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Review Article

"Thought for food": A systematic review of how psychological state factors affect sustainable food outcomes

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ABSTRACT

Given the harmful environmental, social, and economic impacts of our current food system, it is essential to develop a comprehensive understanding of how to effectively shift consumers towards more sustainable food options. Since consumers' psychological state variables are highly susceptible to change, identifying those that significantly influence sustainable food outcomes (i.e., attitudes, intentions, behaviours) is crucial for both policymakers and marketing professionals.

Therefore, this review synthesises scientific research on consumers' psychological state variables and examines how these variables influence sustainable food outcomes. In doing so, this review includes a wide range of sustainable food types, covering environmental, social, and economic dimensions of sustainability. A systematic search across three online databases (Web of Science, PubMed, and Scopus) for quantitative and qualitative studies resulted in 290 relevant articles for full-text analysis.

Eight dimensions of highly researched psychological states were identified: Attitudes, subjective norms, perceived behavioural control, perceived barriers and resources, pro-social values, individualistic values, self-identity, and emotions. Relevant for intervention communications, we found strong evidence for the positive effect of specific attitudes (e.g., attitude towards meat alternatives) but not for more general pro-environmental attitudes. There was also strong evidence for an association between knowledge and sustainable food outcomes. Additionally, research gaps were identified, especially with regards to plant-based eating as findings indicate that some consumers hold beliefs about the healthfulness, price and needed cooking skills of plant-based diets that potentially negatively influence consumer outcomes.

Overall, this paper identifies key opportunities for policymakers and marketing professionals to encourage sustainable food outcomes among consumers, such as designing educational campaigns to address misconceptions, or creating visually appealing packaging that enhances product visibility and communicates its value.

1. Introduction

Food plays a fundamental role in both human and planetary health, yet current food consumption patterns are increasingly harming our environmental, social and economic systems. On an environmental level, the main impacts of the food system include greenhouse gas emissions, with the current food system accounting for approximately one third of global emissions (Crippa et al., 2021), water pollution and a loss of biodiversity (Reisch et al., 2013). On a social level, poor-quality diets are a major contributor to non-communicable diseases, accounting for 75 % of all diseases and 85 % of deaths in Europe, significantly increasing healthcare costs (European Public Health Alliance et al., 2019). At the same time, approximately 280 million people worldwide are facing severe food insecurity and suffering from hunger (European Commission, 2024). Furthermore, economically, the global food system is dominated by a few large corporations, leading to an unequal distribution of profits at the expense of many smaller, fragmented actors in the food supply chain (FAO, 2022).

These interconnected issues underscore the need for a large-scale shift towards a more sustainable food system. While consumers represent only one part of the broader food system, their collective actions play a critical role in driving this transformation (Polyportis et al., 2024). As such, it is crucial to explore how individuals can be encouraged and empowered to alter their consumption patterns, enabling them

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to contribute to more sustainable food practices. Therefore, this research will review the available evidence concerning the relationship between psychological state variables and sustainable food outcomes —specifically attitudes, intentions, and behaviour. Moreover, behaviour includes consumers' choices and purchases of food, as well as their consumption of food products (Verain et al., 2015). These outcomes represent distinct but interconnected stages in the decision-making process that drive sustainable diets. Understanding how psychological factors influence each of these stages provides a more comprehensive view of what motivates or hinders the adoption of sustainable diets. According to the Food and Agriculture Organization of the United Nations (FAO, 2010, p. 27), sustainable diets are "those diets with low environmental impacts which contribute to food and nutrition security and healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimising natural and human resources".

Transforming the global food system to align with these principles is a worldwide priority (European Investment Bank Group, 2024). Various (political and policy) initiatives started to address this current sustainability challenge (Sedlacko et al., 2013). On an international level, these efforts encompass the introduction of the European Green Deal (*The European Green* European Commission, 2021), the Paris Agreement (United Nations, n.d.), the UN Sustainable Development Goals (European Commission, 2016) and the EU Common Agricultural Policy (CAP) (CAP At A Glance, 2024), which all call for coordinated efforts towards building a sustainable future for people and planet. National actions have been undertaken in several countries as well, such as the introduction of official dietary guidelines with explicit recommendations for sustainable food consumption (Food-based dietary guidelines, n.d.). Furthermore, several initiatives have also been implemented by private actors in the food sector, such as the Fair Trade Advocacy Office (FTAO), who play a crucial role in driving policy changes to support fair trade practices.

Despite these efforts, current food consumption patterns remain significantly misaligned with these principles of sustainability (Global Nutrition Report, 2021). Recognizing the key role of dietary change in both human and planetary health (Polyportis et al., 2024), it is crucial to understand how to truly shift individuals towards more sustainable diets. The role of psychological state variables, such as perceptions, beliefs, values or emotions, in this regard can be particularly important. A psychological variable is a measurable characteristic or construct that is often used in psychological theories (e.g., Theory of Planned Behaviour, Social Cognitive Theory) to explain an individual's thoughts, feelings, or behaviours (Ajzen, 1991; Bandura, 1986). This review focuses on psychological *states* – as opposed to *traits* – as these variables are more dynamic and can vary across time as a function of the situation the person encounters (Chaplin et al., 1988). Given that these variables are rather fluent and can be influenced by external or situational factors, examining these variables can be very meaningful to inform interventions or policies aiming to enhance food sustainability. By understanding how these variables operate and affect attitudes, intentions or behaviour towards sustainable food, policymakers and practitioners can develop targeted strategies that effectively motivate change, tailoring interventions to address specific psychological drivers that influence these food outcomes.

Numerous articles have already explored the role of these psychological variables in promoting sustainable food outcomes, often supported by psychological theories. As an example, the three key constructs of the Theory of Planned Behaviour (TPB, Ajzen, 1991), attitudes, perceived behavioural control and subjective norms, are often used to predict behavioural intentions for sustainable food consumption (Bhutto et al., 2022; Chen, 2020; Martini et al., 2024). These intentions, in turn, are considered to be predictors of consumers' planned behaviour (Ajzen, 1991). Additionally, literature evidences that knowledge or awareness of the environmental impacts of food choices is also positively related to sustainable choices (Kamboj et al., 2023; Synodinos et al., 2023). However, the former does not always translate into sustainable food practices due to perceived barriers, such as high costs or limited availability (Chang et al., 2021). Additionally, personal values—whether pro-social (caring for the environment and society) or individualistic (focused on personal benefits, such as health)—have also been found to influence sustainable consumption decisions (Kaygisiz et al., 2019; Kopplin and Rausch, 2022). These findings already highlight the multifaceted nature of the diverse psychological state variables that influence sustainable food outcomes.

Despite this growing body of research, a comprehensive synthesis that identifies the most impactful states—and those requiring further investigation—remains absent. Existing reviews on sustainable food have investigated this to some extent, however, they were often limited in scope. For instance, Aguirre Sánchez et al. (2021) focused exclusively on university students as a specific subgroup, while the review of Katt and Meixner (2020) only investigated a specific food category, i.e., organic food. Additionally, Randall et al. (2023), restricted their analysis to the psychological variables from a single theoretical framework, i.e., the Theory of Planned Behaviour, thereby excluding other important predictors from the analysis.

This review aims to address this gap by systematically synthesizing evidence on the role of psychological state variables in shaping sustainable food outcomes (i.e., attitudes, intentions, behaviour). In doing so, this review will consider multiple sustainable food types, beneficial on one or more dimensions of sustainability (e.g., plant-based food, local food, fair trade food) and therefore contribute to a sustainable diet. This allows to identify which food types have received the most research attention and highlights those that may be underexplored. The findings from this review will provide valuable insights and recommendations for key stakeholders, such as policymakers, food industry leaders, and other researchers, to effectively encourage sustainable consumer practices and drive meaningful change in the food system.

2. Methodology

This systematic review was conducted following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines for reporting (Page et al., 2021). This method was chosen because it offers a structured framework that ensures a transparent, systematic, and replicable process for identifying, selecting, and synthesizing relevant literature.

Prior to the formal screening of studies against eligible criteria, the review protocol was preregistered via the international prospective register for systematic reviews, i.e., PROSPERO (case number: CRD42024538965). As the research involves the use of secondary literature sources, no ethical approval was required.

2.1. Search protocol

The literature search was conducted in April 2024 using the following electronic databases: Web of Science, PubMed and Scopus. This review is part of a set of multiple systematic reviews, aimed at gaining insight into all individual, social, physical environmental and digital environmental factors that drive or inhibit sustainable food consumption behaviour. To be more efficient with time and resources, one extensive search string was developed and used for this set of systematic reviews. Keywords relevant for this particular study concerned a range of psychological state variables (e.g., attitude, value, knowledge) that appeared relevant in the literature, keywords referring to sustainable food types (e.g., plant-based, local, fair trade), as well as keywords concerning sustainable eating-related attitudes, intentions and behaviours (e.g., purchase, consumption) as the outcome. In addition to being a key outcome, attitudes were also included as a psychological state variable, given their role as predictor in several important theoretical

frameworks (e.g., the Theory of Planned Behaviour, Ajzen, 1991). We piloted the search string in Web of Science to test its effectiveness and made adjustments to enhance its precision and relevance. The final search string was adapted to the syntax of each database and is available in the supplementary materials.

2.2. Selection criteria

The articles included in this systematic review examine various psychological state variables that drive sustainable food outcomes. The selection criteria can be consulted in Table 1 below.

2.3. Study selection

Two authors (L.G. & L.H.) independently screened and reviewed articles for inclusion. Any discrepancies were addressed through discussion and consensus and persistent disagreements were resolved via a third reviewer (T.S.).

All retrieved articles from the three databases (n = 12,942) were exported to a database management software, Zotero. The screening process began with the removal of duplicates with the SR Accelerator software (Bond University, 2022) (see Fig. 1). Then, the remaining articles were screened based on title and abstract. After title and abstract screening of the initial database (for the set of reviews), all articles were categorized into the different review topics. For this particular review on psychological state variables, 602 articles were considered to be eligible for full text screening. The selected articles were screened thoroughly to determine eligibility, guided by the inclusion and exclusion criteria. Out of these 602 articles, 290 were ultimately included in the systematic review. Additionally, a backwards search was conducted; however, no additional papers were included. A summary of included papers is presented in the supplementary materials.

Table 1
Overview of inclusion and exclusion criteria.

Category	Inclusion	Exclusion
Publication Type	Peer-reviewed articles	Review articles, meta-analyses, conference abstracts, dissertations, books, and book chapters
Publication Date	Published between 2014 and 2024. This timespan was chosen because of the noticeable rise in scientific interest in sustainable food consumption that emerged around 2014 and has continued to grow since (Kristia et al., 2023).	Published outside the 2014–2024 period
Language	English	Non-English
Research Design	Both quantitative and qualitative research	Studies that do not explicitly investigate the relationship between psychological state variables and sustainable food outcomes
Setting Variables	Lab setting or natural setting psychological state variables (operationalized as personal variables that are modifiable, meaning they are not fixed traits but rather dynamic factors that can be influenced over time) and sustainable food outcomes (attitudes, intentions, or behaviours such as purchase or consumption)	/ Studies that do not examine psychological state variables or do not explicitly assess the relationship with sustainable food outcomes; studies with the outcome "willingness"; behaviour change campaign studies
Sustainable food	Studies that investigate food and non-alcoholic beverages that contribute to at least one of the three dimensions of sustainability (environmental, social, economic)	Studies that investigate Genetically Modified Organisms (GMO)
Target group	No exclusion criteria based on gender, age, or nationality	Studies exclusively focused on populations with specific diseases or conditions (e.g., diabetes, cancer, eating disorders) or clinical populations (e.g., hospital patients); studies where these groups make up more than half of the sample

2.4. Data extraction and analysis

Two authors (L.G. & L.H.) independently and manually extracted data from the included studies. A total of 290 articles were included in the review, encompassing 298 individual studies. A customized data extraction form was created in Excel, capturing the following information: study characteristics (e.g., authors, year of publication, country of data collection, population (e.g., sample size, sampling method, age, gender), psychological state variables, theoretical framework, outcome variables (food type, attitudinal/intentional/behavioural outcome) and results (e.g., analysis technique, quantitative and/or qualitative results). Authors were contacted to obtain missing information. This form served as the foundation for analysing the results of this review.

To present the wealth of data as clearly as possible, only the most frequently mentioned psychological state variables will be discussed hereafter, based on an in-depth and qualitative assessment of all reported effects. Given the broad scope of this review and the substantial differences between the studies, a quantitative meta-analysis was not feasible (Borenstein et al., 2009).

2.5. Quality assessment

Two authors (L.G. & L.H.) independently assessed the quality of the included studies using the Mixed Methods Appraisal Tool (MMAT) (Hong et al., 2018). Disagreements were resolved through discussion and consensus. The MMAT is a critical appraisal tool that is designed for the appraisal stage of systematic mixed studies reviews, i.e., reviews that include qualitative, quantitative and mixed methods studies. It allows authors to assess the methodological quality of five categories of research designs: qualitative research, randomised controlled trials, non-randomised studies, quantitative descriptive studies, and mixed methods studies. Quality was assessed through rating (Yes/No/Can't tell) of five criteria specific to one of the five abovementioned research designs. Some examples of these criteria are with regards to the representativeness of the target population, the appropriateness of the measurements or the risk of non-response bias. 38.3 % (n = 114) of the studies fulfilled ("Yes") four or more of the five criteria and are therefore considered to have a low risk of bias. 54.0 % (n = 161) fulfilled 3 out of 5 criteria and consequently have a moderate risk of bias. Finally, 7.7 % (n = 23) of the included studies only fulfilled 2 or less criteria and therefore have a high risk of bias. As recommended by the authors of the MMAT, all studies were included in the analysis, independently of their MMAT score.

3. Results

First, the research's situational context will be outlined, followed by the findings on the relationship between key categories of psychological state variables and sustainable food outcomes (i.e., attitudes, intentions, behaviour).

3.1. Situational outline of the research

3.1.1. Year and country

The 290 articles included in this review were published between January 2014 and April 2024. There has been a notable increase in peer-

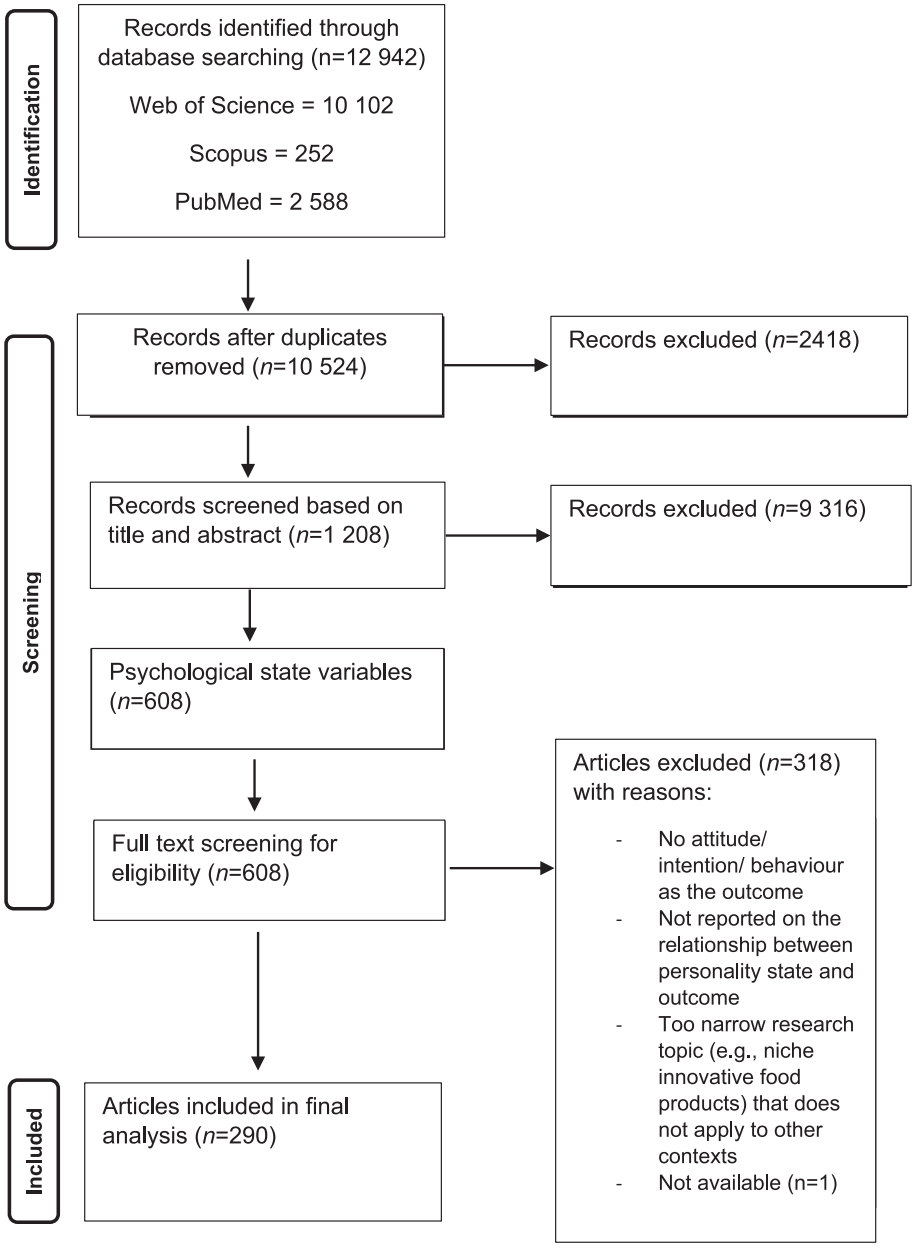

Fig. 1. Flowchart of the article screening process.

reviewed articles about this topic in the last few years, particularly since 2019 (see Fig. 2). This is demonstrated by the publication of 175 studies between 2021 and April 2024, compared to just 44 studies in the initial four years (2014–2017). Since data collection took place in April 2024, Fig. 2 only shows articles published until that moment (See Fig. 3.).

A total of at least 66 different countries were represented in the articles, including 30 cross-national studies. One study did not specify the countries of data collection. The majority of the studies were conducted in high- or upper middle- income countries ($n = 271$; 74.6 %), with the majority in China ($n = 32$), followed by Italy ($n = 26$), Turkey ($n = 19$) and the United States ($n = 17$) (WDI - The World by Income and Region, n.d.). In contrast, a substantially smaller number of 92 studies were conducted in countries classified as low- or lower middle- income countries (25.3 %) such as India ($n = 25$), Pakistan ($n = 16$) or Vietnam ($n = 15$) (WDI - The World by Income and Region, n.d.).

3.1.2. Study design and sample

A total of 290 articles were included in the review, encompassing 298 individual studies. The subsequent analysis in this review is based on this sample of 298 studies.

277 studies (93.0 %) reported on quantitative research, whereas 15 studies (5.0 %) concerned qualitative research and 6 studies (2.0 %) applied a mixed methods design. Most of the quantitative studies consisted of cross-sectional surveys, whereas only three studies (Caso et al., 2024; Onwezen, 2015) used an experimental design, and two studies conducted a survey with a built-in experimental manipulation (Ruzgys and Pickering, 2020; Ryan and Casidy, 2018). Sample sizes ranged from 79 to 50,000 individuals for quantitative cross-sectional studies and from 187 to 726 individuals for the experimental studies. For the qualitative studies, both focus groups and individual interviews were used as research methods. Sample sizes ranged from 10 to 83 participants. Whereas these interviews mostly took place in artificial settings, one study was conducted in a real-life setting by administering accompanied shopping interviews with consumers at the supermarket (Aschemann-Witzel and Aagaard, 2014).

Various outcomes were investigated including attitudes ($n = 99$),

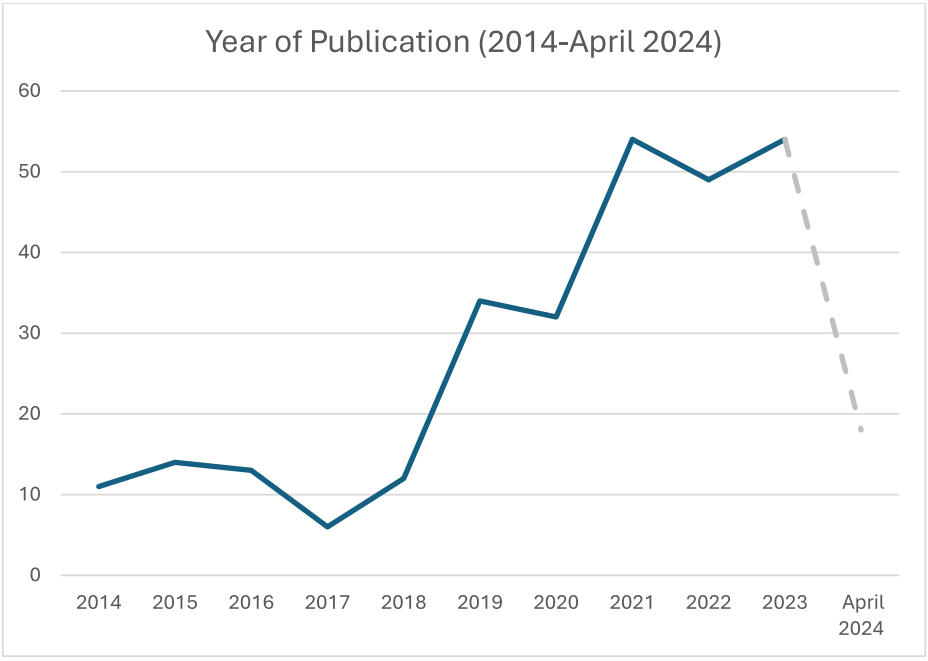

Fig. 2. Publication trends over time for included studies.

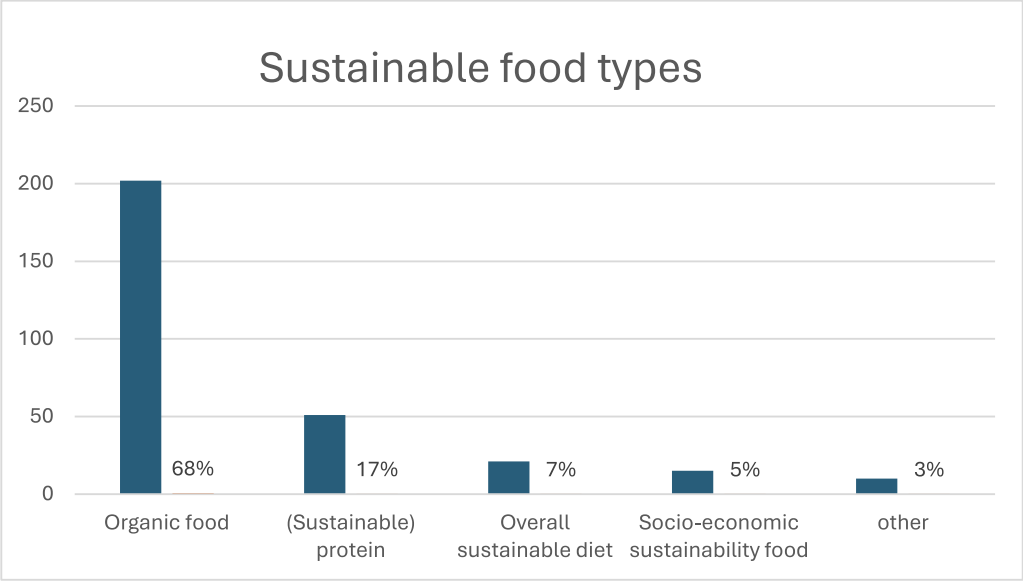

Fig. 3. Categorization of sustainable food types.

intentions ($n = 210$) and behaviours (i.e., purchase, consumption) ($n = 134$). Notably, consumer behaviour was nearly always measured through self-reported methods. Only four studies objectively measured participants' (consumption or purchase) behaviour (Janssen, 2018; Menozzi et al., 2017; Panzone et al., 2016; Testa et al., 2019). For example, Panzone et al. (2016) measured actual sustainable purchase behaviour by tracking consumers' supermarket expenditures from Tesco ClubCards over a period of 12 months. Menozzi et al. (2017) employed a more cost-effective approach for measuring actual consumption. Here, participants were asked to complete a survey about their intentions to try an insect-based product, and the authors later observed whether they actually followed up on that behaviour.

The studies included samples of male and female participants whose age ranged between 5 and 95 years. While most studies achieved a balanced representation of men and women, some studies had a slightly higher representation of female participants. Most studies did not target a specific age group but included participants from a wide age range. However, 33 studies (11.3 %) intentionally focused on a specific age-group, mostly young or middle-aged consumers (e.g., students, Gen Z, Millennials). Notably, only one of the included studies focused exclusively on the older age group (65+) (Drolet-Labelle et al., 2023) and only one study examined the perspective of children (*range*: 5-21y; $M = 11.5$y) (Boaitey and Minegishi, 2020).

Lastly, many articles relied on a theoretical framework to situate the empirical research. In total, 59 different theoretical frameworks were employed in the sample, with the Theory of Planned Behaviour (TPB; Ajzen, 1991) being the most frequently used ($n = 122$), in both quantitative and qualitative studies. However the use of a guiding theoretical

framework in qualitative research was scarce (n = 7/15; 46.7 %). The TPB posits that three key components (i.e., attitude, perceived behavioural control, subjective norms) predict consumers' behavioural intentions. In turn, these intentions are considered to be predictors of consumers' planned behaviours. Other theoretical frameworks mentioned include the Theory of Reasoned Action (n = 14), Norm Activation Model (n = 5) or the Protection Motivation Theory (n = 4).

3.1.3. Categorization of sustainable food types

As this review included all foods that were beneficial on one or more dimensions of sustainability (i.e., environmental, social, economic), a wide variety of sustainable food types was observed, ranging from specific food products (e.g., sustainably labelled coffee; Chen, 2020) to the assessment of participants' overall dietary intake (Panzone et al., 2016; Righi et al., 2023). As certain food types may contribute to multiple dimensions of sustainability, a strict separation of food types into these dimensions is not feasible. Nevertheless, to maintain clarity in the results, we categorized these sustainable food types into five different categories, which are described below.

3.1.3.1. Organic food products. A large majority (n = 201; 67.6 %) of the articles focused on the category of organic (n = 181), green/ecological (n = 19) and natural (n = 1) food products. These terms are often used interchangeably, despite having different standards and certifications, particularly regarding the use of chemicals and farming practices (Ashaolu and Ashaolu, 2020). Either specific product types (e.g., organic beef, dairy, fruit) or "organic food" as a whole were studied.

3.1.3.2. (Sustainable) protein. The second largest category in this review is that of sustainable animal-based and plant-based foods (n = 51; 17.1 %). Studies in this category examined either attitudinal/intentional/behavioural outcomes with regards to the curtailment of less sustainable protein sources, such as meat, or the promotion of more sustainable alternatives. This included plant-based foods and meat substitutes (n = 31), sustainably produced meat and fish (n = 5), and plant-based dairy products (n = 2).

3.1.3.3. Overall sustainable diet. Twenty-one studies (n = 21; 7.0 %) adopted a wider focus on sustainable food products. This category did not focus on one single type of food product (e.g., organic, plant-based products), but instead integrated a diversity of products into the evaluation of one's sustainable eating score. For instance, Gravelines et al. (2022), assessed 'sustainable food consumption' based on several factors, including local/seasonal food, fair trade and healthy foods. Another approach involved analysing one's overall dietary patterns (sustainable and less sustainable products included) and calculating a sustainability score, for example by comparing to the Mediterranean diet guidelines (Caso et al., 2024; Kocaadam-Bozkurt and Bozkurt, 2023; Metin et al., 2024; Yassibas and Bolukbasi, 2023).

3.1.3.4. Socio-economic sustainability food. A total of 15 studies (5.1 %) examined the economic and social welfare aspects of sustainability. Given the strong overlap between these two dimensions in the context of food (Adelaide, 2024), they were combined into a single category. Some studies focused on local food consumption (n = 7), while others investigated fair-trade products (n = 5) or food sourced from short food supply chains (n = 3). For example, Sadeli et al. (2023) explored the key predictors of a new type of short food supply chain (SFSC) that leveraged e-commerce and social media to connect with consumers.

3.1.3.5. Other. Finally, there were ten studies (3.3 %) that fit into none of these food product categories, such as sustainable palm-oil (Sundaraja et al., 2021) or seaweed products (Govaerts and Olsen, 2022). More detail on these food types can be found in the supplementary materials.

3.2. Psychological states influencing sustainable food outcomes

To provide insight into the various psychological state variables and their relationship with sustainable food outcomes, we considered all state variables mentioned in the total sample of 298 studies. Table 1 displays the eight overarching categories of variables that were frequently investigated in this sample and their subcategories beneath them. Additionally it shows the number of studies that revealed a significant association between those categories of psychological state variables and sustainable food attitudes, intentions or behaviours. Additionally, for the three psychological states/predictors of the Theory of Planned Behaviour (i.e., attitude, subjective norms, and perceived behavioural control), the table indicates the number of studies that found a significant relationship out of the total studies examining this theory, as well as the number of studies in which each variable was identified as the strongest. Below Table 2, the results from each psychological state category are further discussed, first regarding the quantitative studies followed by insights from qualitative studies.

3.2.1. Attitudes

In addition to being a key outcome and part of the decision-making process, attitudes also function as predictors of both intentions and behaviour. "Attitude" was the most frequently studied psychological state variable in this review, appearing in 163 different studies (54.7 %), mostly used in combination with the Theory of Planned Behaviour (TPB) (n = 112), or an extended version of this theoretical framework. In 155 of 163 studies (95.1 %), a significant relationship was observed between attitudes and sustainable food outcomes.

In all studies except one (Jiang and Wu, 2022), a positive relationship was found, indicating that a more favourable attitude leads to better sustainable food outcomes, such as increased purchase intentions for organic foods (Bhutto et al., 2022; Kocer et al., 2023; Koklic et al., 2019; Rashid and Lone, 2023). Furthermore, it seems that attitudes can be used to predict a wide variety of sustainable food types such as organic, fair-trade, meat consumption, and overall sustainable food choices. The positive role of attitudes is further supported by qualitative studies. For example, in a focus group study by Vos et al. (2022), participants' favourable attitudes towards healthy and sustainable food were identified as a key driver of their consumption behaviour.

However, general environmental attitudes were less effective in predicting sustainable food outcomes compared to product- or behaviour-specific attitudes. Five out of eight studies examining general environmental attitudes reported a non-significant relationship, particularly with behavioural outcomes rather than intentions (Chauke and Duh, 2019; Chekima et al., 2019; Hansmann et al., 2020; Panzone et al., 2016; Yogananda and Nair, 2019).

3.2.2. Subjective norms

Subjective norms were also frequently (n = 96; 32.2 %) investigated in relation to sustainable food outcomes, 80 times when the TPB was used as a theoretical framework. Subjective norms refer to an individual's perception of social pressure to perform or not perform a particular behaviour. These norms are shaped by the beliefs about whether important people in one's life, such as family, friends, or colleagues, think they should or should not engage in a specific action (Ajzen, 1991). In some of these studies (n = 6), this variable was operationalized through the distinction between descriptive and injunctive norms.

In 80 of the studies (83.3 %), a significant and positive relationship between subjective norms and sustainable food outcomes was stated. This positive association indicates that greater perceived social pressure to act sustainably aligns with stronger attitudes, intentions, and behaviours towards food sustainability. However, one study using actual purchasing data found a negative relationship between subjective norms and organic food purchases (Testa et al., 2019).

Additionally, the source of social pressure also seems to matter.

Table 2
Overview of predictors, their prevalence, and the number / percentage of studies in which they were identified as significant.

Predictor	Recurrence in studies (% of total studies)	Significant predictor of attitudes	Significant predictor of intentions	Significant predictor of behaviour	Evaluation of TPB (n = 69)	
					Significant predictor	Recurrence as most significant predictor
Attitude	*n* = 155 (52.0 %)	/	*n* = 133/137 (97.1 %)	*n* = 24/27 (88.9 %)	*n* = 66/67 (98.5 %)	*n* = 40/67 (59.7 %)
Environmental attitudes	*n* = 8 (2.7 %)	/	n = 5/6 (83.3 %)	*n* = 0/4 (0.0 %)	n = 1/2 (50.0 %)	n = 0/2 (0.0 %)
Subjective norms	*n* = 96 (32.2 %)	n = 9/14 (64.3 %)	*n* = 64/79 (81.0 %)	*n* = 7/10 (70.0 %)	*n* = 58/69 (84.1 %)	*n* = 18/69 (26.1 %)
Perceived behavioural control	n = 96 (32.2 %)	/	n = 69/91 (75.8 %)	*n* = 17/22 (77.3 %)	*n* = 55/69 (79.7 %)	n = 13/69 (18.8 %)
Perceived barriers and resources (tot.)						
Food literacy						
Food literacy knowledge	n = 61 (20.5 %)	*n* = 23/27 (85.2 %)	n = 18/23 (78.3 %)	n = 15/17 (88.2 %)		
Food literacy skills	n = 5 (1.7 %)	/	n = 1/3 (33.3 %)	n = 0/3 (0.0 %)		
Trust	n = 36 (12,1 %)	n = 7/7 (100 %)	*n* = 16/19 (84.2 %)	*n* = 7/10 (70.0 %)		
Price						
Price perception	n = 27 (9.1 %)	n = 6/9 (66.7 %)	n = 8/13 (61.5 %)	n = 7/9 (77.7 %)		
Price consciousness	n = 7 (2.3 %)	n = 1/3 (33.3 %)	n = 1/1 (100 %)	n = 3/3 (100 %)		
Availability	n = 19 (6,4 %)	n = 1/1 (100 %)	n = 7/11 (63.6 %)	n = 7/8 (87.5 %)		
	n = 4 (1,3 %)	/	n = 1/4 (25.0 %)	n = 1/1 (100 %)		
Prosocial values (tot.)						
Moral value	n = 24 (8.1 %)	n = 1/2 (50.0 %)	n = 18/19 (94.7 %)	n = 3/3 (100 %)		
Environmental value	*n* = 92 (30.9 %)	n = 14/25 (56.0 %)	*n* = 33/44 (75.0 %)	n = 18/25 (72.0 %)		
Animal welfare value	n = 11 (3.7 %)	n = 3/4 (75.0 %)	*n* = 2/2 (100 %)	n = 3/4 (75.0 %)		
Social welfare value	n = 9 (3,0 %)	n = 1/1 (100 %)	n = 3/4 (75.0 %)	n = 3/3 (100 %)		
Schwartz' values (universalism)	n = 3 (1,0 %)	n = 1/1 (100 %)	/	n = 2/2 (100 %)		
Individualistic values (tot.)						
Health value	n = 86 (28.9 %)	n = 19/22 (86.4 %)	n = 40/45 (88.9 %)	n = 15/21 (71.4 %)		
Food safety value	n = 23 (7.7 %)	n = 7/8 (87.5 %)	n = 7/10 (70.0 %)	n = 3/5 (75.0 %)		
Self-identity	n = 15 (5.0 %)	n = 4/4 (100 %)	n = 9/9 (100 %)	n = 5/5 (100 %)		
Emotions	n = 27 (9.1 %)	n = 3/3 (100 %)	n = 20/21 (95.2 %)	n = 1/2 (50.0 %)		

Svecova and Odehnalova (2019) found that subjective norms had a significant positive influence from family members, but not from close friends or colleagues (fellow students). In contrast, McInnes and colleagues' (2023) interview study revealed different results, as the participants indicated that cultural and family norms discourage plant-based diets, while peers and social media can make them more acceptable.

3.2.3. Perceived behavioural control

Perceived behavioural control (PBC), i.e., the control a consumer believes to have over one's own behaviour, and the belief that one has the necessary resources and opportunities to engage in that behaviour successfully (Ajzen, 1991), was examined in 96 studies (32.2 %), frequently in the context of the TPB (*n* = 86). Related terms such as self-efficacy (*n* = 6), perceived effectiveness (*n* = 1) or internal locus of control (*n* = 1) were also used (Honkanen and Young, 2015; Bakr et al., 2023; Seffen and Dohle, 2023).

In 81 of 96 (84.4 %) articles, a significant relationship was found between the PBC-variable and a sustainable food outcome. All studies, except for one (Carfora et al., 2022), identified a positive relationship, meaning that the more control consumers perceive over their behaviour (related to consumption and/or purchase), the stronger their intentions or behaviours to engage in it. Furthermore, PBC can be used to predict a wide variety of sustainable food types, as it was significantly associated with food products such as organic food, fair-trade, meat reduction, and sustainable food choices.

Since the Theory of Planned Behaviour was often used as a guiding framework in this sample of studies, its three key components, i.e., attitudes, subjective norms and perceived behavioural control were often used as predictors of sustainable food outcomes. When looking at the studies that evaluated all three key components of the TPB (*n* = 69) together, attitudes emerged as the strongest predictor in 40 of the studies (58 %), followed by subjective norms (*n* = 18; 26.1 %) and PBC (*n* = 13; 18.8 %). In some articles, two predictors were equally strong. More details on these findings can be found in Table 1.

3.2.4. Perceived resources, opportunities and barriers

Closely related to "perceived behavioural control" are the perceived barriers (i.e., time pressure) or resources (i.e., monetary resources) that a person encounters when trying to conduct a certain behaviour. Some articles even used the latter concepts to operationalize PBC, considering it as interchangeable concepts (Contini et al., 2020; Dangi et al., 2020).

Frequently mentioned barriers and resources in this review included food literacy (*n* = 61), trust/scepticism (*n* = 36), price (*n* = 34), availability (*n* = 19) and time (*n* = 4).

3.2.4.1. Food literacy. Food literacy refers to "the ability of an individual to understand food in a way that they develop a positive relationship with it, including food skills and practices across the lifespan in order to navigate, engage, and participate within a complex food system" (Cullen et al., 2015). Among the studies in this review, different aspects of food literacy were discussed, involving both *food-related knowledge* and *skills*.

Food sustainability knowledge (e.g., the knowledge of sustainable nutrition/foods and how they were produced) was examined in 44 studies. It was found to be a significant and positive predictor of sustainable food outcomes in 35 (79.5 %) of the mentioned studies. Knowledge about sustainable products was mainly used to predict outcomes related to organic food. However, it was also used to predict other foods, including plant-based food, local food, adherence to the Mediterranean diet etc.

Another closely related predictor, which was researched in 17

articles, is more general knowledge about sustainability and the consequences of the current food system on the environment and personal health. The majority of these studies (n = 15; 88.2 %) found that the greater consumers' awareness of the environmental/health consequences of their food consumption, the more they were inclined to eat more sustainably.

Qualitative studies supported the importance of knowledge. Sundaraja et al. (2021) found that limited knowledge about palm oil products and their environmental impact hindered sustainable choices. Similarly, older consumers (65+) highlighted awareness of plant-based options and their benefits as key to increasing consumption (Drolet-Labelle et al., 2023).

In contrast, when looking at food literacy skills (e.g., the capability to buy and/or prepare sustainable food), the variable was (partly) significant in only 1 of 5 articles (20.0 %). Despite these quantitative findings, qualitative studies suggest that food literacy skills may play a crucial role in shaping consumers' food consumption behaviours. For example, in the focus group discussions from Mollaei et al. (2023), food literacy (referred to as cooking skills and knowledge about the ingredients) was mentioned as one of the main factors that impacted the sustainability of their food choices. In particular, a lack of cooking skills hindered healthy and sustainable eating, while participants with adequate cooking skills were more motivated to prepare healthy dishes. Similarly, Drolet-Labelle et al. (2023) and Collier et al. (2022) highlighted that knowledge and skills in choosing, preparing, and serving vegetarian ingredients could facilitate the consumption of plant-based proteins and reduction of meat consumption.

3.2.4.2. Trust. The role of trust in the relation with sustainable food outcomes was examined in 36 articles and was mostly used to predict organic food (n = 29) and "labelled" products (n = 4) (e.g., sustainability-labelled food (Rossi and Rivetti, 2023)). Most articles examined consumer trust in the certification and origin of the product, which is evident since the certification of food (e.g., organic) is an important aspect through which organizations can validate and authenticate their claims (Deliana, 2012). Ladwein and Romero (2021), on the other hand, examined trust towards producers and retailers and revealed the significant relation between trust towards retailers (but not producers) and purchase intention of organic food. The association between trust and sustainable food outcomes was positive and significant in 30 of the studies (83.3 %). These results indicate that the more trust consumers have, the more they are inclined to consume it.

Several qualitative studies elaborated more deeply into these trust issues of consumers with regards to organic foods (Yadav et al., 2019; Mughal et al., 2021). Trust was noted as the most relevant factor in buying organic food, particularly due to the perceived lack of regulation and certification (Mughal et al., 2021). Participants expressed confusion about the legitimacy of organic certifications, questioning the validity of such claims (Yadav et al., 2019). Furthermore, consistent with quantitative findings (Ladwein and Romero, 2021), participants often relied on the reputation of retailers and salespeople to assess the trustworthiness of organic labels. A third-party certification approved by the government is believed to resolve these trust issues (Yadav et al., 2019).

3.2.4.3. Price. Price-related variables (e.g., price-consciousness, perceived price) were another frequently mentioned barrier (n = 34) that have mostly been examined in the context of organic food. The perception of price in relation with organic food was examined in 22 studies and had a significant association in 19 (86.4 %). When evaluating the direction of this association, both positive (n = 7) and negative relations (n = 12) have been found. Upon closer examination, it appears that when the perceived price of organic foods is evaluated as "expensive", there is a negative relationship. In contrast, when the perceived price is assessed as "worth the high price" or "good value for money," the relationship with organic food outcomes is positive. These contrasting associations ultimately converge on the same conclusion: high prices for organic foods act as barriers only for those who perceive these prices as excessive relative to the value offered.

In addition, the variable "price consciousness" or "the degree to which the consumer focusses exclusively on paying low prices" (Lichtenstein et al., 1993) was examined in seven studies – all on organic foods- and also showed differential relationships, with some studies showing negative associations (n = 3), while others found positive (n = 2) or no significant associations (n = 2).

These findings on "price perception" and "price consciousness" suggest that the perception of price, rather than the actual cost, plays a significant role in determining organic food outcomes. This conclusion is supported by qualitative research from Aschemann-Witzel and Aagaard (2014), who conducted shopping interviews where participants frequently cited price as a reason for choosing conventional over organic products. Interestingly, even when organic foods were similarly priced to their conventional counterparts, the perceived high cost still acted as a psychological barrier, reinforcing the idea that it is the perception of price, not the actual price, that influences purchasing behaviour (Aschemann-Witzel and Aagaard, 2014).

In contrast to organic food products, in three out of four studies that examined price as a predictor of plant-based food outcomes, a non-significant relationship was found. Additionally, in qualitative studies on plant-based foods, results were also not clear. In one study, participants did mention price as a barrier to consume more plant-based foods (McInnes et al., 2023). On the contrary, Drolet-Labelle et al. (2023) found that the low price of plant-based products (PBP), as compared to meat, were mentioned as advantages and consequently improved consumers' attitudes towards these products. Only when referring to nuts and processed products, participants in this study considered PBP to be more expensive.

3.2.4.4. Availability. 14 of the 19 studies (73.7 %) that examined the perceived availability or convenience of food products identified a significant and positive relationship. This suggests that as consumers perceive sustainable food products to be easier or more convenient to find and purchase, their outcomes related to these sustainable foods improve. This relation was found for a wide range of food types, including organic, local, plant-based and animal-welfare-friendly products.

This perceived availability, particularly the perceived lack of restaurant or supermarket options available, was also highlighted in several qualitative studies as a barrier to both plant-based food adoption (Collier et al., 2022; Drolet-Labelle et al., 2023; McInnes et al., 2023) and the purchase of sustainable palm oil products (Sundaraja et al., 2021).

3.2.4.5. Time. The perception of time pressure or not having enough time to cook/purchase sustainable food, was examined as a potential barrier in four studies, of which two (50.0 %) found a significant relationship (Contini et al., 2020; Xiao et al., 2023). In one study where time pressure did have a significant impact on consumption (Contini et al., 2020), it was in the context of sustainable convenience food, specifically pre-cooked plant-based food. As pre-cooked food already helps to overcome this time barrier in preparing meals, time pressure had a direct positive impact on the consumption of pre-cooked plant-based food (Contini et al., 2020). The study of Xiao et al. (2023) revealed a significant negative association, indicating that consumers with high time pressure have a lower consumption of green food.

Contrary to the mixed quantitative results, in qualitative studies (Collier et al., 2022; Mcinnes et al., 2023) participants did mention perceived time restraints as an important barrier to eat more vegetarian meals and reduce meat consumption.

3.2.5. Prosocial values

Schwartz (1992, p. 21) has defined a value as "a desirable trans-situational goal varying in importance, which serves as a guiding principle in the life of a person or other social entity" and is therefore thought to influence behaviour. *In this sample, two commonly studied values with regards to sustainable behaviour were present, namely prosocial and individualistic (see 3.2.6) values (*Kollmuss and Agyeman, 2002*).* Prosocial values describe actions taken for the benefit of others without expecting personal gain (Wei et al., 2022). In the context of sustainable foods, these values indicate that consumers seek food choices that will benefit others, such as the environment, animals or farmers, with minimal consideration for personal gain. Several subcategories of prosocial values could be distinguished in the sample and are discussed below.

3.2.5.1. Moral value. The overarching concept moral values, referring to the internalized beliefs and a feeling of moral obligation to engage in an altruistic or sustainable behaviour (Schwartz, 1977), was mentioned in 24 studies. In 22 of the 24 studies (91.7 %), personal moral norms were found to have a positive and significant association with various food types such as organic food, overall sustainable diets, and plant-based foods. Given that having a moral compass was also mentioned as a driver of sustainable palm oil product consumption in qualitative methods (Sundaraja et al., 2021), these results suggest that the stronger consumers' perceived moral obligation to consume sustainable food, the more likely their behaviour will align with this commitment.

3.2.5.2. Environmental concern. The concept of environmental concerns or consciousness was examined in 92 studies. It refers to "a general attitude that reflects the extent to which consumers are worried about threats to the environment" (Lee et al., 2014). In 65 of the 92 studies (70.6 %), a significant relationship was found. In all of these articles, except for one (Dong et al., 2022), the association with sustainable food outcomes was positive, meaning that a greater concern towards the environment resulted in a greater inclination towards sustainable foods. This relation was observed for various sustainable food types, e.g., organic, plant-based food, local, fair trade, etc.

The role of environmental concern was also mentioned in several qualitative studies. In the case of meat consumption, environmental concerns were a frequently mentioned topic in participants' interviews as a motivation to consume more plant-based protein (Beacom et al., 2022). However, Collier et al. (2022) found that ambivalence often hindered meat reduction, meaning that even though many consumers wanted to protect the environment by reducing their meat consumption, several other conflicting thoughts such as the enjoyment of meat-eating or health concerns inhibited them from following through on their meat reduction intentions. This ambivalence potentially explains the slightly weaker quantitative results on the influence of environmental concern.

3.2.5.3. Animal welfare concern. Of the 10 quantitative studies that included animal welfare concerns, 8 studies (80.0 %) found a positive and significant association, including one study showing significant results among adults, though not for young children (Boaitey and Minegishi, 2020). All of these articles (n = 10) concerned plant-based alternatives or the reduction of meat consumption, as the meat industry directly impacts animal welfare conditions. These ethical concerns, particularly regarding animal rights, also prevailed in an interview study with vegan and vegetarian consumers as a reason for participants to stop eating meat (Penz and Hofmann, 2021).

3.2.5.4. Social welfare concern. Few studies (n = 6) looked into social-altruistic values as a potential driver for sustainable food outcomes. These socially oriented values refer to the a general concern for the welfare of other people and society (Webster, 1975). Different variations of this variable were present in the sample, e.g., concern for local farmers (Kirmani et al., 2022), social consciousness (Molinillo et al., 2020) and consciousness for fair consumption (Verneau et al., 2016). Social welfare concerns had a significant and positive association with sustainable outcomes in 5 studies (83.3 %), in the context of varying food types such as organic, local and fair trade food.

These socially oriented values were also underscored in two qualitative studies, which highlighted their positive role in supporting sustainable (Mollaei et al., 2023) and organic food choices (Yadav et al., 2019). Specifically, participants were motivated to continue making these sustainable food choices because of the positive impact they felt they were contributing by supporting local businesses and farmers.

3.2.5.5. Schwartz' universalism value. Three articles explored whether there was a consistent set of underlying universal values that occur across different contexts and cultures (Schwartz, 2012) that influenced various sustainable food outcomes (Lehto et al., 2023; Thøgersen et al., 2015; Thøgersen et al., 2016). The three studies each had one value in common that underlied both organic and plant-based food consumption, namely universalism. According to Schwartz (Schwartz, 2012, p.11) the defining goal of universalism is "understanding, appreciation, tolerance, and protection for the welfare of all people and for nature". This suggests that people who believe that protection for people and planet is very important may be more likely to engage in behaviours that comply with these beliefs, such as sustainable food consumption.

3.2.6. Individualistic values

In contrast to prosocial values, which involve selfless actions, individualistic values pertain to self-interest or personal benefits, such as minimizing one's own suffering or harm (Wei et al., 2022) or improving one's health. In the identified studies, two types of individualistic values could be distinguished and are discussed below:

3.2.6.1. Health concern. A total of 86 articles examined the role of health concern or consciousness in sustainable food outcomes, referring to a psychological state of concerns for personal health, including aspects such as health alertness, participation in health behaviours and the self-monitoring of one's health status (Gould, 1998).

Most articles that included health concerns aimed to predict outcomes related to organic foods (n = 71). In 64 of these articles (90.1 %), health concerns showed a significant and positive association with organic food outcomes. These findings suggest that consumers who are more worried and concerned about their health, have a more positive inclination towards buying and eating organic food. Furthermore, in qualitative studies on organic food consumption, health consciousness was also identified as a primary driver of their organic food choice as participants believed organic foods to be healthier than conventional foods (Qi et al., 2020; Cheah and Aigbogun, 2022).

Regarding meat reduction and plant-based alternatives, the association with health concerns were less clear. Only about half (6 out of 11) of the quantitative articles found a significant association between consumers' health values and outcomes related to reduced meat or plant-based consumption. One of these articles even revealed a significant but negative effect on plant-based consumption (De Backer and Hudders, 2014).

These mixed findings were also found in qualitative studies. Collier et al. (2022) found that while participants acknowledged the environmental benefits of reducing meat, health concerns—such as nutrient adequacy and scepticism about the nutritional quality of meat substitutes—justified their meat consumption. In contrast, Penz and Hofmann (2021) found that personal health was a major driver for participants to have become vegan or vegetarian. Some participants even mentioned a (mainly) plant-based diet as a solution for the negative effects of a Western diet on human's health. The findings of Drolet-Labelle et al. (2023) shed light on these contrasting views; they found that the health benefits and good nutrient composition of plant-based proteins (PBP) were mainly mentioned by participants who already

consume these products, whereas non-consumers mainly mentioned health related disadvantages of PBP, such as a lack of nutrients, which affected their attitudes towards these products.

Health consciousness also showed varying relationships with other sustainable foods; it was a significant predictor of overall healthy and sustainable dietary intake (Righi et al., 2023; Chen et al., 2024), a non-significant predictor of local food consumption (Birch et al., 2018) and a significant predictor of current buying behaviour (but not future intention) of Short Food Supply Chain foods (Benos et al., 2022).

3.2.6.2. Food safety concern. 23 articles included food safety concerns as a predicting variable in their research model. Food safety concerns refer to consumers' concerns about pesticide residues, chemical fertilizers, artificial additives, preservatives in foods, and the agro-biotechnology used in agricultural production practices (Teng and Lu, 2016). Similar to health concerns, food safety concerns were mostly (n = 21) examined in the context of organic foods. It was found to be a significant predictor in 17 of these articles (80.9 %).

It was also investigated whether food safety concerns could predict local food consumption (Birch et al., 2018) and the intention to purchase plant-based meat alternatives (Bhattacharyya et al., 2023), but these relationships were found to be non-significant in both studies.

3.2.7. Self-identity

The concept of self-identity is described as the collection of roles a person assumes, which continuously influences actions that support their self-concept. It serves as a label individuals associate with themselves, often linked to a particular behaviour (Stets and Burke, 2000; Stryker, 1987).

The variable proved significant in all studies (n = 15; 100.0 %), except for one study where this was partially confirmed (Hwang, 2016). Its effect depended on the type of identity: a strong meat-eating identity reduced meat reduction (Hielkema and Lund, 2021), while a vegetarian identity increased vegetarian meal consumption (Zhang et al., 2021). These results seem to indicate that consumers seek out products according to the concept they identify themselves with.

Overall, self-identity was used to predict various food types, including organic food, meat reduction, overall sustainable diet and local food.

3.2.8. Emotions

A total of 27 studies examined the role of emotions in sustainable food outcomes. Eight studies examined specifically the association between negative emotions and sustainable food outcomes, while 5 studies focused on positive emotions and 13 studies examined both positive and negative emotions. The most frequently mentioned emotions were pleasure/enjoyment, pride (*warm glow*), guilt, fear and disgust. Additionally, one study examined the impact of pro-active (e.g., hope, commitment), self-related (e.g., satisfaction, frustration) and social emotions (e.g., guilt, pride) and found a significant impact of only pro-active emotions on the intention to buy fair trade foods (Martini et al., 2024).

When focusing on *anticipated emotions*, 9 of the 13 studies (69.2 %) that examined positive emotions and 7 of 8 studies (87.5 %) that examined negative emotions found a significant association with sustainable food outcomes. Both positive and negative anticipated emotions seemed to be positively associated with sustainable food outcomes. The expectation that choosing sustainable food options would elicit positive emotions stimulated consumers to engage in these behaviours. Contrarily, the expectation that performing a certain unsustainable behaviour would elicit negative emotions, stimulated consumers not to do it.

When examining *experienced emotions*, 6 out of 7 studies (85.7 %) found a significant link between both positive and negative emotions and sustainable food outcomes. For example, Penz and Hofmann (2021) identified a positive correlation between positive emotions and intentions to buy carbon-friendly food, while negative emotions were associated with lower purchase intentions.

Qualitative studies have further supported these findings, indicating that emotions like pride, satisfaction and guilt can act as motivators for making sustainable choices (Sundaraja et al., 2021). Additionally, disgust towards meat was identified as a strong emotional driver for avoiding meat consumption and even becoming vegetarian (Penz and Hofmann, 2021). However, emotions can also function as a barrier to eat more sustainably as the pleasure participants experience from eating meat hinders them in the reduction of their meat consumption (Macdiarmid et al., 2016).

4. Discussion

We carried out a systematic review of 290 articles to document the associations between psychological state variables and food outcomes (i.e., attitudes, intentions, behaviour) related to environmental, social and economic sustainability. One of the most prominent theoretical frameworks used to explain sustainable food outcomes is the Theory of Planned Behaviour (TPB) (Ajzen, 1991). The TPB posits that behaviour is shaped by three key psychological components: attitudes, subjective norms, and perceived behavioural control (PBC). Our review found strong support for the relevance of this model in the context of sustainable foods, with each of these components emerging as significant predictors of various sustainable food types.

Among these, attitudes was the most frequently studied psychological variable and appeared as a key element to foster sustainable intentions and behaviours. In line with the findings of Randall et al. (2023), attitudes emerged as the strongest predictor among the three key components of the TPB. However, there was mostly evidence for the predictive value of specific attitudes (e.g., towards local foods) compared to more general pro-environmental attitudes. This discrepancy aligns with the well-documented environmental attitude-behaviour gap, which has been extensively explored in prior research (Carrington et al., 2014; Juvan and Dolnicar, 2014). According to Wyss et al. (2021), this gap can often be attributed to high perceived personal costs and low perceived environmental benefits, both of which are factors frequently observed in the context of food-related behaviours (Mann et al., 2018; Yazdanpanah and Forouzani, 2015).

Following up on these personal costs, this review identified several important perceived barriers for sustainable food outcomes. Regarding organic foods, this review revealed that high perceived prices of these foods do not necessarily result in decreased consumption, even consumers who are very aware of their budget are sometimes prepared to pay the high organic prices. These results align with previous evidence (Moser, 2015; Konuk, 2018) that indicates that it is not the actual price that matters, but more how the consumers perceive the price (expensive or worth it) and if they are willing to pay it based on that evaluation. It is therefore important to distinguish between these two concepts in following research.

Furthermore, food sustainability knowledge (a component of food literacy) was also frequently identified as a key factor, with strong evidence supporting its role in influencing consumers' sustainable food outcomes. However, this finding might be concerning given that many consumers have limited food sustainability knowledge, and this is more pronounced among people from low socio-economic backgrounds (Palumbo et al., 2018; Skeaff et al., 2018).

When it comes to plant-based food outcomes, food literacy skills were highlighted as an important driver in qualitative studies, but not in quantitative studies. In the few quantitative studies that investigated food literacy skills, this variable was generally not found to be a significant predictor. Future studies should continue to explore the role of food literacy skills in predicting plant-based food outcomes to gain a deeper understanding of this relationship. Moreover, our review revealed mixed findings regarding the relationship between health

concerns and a more plant-based diet. Some consumers appear to be skeptical about the health benefits of plant-based diets. However, research consistently associates "traditional" whole-foods plant-based diets with numerous health benefits, including lower BMI and reduced risks of cardiovascular diseases and cancer mortality (Harland and Garton, 2016; Naghshi et al., 2020). Nevertheless, in modern society, these "traditional whole-plant foods" are increasingly being replaced by processed meat alternatives (Weinrich, 2019). It is this perceived unhealthy nature (being high in fat, salt or sugar) of plant-based meat that contributes to the scepticism surrounding plant-based diets and the relatively low acceptance of meat alternatives among consumers (Beacom et al., 2022; Onwezen et al., 2021). It is important to enhance consumer awareness about the health benefits of traditional, whole-food plant-based diets as well as healthier meat alternatives. This could enhance consumers' capacity to make informed choices about their diet and could help boost perceptions of plant-based diets as a genuinely healthful choice.

This review only found a few articles investigating the relationship between emotions and sustainable food outcomes, highlighting a significant gap in the literature. Anticipated pride and guilt were mostly examined and effectively motivated people towards more sustainable food. As these emotions are easily influenced and mutable, gaining insight into these variables holds considerable potential for developing effective intervention strategies. Future studies should therefore prioritize the examination of these dynamic constructs, preferably in experimental research, to enhance our understanding of consumer behaviour and inform evidence-based interventions that promote sustainable food choices.

Concerning the different food types, most studies examined organic foods (n = 201; 67.6 %), highlighting a gap in research on other sustainable food types. Considering the limitations of organic food's sustainability (Niggli, 2015), it is important for researchers to expand their focus to more diverse and impactful foods. Despite the sustainability benefits of reduced meat consumption and plant-based diets, a relatively smaller portion of studies in our review (n = 51, 17.1 %) investigated psychological state variables in relation to these foods. Given that the livestock sector is responsible for approximately 14.5 % of total human-induced greenhouse gas emissions (FAO, 2017), investigating meat reduction offers a promising avenue to more effectively alleviate environmental pressures.

Another promising avenue for future research in this regard is to assess participants' overall dietary pattern rather than concentrating solely on discrete food choices. As food choices can be sustainable on one dimension (e.g., environmental) but unsustainable on other dimensions (e.g., social), this holistic approach enables researchers to identify which sustainability dimensions are mostly neglected in one's overall diet. To achieve this comprehensive evaluation of dietary sustainability, research should ensure that all three components—environmental, social, and economic—are sufficiently represented in this measure. The study of Gravelines et al. (2022) offers a valuable example by incorporating a broad range of sustainable practices, which reflects the three pillars of sustainability and therefore serves as an example that future research can build upon.

The findings in our review have been observed across different cultural contexts, suggesting that certain intervention strategies to enhance sustainable food outcomes< may be applied on a broader scale. Nevertheless, research on this topic has been mainly conducted in high- and upper-middle income countries, which aligns with previous systematic reviews on sustainable food consumption (Biasini et al., 2021; Pandey et al., 2023; Ruppenthal, 2023; Aguirre Sánchez et al., 2021). Given the existing evidence that sustainable consumption drivers and barriers are often specific to the cultural context (Randall et al., 2023; Wooliscroft and Ko, 2023), it is probable that lower income countries require different solutions for increasing sustainable food consumption.

Finally, evidenced by the vast amount of included articles (n = 290), many researchers have examined psychological state variables in relation to sustainable food outcomes. However, consistent with previous reviews on this topic (Randall et al., 2021; Aguirre Sánchez et al., 2021), much of this work has relied on observational or self-reported data, highlighting a gap in actual consumer behaviour. Additionally, a lack in experimental research was observed (n = 4), leaving us with only few insights on the direct and causal relation between these factors and sustainable food outcomes. Addressing this challenge requires research approaches that provide ecologically valid insights, such as field experiments, which can help uncover the key drivers of real-life decisions regarding sustainable food choices.

4.1. Implications

The findings of this review hold significant implications for both policymakers and marketing practitioners aiming to promote sustainable food outcomes. For policymakers, the identification of key psychological variables can help guide the development of more targeted and effective policies and interventions. For example, given the large amount of evidence for specific attitudes as a key variable, this suggests that promoting positive attitudes towards a specific product or behaviour (e.g., plant-based meat) is a promising strategy to enhance corresponding behaviour (e.g., purchase of plant-based meat). However, as all of these relations were identified in cross-sectional research, no causal conclusions can be drawn. In this regard, some authors suggest that the effects of specific attitudes are overestimated, and that it is more likely the behaviour that has an effect on the attitudes than the reverse (Kroesen and Chorus, 2017). In this case, changing behaviour directly – e.g., via price/tax regulations- might be a more promising avenue. Future research should therefore investigate the causal or non-causal nature of this association.

Furthermore, given that food sustainability knowledge appears to be a key driver and acknowledging the current limited knowledge in society (Palumbo et al., 2018; Skeaff et al., 2018), policymakers should design educational campaigns to shift public perception and increase awareness of the benefits of sustainable food. To maximise their effectiveness, such programs should prioritize interactive, hands-on, and experiential learning methods, which have been shown to be more impactful in fostering sustainable behaviours than more declarative, information-heavy approaches (Redman and Redman, 2014; Zelenika et al., 2018).

As a final example, both prosocial values (e.g., environmental protection, animal welfare, and social impact) and individualistic values (e.g., personal health benefits) have been shown to boost consumers' sustainable food outcomes. Emphasizing these benefits in informational campaigns could be an effective strategy. Moreover, addressing common misconceptions about the health benefits of plant-based foods by clearly highlighting their nutritional value in these materials could help correct these misunderstandings and, in turn, increase adoption.

Marketing practitioners, on the other hand, can leverage these psychological insights to craft more effective messaging strategies. This review underscores that it is not the actual price of organic foods that acts as a significant barrier to sustainable outcomes, but rather the perceived value. This finding has important implications for organic food marketers seeking to drive demand. Rather than prioritizing price reductions, efforts should focus on enhancing the perceived value of organic products by emphasizing aspects such as superior quality (Konuk, 2018) or associated health benefits (Lim et al., 2014).

Another strategy for marketeers to help consumers find their products more easily (i.e., availability barrier) is to create eye-catching, innovative packaging that help products stand out on crowded shelves. Marketers should thus focus on designs that grab attention quickly while reflecting the product's value (e.g., sustainability, health benefits).

In line with this, enhancing the overall shopping experience can further encourage sustainable food outcomes. Retailers and marketers should focus on strategies that evoke positive emotions during the

shopping process, such as creating aesthetically pleasing and interactive store layouts or offering in-store tastings of sustainable products. Since experienced emotions during shopping are rather easily influenced, these strategies provide a practical means of shaping consumer outcomes. However, these strategies must be applied ethically, as these psychological state factors can also be misused to create misleading perceptions of sustainability (e.g., greenwashing).

4.2. Limitations and conclusion

This systematic review synthesised findings from 290 articles to examine the associations between psychological state variables and food-related outcomes tied to environmental, social, and economic sustainability. Certain variables (e.g. attitudes, self-identity, knowledge, etc.) demonstrated strong evidence of association with sustainable food outcomes, highlighting their potential importance. However, several limitations should be acknowledged.

First, this review only included studies published between 2014 and 2024. While this timeframe was selected due to the notable increase in scientific interest in sustainable food consumption during this period (Kristia et al., 2023), this choice may exclude earlier studies that could offer valuable insights into the relationship between psychological variables and sustainable food outcomes.

Additionally, this review focused exclusively on psychological variables in the association with sustainable food behaviour, which may imply that sustainable food consumption is merely the result of manipulating the right psychological factors. The authors, however, acknowledge that sustainable food consumption is the results of the interplay between various factors (e.g., income, cultural aspects, external influences etc.). For the sake of this review, the authors have chosen to solely take psychological state variables into account since they are susceptible to manipulation and as a consequence are useful for future interventions and policy dialogues. The authors therefore hope that these insights will contribute to further research and useful policy initiatives.

Furthermore, while the variables discussed in this review represent the most prominent psychological state variables in the sample, some less commonly investigated but potentially significant variables were excluded from the analysis, marking a limitation of the study. However, this selective focus allowed for a more detailed and nuanced examination of the psychological state variables, providing deeper insights into their effectiveness and relevance in the context of sustainable food behaviour.

Lastly, most articles focused exclusively on organic food products, which may limit the generalizability of the findings to other sustainable food categories. While this review welcomed articles on all types of sustainable food, it identified only few studies on socially and economically sustainable food products (e.g., fair trade, locally sourced products). Therefore, this review offers a limited understanding of the influence of psychological variables on these sustainable food categories.

Given these limitations, future research should expand its focus beyond organic food to encompass a broader range of sustainable food outcomes. Additionally, the current lack of experimental research hinders the ability to establish causality, making this an essential area for further investigation. In particular, more research is needed on plant-based consumption, including the role of food literacy in promoting plant-based diets and how beliefs about the health benefits of plant-based foods versus meat impact dietary choices. These insights can inform targeted interventions to encourage more sustainable eating behaviours. Ultimately, this review offers valuable evidence for policymakers, marketers, and researchers seeking to promote sustainable food consumption more effectively.

CRediT authorship contribution statement

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.spc.2025.05.022.

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