural control, dietary group (Povey et al., 2001), ecological self-identity (Barata & Castro, 2013; Povey et al., 2001), perceived innovativeness (Onwezen et al., 2019), manipulation of social proof (Venema et al., 2020), worry (Jylhä

Table 3
Overview of found effects of ambivalence as mediator on behaviour/intentions.

Mediation effect	Objective ambivalence (number of studies)	Subjective ambivalence (number of studies)	Subjective ambivalence -indirect[a] (number of studies)	Total effects (number of studies)
Full mediation	0	5 (5)	1 (1)	6 (6)
Partial mediation	2 (2)	2 (2)	0	4 (3)
Mediation not confirmed	1 (1)	4 (2)	3 (2)	8 (4)
Total	3 (3)	11 (9)	4 (3)	18 (13)

[a] As the indirect measure of SA through mouse trajectories is relatively new, we analysed this separately from the more commonly used operationalisation of SA.

et al., 2023), and norm conflicts (Mouro et al., 2021).

Of the 36 studies, 44 moderator effects were studied in 17 studies (see Table 4), and the results also reflected this diversity in the set-up: in 15 cases, ambivalence moderated the IV–DV relationship negatively. Five analyses observed a positive moderating effect of ambivalence, and 23 analyses did not find an effect. Lastly, the direction of the moderating role was not reported in one case (see Table 4).

More specifically, negative moderating effects indicated that the relationship between the IV and behaviour weakened as ambivalence increased. For example, ambivalence towards a meat diet (Povey et al., 2001), climate-friendly food choices (Jylhä et al., 2023), or suboptimal food (Puteri et al., 2022) showed weaker correspondence between their attitudes and intentions. Moreover, as ambivalence towards recycling increased, the strength of the attitude–intention relation weakened (Castro et al., 2008; Costarelli & Colloca, 2007), and both the intention–behaviour relation and the ecological identity–behaviour relation decreased (Barata & Castro, 2013). Onwezen et al. (2017) showed that the relation between risk and intention to buy bio-based products decreased for ambivalent persons (SA). This was, as hypothesised, not the case for the relation between benefits and intention. Table 4 also shows that, in contrast to recent theories on ambivalence, no differences in direction or effects were found when OA and SA were compared.

Regarding the deviating results, five analyses showed a positive moderating effect of ambivalence: as ambivalence increased, the predictive power of the IV on DV also increased. In three analyses, Castro et al. (2008) and Barata and Castro (2013) showed that the intention–behaviour relationship increased for persons highly ambivalent about recycling, although negative and no moderator effects were also found in both studies. Onwezen et al.'s (2017) study showed a positive moderating role of SA on the perceived innovativeness of new protein products such as insects and seaweed and consumption intention.

Lastly, 23 effects were not confirmed. Of those 23 not-found effects, 18 were from three studies that tested a full research design, including all possible not-theorised interaction effects (Barata & Castro, 2013; Costarelli & Colloca, 2004; Povey et al., 2001). Two other 'no effect found' were hypothesised and confirmed in Onwezen et al.'s (2017) study, as SA moderated only risks and not benefits. Although Jylhä et al.'s study (2023) did find an interaction effect of OA with attitudes, it did not find an interaction effect of ambivalence with worry. Lastly, Puteri et al. (2022) hypothesised a moderating role of SA on the relationship between attitudes and intention to consume suboptimal food, which was not confirmed.

Summarising, the evidence suggests that ambivalence has a negative moderating role in IV–DV relationships. However, the evidence is less robust than ambivalence's negative direct effect on behaviour. In contrast to recent theories on ambivalence, no distinct differences between OA and SA were found when the moderating effects or direction of effects were compared.

Table 4
Overview of effects of ambivalence as moderator on behaviour or intentions.

Moderation effect	Objective ambivalence (number of studies)	Subjective ambivalence (number of studies)	Total effects (number of studies)
Negative	7 (6)	8 (6)	15 (11)
Positive	2 (2)	3 (2)	5[a] (4)
No effect found	16 (4)	7 (5)	23[b] (8)
Unknown		1 (1)	1 (1)
Total	25 (8)	19 (10)	44 (17)

[a] Three out of 5 positive moderator effects were beforehand hypothesised and confirmed.

[b] Eighteen out of 23 'no effect found' were analysed with a full design, meaning interaction terms were included without clear hypotheses. Two other of the 'no effect found' were beforehand hypothesised and confirmed, as ambivalence only moderated risks and not benefits.

3.3.4. Environmentally friendly versus unfriendly behaviours

As mentioned in the introduction, research does not theoretically distinguish between the two types of behaviours. For example, a negative effect is hypothesised for both types of behaviour. To investigate if this is indeed the case, we have differentiated the type of behaviour for all found effects (see Appendix D; Tables D.1 to D.3).

Regarding the direct effect, almost all environmentally unfriendly behaviours had a negative effect of ambivalence on behaviour (nine out of 11 effects). This association was still present for environmentally friendly behaviours but less strongly (20 out of 35 effects). All other effects that had a positive or no association concerned environmentally friendly behaviour; only two of the other 15 effects concerned environmentally unfriendly behaviour.

A similar pattern was found for the mediator effects. Five out of 7 mediator effects were confirmed for ambivalence about environmentally unfriendly behaviour, whereas only partial (four) or no mediator effects (six) were found for environmentally friendly behaviour.

Finally, the picture for moderator effects is more diffuse. Of the 44 moderator effects described, only seven involved ambivalence about environmentally unfriendly behaviours, and five showed no effect. The moderator effects of ambivalence about environmentally friendly behaviour are scattered: one-third involve a negative moderator effect, some a positive effect, and about half a not-found effect. We should interpret these not-found effects cautiously; three studies on environmentally friendly behaviour used a full design, inflating the effects.

The overall pattern shows a more distinct negative direct effect of ambivalence about environmentally unfriendly behaviours than about environmentally friendly behaviours.

4. Discussion

This systematic review synthesises findings from 36 studies on ambivalence's direct, mediating, and moderating effects on environmental behaviours. Ambivalence can act as a barrier to environmentally friendly behaviours (activating ambivalence regarding recycling could lead to less recycling) and as a motivator to change environmentally unfriendly behaviour (activating ambivalence regarding meat consumption could reduce meat consumption). Empirical results of mediator analyses support the assumption that the averse feeling of SA and not OA plays a crucial role in behaviour change.

4.1. Strengths

This systematic review of empirical studies makes a novel contribution to the literature in five aspects. First, it integrates the findings of 36 studies by systematically analysing how ambivalence relates to behaviour. We have analysed the findings methodically to accommodate the richness of the data while simultaneously simplifying the data. Second, by creating an overview of the construct's different operationalisations, we have identified methodological issues that must be resolved. A third strength of this review is that it advances the latest theoretical thinking on ambivalence. Based on empirical findings, this review points to a novel hypothesis that ambivalence might play a different mediating role in environmentally unfriendly behaviours than in environmentally friendly ones. Fourth, the fact that ambivalence can be manipulated and felt more strongly in some contexts than in others might provide a concrete entry point to change behaviour on an applied level.

4.2. Limitations

This review was limited by some methodological constraints. Some weak research designs and a lack of validated and standardised operationalisations of OA and SA hindered comparisons between studies. Also, as this review focuses on the environmental domain, results may not be generalisable to other domains. In addition, the majority of

studies were conducted in Western societies and might not apply to other societies. Research shows that a defensive response to ambivalence is more prevalent in Western cultures than in Eastern societies that embrace paradox (Pang, Keh, Li, & Maheswaran, 2017; van Harreveld et al., 2015).

4.3. Discussion per research question

This review answers the following research questions: 1) In what ways and contexts has ambivalence towards environmental behaviours been studied? 2) How is ambivalence operationalised in studies of environmental behaviours? 3) What is the relationship between ambivalence and environmental behaviours? Following the structure of these research questions, we draw conclusions, point to shortcomings, weaknesses, and gaps, and formulate recommendations to advance research on ambivalence in the environmental domain.

4.3.1. In what ways and contexts has ambivalence towards environmental behaviours been studied?

4.3.1.1. Imbalances in topics. This review highlights two imbalances in behaviours studied. Regarding the first imbalance, some environmental behaviours, such as mobility, water/energy, or nonactivist behaviours in the public sphere (e.g., petitioning, donating) are rarely studied. One explanation is that certain environmental behaviours, such as energy behaviours, may be less conspicuous (Hargreaves, Nye, & Burgess, 2010) and elicit less ambivalence than behaviours like meat consumption. Second, behaviours influenced by the context, such as car driving, might also elicit less ambivalence as people feel their perceived behavioural control is low (Dütschke, Engel, Theis, & Hanss, 2022) and their mobility behaviour is steered by context. Based on the goal framing theory, we suggest that it is particularly interesting to study behaviours when a clash can be assumed, such as behaviours with a strong normative value (meat consumption, air travel).

Regarding the second imbalance, this review showed that ambivalence about environmentally friendly behaviours is more studied than ambivalence about environmentally unfriendly behaviours, with the exception of meat consumption being studied more than meat alternatives. The skewness towards environmentally friendly behaviours is important to highlight, as social norms seem to be shifting for some environmentally unfriendly behaviours, such as flying (Doran, Pallesen, Böhm, & Ogunbode, 2022; Gössling, Humpe, & Bausch, 2020) and meat consumption (Croney & Swanson, 2023; Ostermann & de Barcellos, 2021). Ambivalence about those behaviours will likely increase as positive attitudes ('I enjoy my tropical island holiday') and negative attitudes ('flying is bad for the environment') are activated. Also, mediator results showed that the effect of SA was more distinct for environmentally unfriendly than for environmentally friendly behaviours (see also 4.3.3), so more research on environmentally unfriendly behaviours might be desirable.

4.3.1.2. Limitations in research designs. The review has also identified weak elements in research designs. Half of the studies in this review consisted of convenience sampling, and half did not employ an experimental design. The first might impede the external validity of findings, and the second might hinder establishing causal relations between ambivalence and behaviour. In addition, most studies employed behavioural intention or self-reported behaviour as DV, implying a possible risk of self-report bias. Some studies predicted current behaviour (as DV) with future intentions about that behaviour (IV), although both variables were measured simultaneously.

Moreover, most studies in this review measured ambivalence as a static given, e.g., one is ambivalent about recycling or not. Yet, current literature points to the dynamic and contextual character of ambivalence (Schneider & Schwarz, 2017; van Harreveld et al., 2009). For example, a flexitarian might not feel conflicted eating meat with carnivore friends. However, in the company of vegetarian friends, the choice option might activate SA about eating meat. Most studies included in this review have not considered the dynamic character of ambivalence. Experimental designs that explore the dynamic character of ambivalence help identify boundary conditions of activation (e.g., reference groups, activated goal frames) for the theory on ambivalence.

We propose the following recommendations concerning the context and how ambivalence in the environmental domain can be studied to advance the field:

a) We advocate for more research on ambivalence and environmentally unfriendly behaviours, such as flying, fossil-fuel car driving, and energy behaviours, to better understand the conditions under which SA is likely to arise and how SA affects these behaviours.
b) We plead for more rigorous research designs, preferably more (field) experiments and measuring actual behaviour instead of behavioural intentions.
c) Experimental designs that activate ambivalence through contextual manipulations enable more profound insight into causal relations and boundary conditions.

4.3.2. How is ambivalence operationalised in studies of environmental behaviours?

4.3.2.1. Lack of uniformity in operationalisations. The terminology of the OA and SA constructs varied widely between studies; no consistent labels have emerged over time. Studies also differed in the operationalisations of both SA and OA; 23 different methods were employed in 36 studies, demonstrating a lack of consistent operationalisation of the constructs. This reflects the results of a scoping review on methods to assess ambivalence towards food, which identified 18 different methods in 45 studies (Hayashi et al., 2023).

4.3.2.2. Methodological limitations: subjective ambivalence. We found many different operationalisations of SA. No scale development procedure was followed for the most used scale - Priester and Petty's - as that study aimed to investigate the relationship between OA and SA. Second, a novel SA method with mouse trajectories has been developed. Schneider et al. (2015) conclude that this method taps more into the experience of SA than of OA. However, Puteri et al. (2022) found that mouse trajectories and self-reported SA were weakly correlated, which leaves open what this method measures, and how it relates to SA and OA. Third, the Meat Ambivalence Questionnaire is an example of methodological advancements in the field. However, this scale has limited applicability to other behaviours, as this scale taps into dimensions specific to meat consumption (notably, animal, health, and sensory-based conflicts).

4.3.2.3. Methodological limitations: objective ambivalence. Even more than SA operationalisations, OA operationalisations differed greatly between studies in terms of the number of items, the specific items measuring the attitudes, and the instruction added to the questions. Ambivalence research could learn from operationalisations of other domain-specific constructs that found ways to standardise operationalisations in different contexts, such as the domain-specific innovativeness construct (Goldsmith & Hofacker, 1991). Using a vested method for scale development and our pool of OA items from the included studies (see Appendix C) could be a starting point to develop a standardised item mode, allowing for adaptions in introductory texts and wordings in items for specific behaviours. In addition, Ullrich, Schermelleh-Engel, and Böttcher (2008) warned against biases by using a composite OA score from two attitudinal dimensions, with the danger of finding disputable moderator effects.

We have formulated the following methodological

recommendations:

a) For a shared understanding and possibilities to build upon each other's work, we propose a consistent use of the terms objective ambivalence and subjective ambivalence, as these reflect the difference in constructs well and seem most widely accepted.
b) The academic field could benefit from sounder methodological investigations of the operationalisations of OA and SA, including the development of domain-specific constructs.
c) Based on the current theoretical reasoning, we suggest focusing on SA using Priester and Petty's (1996) scale.

4.3.3. What is the relationship between ambivalence and environmental behaviours?

This review shows that, in the included studies, ambivalence was linked to environmental behaviours in three ways: as a direct explanatory variable associated with behaviour, as a mediator driving behaviour change, and as a moderator influencing IV–DV relationships. In most studies, hypotheses about direct and mediator effects were quite developed. The rationale for moderator effects was less distinct and sometimes only empirical, i.e., referring to other studies that showed moderator effects. The review also points to a lack of clear hypotheses in some studies, with a subsequent danger of 'fishing' in the data.

4.3.3.1. Direct effects. In line with Fig. 1, which visualises the relations between ambivalence and behaviour, the main outcome of this review shows that ambivalence has a negative direct effect on environmental behaviours: higher levels of ambivalence are linked to lower levels of environmental behaviours – irrespective of the type of ambivalence (objective or subjective) or the type of behaviour (environmentally friendly or environmentally unfriendly). This implies that ambivalence can incentivise changing environmentally unfriendly behaviours and hinder the adoption of environmentally friendly behaviours. There were a few exceptions of studies finding a positive or no effect, but the explanation for these deviating results could be explained by the different research designs (see section 3.3.1).

Recent theories on ambivalence (see 1.1.2) assume that the conflictive experience of SA – and not OA – has a direct negative relationship with behaviour. Not all included studies assumed this premise; 11 of the 36 studies measured only OA. Contrary to this assumption, the evidence did not show distinct patterns in the types of ambivalence about behaviour: for example, both types of ambivalence – OA and SA – showed a negative direct effect of ambivalence on behaviour. For studies that included both types of ambivalence, no clear conclusions could be drawn about which type of ambivalence seemed a better predictor; in some cases, this was OA, and in others, SA.

We consider it plausible that – when SA is not controlled for – an effect of OA can still be found as an indicator of SA, as OA and SA are linked. Second, it might also be possible that the OA study design activates SA, as people need to assess both positive and negative evaluations. People can become aware of their internal inconsistencies by answering the survey questions. Third, and a more theoretically reasoned explanation, the literature suggests two possible explanations for why ambivalence negatively affects behaviour. The first hypothesis considers ambivalence as a measure of (weak) attitude strength, and the second that the unpleasant nature of ambivalence stimulates a person to resolve internal inconsistencies. Both statements may be correct, with the first statement referring to OA and the second referring to SA. In that case, OA still impacts behaviour negatively but with less transformative power, as it only reflects the underlying division in attitudes. SA would then be the most important driving force in behaviour change. In addition, from an applied viewpoint, SA can be manipulated more than OA, which is unconsciously present in a person. In light of these arguments, we suggest focusing on SA and not OA to research ambivalence in the context of environmental behaviours, although deepening methodological research on the constructs of ambivalence is still desirable.

4.3.3.2. Mediator effects. Studies confirmed a mediating role of ambivalence in environmental behaviours; ten out of 15 mediation analyses demonstrated a (partial) mediating role of ambivalence. For example, Pauer et al. (2022) showed in a serial mediation model that SA mediated meat salience on the intention to eat less meat. In line with recent theories on ambivalence, mainly SA and not OA was studied as mediator and also more often confirmed than OA. Overall, the results point to SA as an underlying mechanism towards behaviour change. The mediator effect seems more prominent for ambivalence about existing behaviour, for example, meat consumption, than for desired behaviour, for example, carbon-free travelling (see also section *Environmentally friendly and unfriendly behaviours*).

4.3.3.3. Moderator effects. In Fig. 1, which presented all relations of ambivalence with behaviour, the direction of the moderating effect was unclear; prior research hypothesised and found both positive and negative effects. The empirical findings show that ambivalence moderates the relationship between explanatory variables and environmental behaviours mainly negatively, e.g., as ambivalence increases, the association between attitudes and behaviour becomes less strong. However, positive effects or no effects were also found. Moderator analyses of the included studies seemed more exploratory, and the evidence was less strong than the findings of the direct effects. A lack of validated standardised measurements of ambivalence in the studies makes it difficult to reach conclusions about the direction of the moderator effect of ambivalence. Theoretical clarification of the moderating role of OA and SA and improved methods and research designs could help answer this question.

4.3.3.4. Environmentally friendly and unfriendly behaviours. Ambivalence has a negative direct effect on both types of behaviours: ambivalence about recycling leads to less recycling, and ambivalence about meat consumption leads to less meat consumption. From a theoretical perspective, the aversive feeling of SA wants to be alleviated in both cases, but resolving ambivalence takes different paths for current and new behaviour (Rothman, Pratt, Rees, & Vogus, 2017). For existing (environmentally unfriendly) behaviours, each time one performs the behaviour, SA prompts a reassessment of one's current behaviour, leading to chronic ambivalence and a heightened motivation to resolve ambivalence (Pauer, 2022) through reduction or avoidance of the current behaviour and adoption of new behaviours, e.g., 'I reduce my meat intake and eat more meat alternatives'. In contrast, ambivalence about desirable environmentally friendly behaviours signals that the new behaviour needs to be reassessed, resulting in the opposite: resistance to behavioural change, e.g. 'I continue driving my fossil fuel car as travelling by train takes too much time and hassle'.

In addition, the mediator analyses point to a more distinct effect of ambivalence on environmentally unfriendly behaviours than on environmentally friendly ones, which might be explained by these two different paths. These findings should be interpreted cautiously because of a lack of effect sizes, differences in the types and operationalisation of ambivalence, and differences in behaviour characteristics (frequency, visibility, etc). Nevertheless, elaborating on this line of thought can sharpen assumptions about how ambivalence mediates behaviour change.

The mediating role of SA in environmentally friendly behaviours is different from unfriendly behaviours where the aversive feeling of SA is the incentive to modify the behaviour. In the case of desired environmentally friendly behaviours, the empirical studies in our review hypothesise that SA should be lowered to increase the desired behaviour. However, lowering SA – the incentive to resolve the ambivalence – also lowers the stimulus for change. In short, the mediating effect of SA

on behaviour change might particularly work for chronic ambivalence about current (environmentally unfriendly) behaviours and, to a much lesser extent, for desired environmentally friendly behaviours. This novel hypothesis requires more investigation.

Lastly, whilst reflecting on these two types of behaviour, it is also important to highlight that the distinction between ambivalence about environmentally friendly and unfriendly behaviours is somewhat artificial. Ambivalence about environmentally unfriendly behaviours can encompass attitudes toward alternative behaviours and can be experienced as a singular conflict. Moreover, being torn between two alternative behaviours can even elicit SA (van Harreveld et al., 2009). However, as most studies focus on ambivalence toward a specific behaviour without including an alternative behaviour, and the routes to resolve ambivalence seem to be different for the two behaviours, it remains academically important to differentiate.

Concerning studying the link between ambivalence and behaviour, we recommend the following:

a) A comprehensive model of how ambivalence impacts behaviour should be developed. Authors should build upon that model, extract appropriate and clearly defined hypotheses before starting the research, preferably through pre-registration to prevent 'fishing' in the data.
b) The field could be further developed by more explicit theorisation of the different effects of ambivalence on behaviour, whether direct, moderator, or mediator effects.
c) Research is necessary to flesh out and confirm whether SA indeed has a more distinct mediating effect on existing environmentally unfriendly behaviours than desired friendly ones.

5. Implications for the real world

As climate urgency increases and behaviour change is necessary and inevitable, understanding ambivalence about environmental behaviours becomes increasingly important. In practice, there may be hesitation to activate aversive feelings, such as ambivalence, for fear that this will result in resistance. However, this review shows that the aversive feeling of SA plays a pivotal role in behavioural change. Not only can SA be manipulated by situational cues, but ambivalent people are also more susceptible to persuasion. Activating ambivalence about environmentally unfriendly behaviour in a choice situation can help inhibit behaviour. For example, increasing ambivalence about meat consumption could decrease consumption, as ambivalence is shown to impede behaviour. Repeated activation of ambivalence could help steer people towards alternative environmentally friendly behaviours and facilitate the much-needed transition towards environmentally friendly lifestyles.

CRediT authorship contribution statement

Marije J.Van Gent: Writing – original draft, Visualization, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization. **Marleen C. Onwezen:** Writing – review & editing, Supervision, Methodology, Formal analysis, Conceptualization. **Reint Jan Renes:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Michel Handgraaf:** Writing – review & editing, Supervision, Conceptualization.

Declaration of competing interest

None.

Acknowledgements

H.S. Schmidt contributed to this study concerning the development of the search strategy and data extraction and as a second reviewer of articles. M. Krikke assisted as a second reviewer of articles in the second search. We thank Catherine O'Dea for the English proofreading. This work was supported by NWO, the Dutch Research Council as main funder (grant number: 023.017.055) and also funded by the Dutch ministry of agriculture, nature and food quality (KB37-Healthy and safe food systems).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2024.102311.

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