



Review article

Meat consumption & positive mental health: A scoping review

Urška Dobersek^{*}, Mary Bender, Alexandria Etienne, Gabriela E. Fernandez Gil, Claire Hostetter

Department of Psychology, University of Southern Indiana, Evansville, IN, USA

ARTICLE INFO

Keywords:

Meat
Beef
Omnivory
Vegetarianism
Veganism
Positive psychology
Positive psychological functioning

ABSTRACT

The objective of this scoping review was to examine the breadth of the existing literature on the relation between meat consumption or meat abstinence and positive psychological functioning. In April 2022, we conducted a systematic search of online databases (PubMed, PsycINFO, CINAHL Plus, Medline, Cochrane Library, and Web of Science) for primary research examining positive psychological functioning in meat consumers and those who abstain from meat. Thirteen studies met the inclusion/exclusion criteria, representing 89,138 participants (54,413 females and 33,863 males) with 78,562 meat consumers and 10,148 meat abstainers (13–102 years) from multiple geographic regions. The primary outcomes were life satisfaction, “positive mental health”, self-esteem, and vigor. The secondary outcomes were “meaning in life”, optimism, positive emotions, and psychological well-being. Eight of the 13 studies demonstrated no differences between the groups on positive psychological functioning, three studies showed mixed results, and two studies showed that compared to meat abstainers, meat consumers had greater self-esteem, “positive mental health”, and “meaning in life”. Studies varied substantially in methods and outcomes. Although a small minority of studies showed that meat consumers had more positive psychological functioning, no studies suggested that meat abstainers did. There was mixed evidence for temporal relations, but study designs precluded causal inferences. Our review demonstrates the need for future research given the equivocal nature of the extant literature on the relation between meat consumption and meat abstinence and positive psychological functioning.

1. Background

Over the past few decades, there has been a substantial increase in the advocacy, practice, and research of vegan and vegetarian diets (Kamiński et al., 2020; Loh et al., 2021; Dobersek et al., 2020; Rosenfeld, 2018; Ruby, 2012; Willett et al., 2019; Leitzmann, 2014; Statista, 2019). As a result, a large body of evidence revealing the potential risks of limiting or abstaining from meat consumption has emerged (Dobersek et al., 2020; Dobersek et al., 2021; Cofnas, 2019; Dwyer, 1991; O’Keefe et al., 2022; Dwyer and Loew, 1994; Jacobs and Dwyer, 1988; Menzel et al., 2021; Dobersek and Archer, 2022). Nevertheless, a significant portion of this work suffers from conceptual and methodological weaknesses that limit causal analyses and definitive conclusions [please see Dobersek et al., 2020 (3), pages 9–11].

Yet more importantly, studies examining the risks and benefits of the consumption or avoidance of meat were studied primarily from a

disease-centered perspective. For example, examinations of psychological functioning focused on negative outcomes and the presence of pathologies, such as depression, anxiety, self-harm, and eating disorders (Dobersek et al., 2020; Dobersek et al., 2021; Dobersek and Archer, 2022). Nevertheless, as per the World Health Organization (WHO), health is “...not merely an absence of disease”, but “a state of complete... mental and social well-being” (WHO, 1948). Therefore, while the disease-centered perspective offers insights into ‘diet-disease’ associations, it renders science poorly equipped to understand ‘diet-health’ relations; and notably, it offers no information on the genesis and maintenance of positive psychological health.

In contrast, the ‘Positive Psychology’ paradigm not only promotes survival and prevents disease but also engenders personal well-being by allowing “...every individual...[to] work productively and...make a contribution to her or his community” (Seligman and Csikszentmihalyi, 2000; Kubzansky et al., 2015; WHO, 2018; Antonovsky, 1979). Recently, there

Abbreviations: WHO, World Health Organization; PRISMA-ScR, Preferred Reporting Items for Systematic Review and Meta-Analysis extension for Scoping Review; PE/I/COS, Population, Exposure, Intervention, Comparison, Outcomes, Study Design; FFQ, Food Frequency Questionnaires; 24HR, 24-hour recall interviews; M-BMs, Memory-Based Methods; RCT, randomized control trial; The RSES, The Rosenberg Self-Esteem Scale; SF, short form; The POMS-V, The Profile of Mood States-Vigor; The PMH, The Positive Mental Health; QoL, Quality of Life; The WHOQOLA, The World Health Organization Quality of Life Assessment; NR, not reported.

^{*} Corresponding author.

E-mail address: udobersek@usi.edu (U. Dobersek).

<https://doi.org/10.1016/j.pmedr.2023.102556>

Received 29 August 2023; Received in revised form 4 December 2023; Accepted 11 December 2023

Available online 14 December 2023

2211-3355/© 2023 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

has been an increased focus on identifying ‘salutogenic’ (health-promoting) factors such as diet and exercise. Consequently, recent literature showed that a ‘healthy’ diet was associated with ‘optimism’ (i.e., expectations that good things will happen in the future) (Scheier et al., 1994), ‘life satisfaction’ (i.e., evaluations of one’s life) (Diener et al., 2002), ‘self-esteem’ (i.e., a sense of self-worth) (Scheier et al., 1994), ‘resilience’ (i.e., “ability to adapt positively to life conditions”^{p.14} (Sisto et al., 2019), and ‘quality of life’ (i.e., individuals’ perception of their contentment with their position in life) (Organization, 1996) (Boehm et al., 2018; Boehm et al., 2011; Boyle et al., 2010; Chida and Steptoe, 2008; Ronaldson et al., 2015; Rozanski et al., 2019; Bolier et al., 2013; Goodmon et al., 2016; Santos et al., 2013; Schotanus-Dijkstra et al., 2017; Woo et al., 2010).

Nevertheless, although previous research examined relations between positive outcomes (e.g., quality of life) and ‘healthy’ eating (Govindaraju et al., 2018; Vajdi and Farhangi, 2020), this work has several limitations (Govindaraju et al., 2018; Vajdi and Farhangi, 2020). To begin, the term ‘healthy diet’ is subject to intense debate due to poor operationalization (Archer and Arjmandi, 2020; Archer et al., 2018; Gibney et al., 2017; Harper, 1980). In fact, “the public, dietitians, researchers, nor policy makers...agree on which foods [are] ‘healthy’ and which [are] ‘unhealthy’” (Archer, 2018). Second, current reviews failed to examine diet and psychological health independent of physical health. This conflation offers only indirect relations and makes it impossible to determine the unique associations between diet and psychological health. Third, there are well-established methodologic issues that were not addressed — including the limitations of cross-sectional designs, biased recruitment strategies, and the use of self-report assessments of both psychological outcomes and dietary intake (Dobersek et al., 2020; Archer and Blair, 2015; Archer et al., 2013; Archer et al., 2018; Archer et al., 2018). Taken together, we posit that these limitations led to inconsistent, equivocal, and nonreplicable findings that offer clinicians and researchers little fodder for progress.

Therefore, given the limitations of the ‘Diet-Disease’ perspective and prior reviews, the goal of our research was to examine the breadth of the current literature from a meta-perspective that incorporated both the ‘Positive Psychology’ and ‘diet-health’ paradigms. We present our findings as a ‘scoping’ review because this type of analysis is more appropriate for identifying research gaps and providing recommendations and solutions for future progress (Arksey and O’Malley, 2005; Colquhoun et al., 2014; Levac et al., 2010; Munn et al., 2018; Peters et al., 2020a,b; Tricco et al., 2021). Specifically, first, we identified and summarized the scientific literature on the relation between meat consumption/abstention and positive psychological functioning. Second, we qualitatively described the methods used in the primary studies. And finally, we provided recommendations for researchers to ‘fill the gaps’ in current research examining ‘diet’ and psychological outcomes.

The review was guided by the following questions:

- Which positive psychological constructs were examined in relation to meat consumption and meat abstention?
- Which methods were used to examine these relations?
- What is the qualitative relation between meat consumption and meat abstention and positive psychological functioning?

2. Methods

Methods are organized and reported according to the Preferred Reporting Items for Systematic Review and Meta-Analysis extension for Scoping Review (PRISMA-ScR) (Tricco et al., 2018).

2.1. Protocol

Our scoping review protocol was developed using an amalgam of frameworks by Arksey and O’Malley (Arksey and O’Malley, 2005), Levac et al. (Levac et al., 2010), and the Joanna and Briggs Institute

(Peters et al., 2020a). The final version of the protocol is available upon request from the corresponding author.

2.2. Eligibility criteria

Eligibility criteria were developed according to a Population, Exposure, Intervention, Comparison, Outcomes, Study Design (PE/IC/OSD) framework (Brown et al., 2006; Huang et al., 2006). We sought to identify primary studies that examined the relation between meat consumption or meat abstention and a number of variables related to positive mental functioning. This scope was necessary because of a lack of research on the relation between *meat consumption* or *meat abstention* and *positive psychological* outcomes (e.g., quality of life, life satisfaction, self-esteem).

2.3. Study inclusion criteria

All study designs were eligible (e.g., cross-sectional, retrospective, prospective, case-control, randomized controlled trial (RCT), longitudinal, qualitative). Studies were included if 1) they were written in English language, 2) they examined humans who consumed meat and avoided meat consumption (population), 3) the authors provided a clear distinction between participants who reported eating meat (i.e., meat consumers; e.g., omnivores) and those who avoided meat consumption (i.e., meat abstainers; vegetarians, vegans) (exposure), and 4) they included data on positive psychological functioning (outcome).

2.4. Study exclusion criteria

Studies were excluded if they 1) were written in a non-English language, 2) included non-human populations, 3) examined dietary patterns that did not include meat (e.g., plant-based diets), 4) examined outcomes not related to positive psychological functioning (e.g., physical health, mental illness, anxiety, depression, self-harm, stress, eating disorders), and 5) examined meat consumption as a continuous or multi-level variable. As detailed in our discussion (please see lines 349–385), this latter exclusion was necessary due to the inability of current dietary assessment methods (e.g., memory-based methods, M-BMs) to precisely quantify actual dietary intake.

Table 1 provides a detailed description of inclusion/exclusion criteria.

2.5. Disclosure of ethical compliance

The analyses were based on published studies that met ethical standards.

2.5.1. Search strategy

The search strategy was developed by the lead author (UD) with assistance from the university librarian and an outside expert in obesity, nutrition, and epidemiological science. The lead investigator and two, two-person teams independently conducted the searches of six online databases (PubMed, PsycINFO, CINAHL Plus, Medline with full text, Cochrane Library, and Web of Science) using a broad set of keywords for primary research examining meat consumption and positive psychological functioning (e.g., optimism, life satisfaction, quality of life, self-esteem). The search included all papers published up to and including April 2022. The search strategy also included examining reference lists from previous reviews and research papers. Grey literature was not searched/included because it is often not peer-reviewed and is of lower quality (Corlett, 2011). Detailed information on the keywords and search strategy is provided in *Supplemental File 1*.

2.5.2. Study selection process

Following the initial search, results were imported into reference-managing software (EndNote20, 2022). After duplicate articles were

Table 1
Detailed Description of Selection Criteria According to the PE/I/COS Framework (Brown et al., 2006; Huang et al., 2006).

Search Strategy	Details
Inclusion criteria	P: Humans E/I/C: Clear distinction between meat consumers and meat abstainers O: Constructs related to positive psychology, psychological benefits, and outcomes (e.g., optimism, life satisfaction, happiness, flow, grit, mental toughness, resilience, etc. – please see <i>Supplemental File 1</i> for an exhaustive list of key terms) S: Any
Exclusion criteria	P: Animals E/I/C: Plant-based diets only; no clear distinction between meat consumers and meat abstainers (e.g., Mediterranean diets, FFQs, etc.) O: Outcomes not related to positive psychological constructs (e.g., mental illnesses, disorders, diseases, physical health, nutritional outcomes, etc.) S: N/A
Language	English
Time filter	None
Database	PubMed, PsycINFO, CINAHL Plus, Medline with full text, Cochrane Library, Web of Science

Note. FFQs = Food Frequency Questionnaires, N/A = Not Applicable, P = Population, E/I/C = Exposure/Intervention/Comparison, O = Outcomes, S = Study Design.

excluded, both teams independently identified and screened titles and abstracts of potentially relevant articles. After arriving at a consensus for each article, full-texts of potentially relevant articles were obtained and critically assessed by both two-person teams and the lead investigator working independently. Following this assessment, the teams and lead investigator met to arrive at a consensus on the inclusion/exclusion criteria for each study. Disputes were then adjudicated by the discussion, with the final decision made by the lead investigator. A consensus was obtained for all included articles.

2.5.3. Data items and data collection process

Data extraction was conducted independently by both teams and the lead investigator on all included full-text articles. The information extracted included study characteristics, psychological outcomes, conceptual definition of positive psychological variables, assessment methods, and key findings. The data extraction form was piloted on a random sample of eight studies and revised as needed. The teams were not blinded and had full access to paper details, such as authors, affiliations, and journals during data extraction and compilation. The lead investigator examined the extraction tables for accuracy and completeness. Once compiled in the Excel document, information from the included studies was transferred to [Table 3](#).

2.5.4. Methodologic quality appraisal

Consistent with the scoping review guidelines, we did not appraise methodological quality assessments or the risk of bias of the included studies (Peters et al., 2022).

2.5.5. Data analysis and charting

To allow for descriptive analysis and identification of research gaps, the positive psychological outcomes were divided into primary and secondary categories based on the frequency with which they were examined in the relevant literature. [Table 2](#), presents details on the primary and secondary outcomes identified in the literature.

To summarize the study and participant characteristics, we performed descriptive analyses on study design, sample size, setting/region, participants' age, assessment methods, and positive psychological outcome categories.

Table 2
Included Positive Psychological Outcomes (please see [Table 4](#) for Conceptual and Operational Definitions).

Primary Outcomes
1. Life Satisfaction 2. Self-Esteem/Self-Worth 3. Positive Mental Health 4. Vigor/Vitality
Secondary Outcomes
5. Optimism 6. Psychological Well-Being 7. Positive Emotions 8. Meaning in Life

3. Results

3.1. Literature search and description of studies

The initial search resulted in 12,794 potentially relevant articles. After de-duplication, the titles and abstracts of 10,395 papers were screened for inclusion/exclusion criteria. This resulted in 209 full-text articles, which were read fully and critically assessed. This qualitative analysis resulted in 13 papers that met the inclusion/exclusion criteria, which included 10 cross-sectional (Baines et al., 2007; Baş et al., 2005; Beezhold et al., 2010; Boldt et al., 2018; Krizanova and Guardiola, 2021; Lindeman, 2002; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Timko et al., 2012), 2 mixed cross-sectional and longitudinal studies (Lavalley et al., 2019; Velten et al., 2018), and 1 RCT (Beezhold and Johnston, 2012).

As per Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Review (PRISMA-ScR) flow diagram, the results of the search and the study inclusion process are presented in [Fig. 1](#) (Tricco et al., 2018).

3.2. Study and participants characteristics

The total sample included 89,138 participants (54,413 females and 33,863 males), with 78,562 meat consumers and 10,148 meat abstainers. Two studies included only females (Baines et al., 2007; Lindeman, 2002). Four studies included samples from the U.S. (Beezhold et al., 2010; Nezlek et al., 2018; Timko et al., 2012; Beezhold and Johnston, 2012), six were from non-U.S. countries (e.g., Europe and Oceania) (Baines et al., 2007; Baş et al., 2005; Boldt et al., 2018; Krizanova and Guardiola, 2021; Lindeman, 2002; Pfeiler and Egloff, 2018), and three studies included samples from multinational cohorts (Pfeiler and Egloff, 2020; Lavalley et al., 2019; Velten et al., 2018). The sample sizes ranged from 39 to 22,417 participants between 13 and 102 years of age. [Table 3](#) reports details on participants and study characteristics.

3.3. Summary of results¹

3.3.1. Positive psychological constructs

Out of the 13 studies, 12 examined the primary outcomes of life satisfaction (Krizanova and Guardiola, 2021; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020), “positive mental health” (Baines et al., 2007; Lavalley et al., 2019; Velten et al., 2018), self-esteem/self-worth (Baş et al., 2005; Lindeman, 2002; Nezlek et al., 2018; Timko et al., 2012), and vigor (Beezhold et al., 2010; Krizanova and Guardiola, 2021; Beezhold and Johnston, 2012); and 4 examined the secondary outcomes of “meaning in life” (Nezlek et al., 2018),

¹ The number of studies does not always match the number of outcomes because many studies examined multiple outcomes.

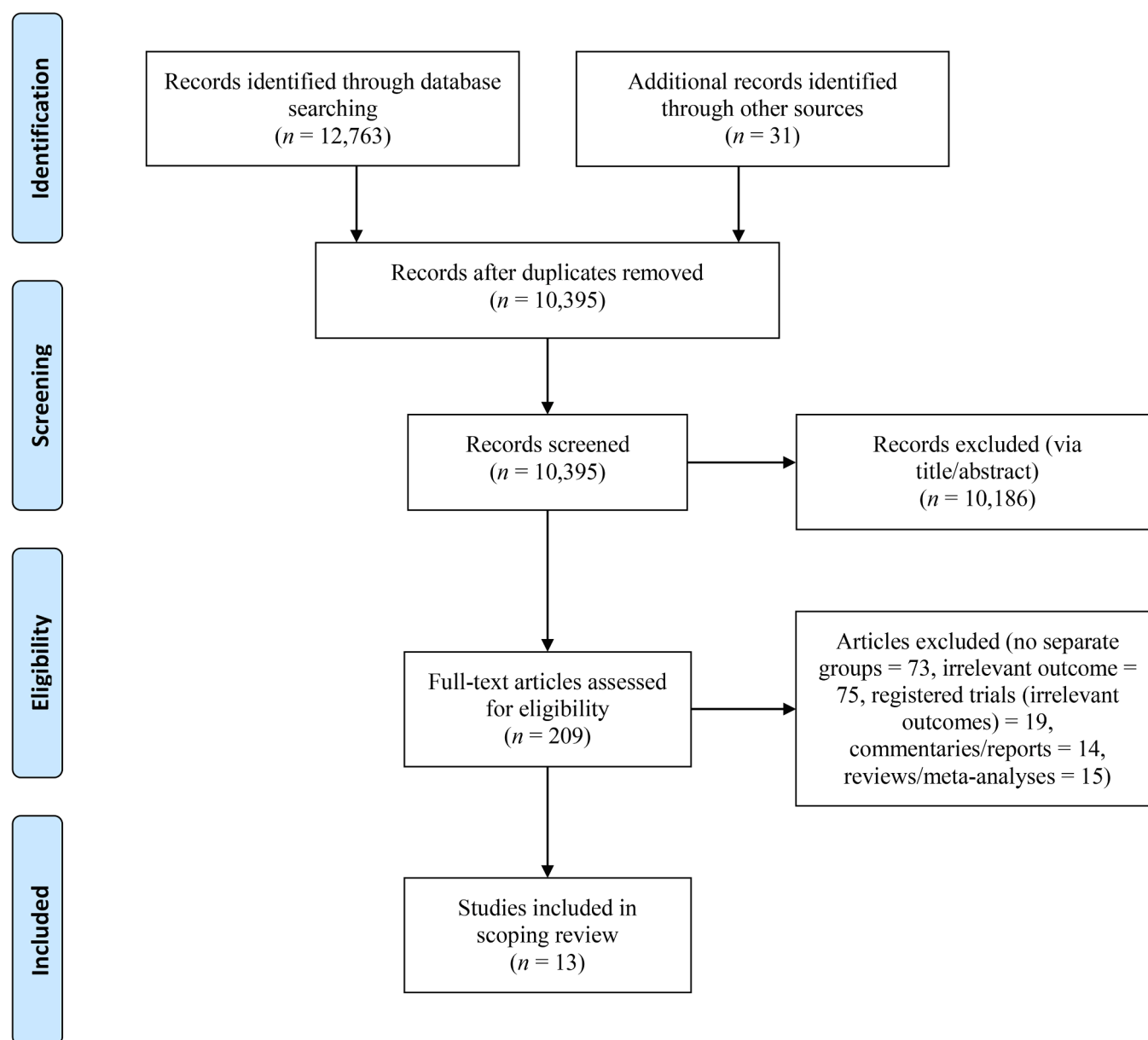


Fig. 1.

optimism (Pfeiler and Egloff, 2018), positive emotions/affect (Nezlek et al., 2018; Pfeiler and Egloff, 2020), and psychological well-being (Boldt et al., 2018) in relation to meat consumption. Tables 2 and 4 present details on the primary and secondary outcomes found in the literature and their associated conceptual and operational definitions, respectively.

3.3.2. Methods used

3.3.2.1. Sampling and recruitment strategies. Out of the 13 studies, 12 reported sampling and recruitment strategies. Specifically, 6 examined large, randomly selected, and representative samples (Baines et al., 2007; Baş et al., 2005; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Lavalley et al., 2019; Velten et al., 2018). For example, Baines et al. (2007) (Baines et al., 2007) employed a randomly selected and representative sample of women drawn from a larger study population. Similarly, Pfeiler and Egloff (2018, 2020) (Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020) employed a large sample drawn from a large representative longitudinal study from Germany and Australia.

Conversely, 6 studies used nonprobability sampling and biased recruitment strategies (Beezhold et al., 2010; Boldt et al., 2018; Krizanov and Guardiola, 2021; Lindeman, 2002; Nezlek et al., 2018; Timko et al., 2012). For example, Krizanov and Guardiola (2021), Lindeman (2002), Nezlek et al. (2018), and Timko et al. (2021) (Krizanov and Guardiola, 2021; Lindeman, 2002; Nezlek et al., 2018; Timko et al., 2012) employed convenience sampling and recruited participants entirely from universities. Beezhold et al. (2010) and Boldt et al. (2018) recruited participants that targeted specific groups via “social websites geared to [vegans and vegetarians]” (Beezhold et al., 2010), vegan chatrooms and magazines, and vegetarian “fairs” (Boldt et al., 2018). Please see Table 3 for a detailed description of the sampling and recruitment methods.

3.3.2.2. Assessment methods

3.3.2.2.1. Dietary intake. All studies used a variety of self-reported dietary assessments ranging from the established Food Frequency Questionnaires (FFQs) to author-developed questionnaires to examine dietary intake (Baines et al., 2007; Baş et al., 2005; Beezhold et al., 2010;

Table 3
A Summary of the Studies Included in the Scoping Review in Alphabetical Order.

Short Citation	Country	Design	Population	Recruitment Methods	Dietary Assessment	Positive Psychological Variables	Factors Adjusted in Analyses	Key Findings	Funding Sources & Notes
Baines et al. (2007)	Australia	Cross-sectional	9,113 women22 & 27 years of age	Random selection from the national health insurance database (Medicare)	Do you exclude any of the following food groups from your diet? Vegetarians (excluded meat, poultry, & fish) = 252Semi-vegetarians (excluded red meat) = 827Nonvegetarians (included red meat) = 8034	The Short Form Health Survey (SF-36): summary scores for mental health (score > 50 better health than the reference population; score < 50 worse health than the reference population)	Oversampling of women from rural & remote areas	Nonvegetarians had significantly better mental health than vegetarians & semi-vegetarians.	None
Baş et al. (2005)	Turkey	Cross-sectional	1,205 students 597 females & 608 males 17 & 21 years old (<i>Mage</i> = 21.3, <i>SD</i> = 1.9)	Multistage cluster sampling method	Are you a vegetarian? Yes/ No Vegetarians = 31Nonvegetarians = 1174	The RSES assesses general self-esteem: a 10-item measure that uses a 4-point Likert-type scale from 0 (<i>strongly agree</i>) to 3 (<i>strongly disagree</i>)	NR	NS between vegetarians & nonvegetarians on self-esteem.	None
Beezhold et al. (2010)	USA	Cross-sectional	138 Seventh Day Adventists77 females & 61 males (<i>Mage</i> = 43.04)	Volunteers from Seventh Day Adventist communities in Phoenix, AZ & Santa Barbara, CA	^a The FFQ with 152 items previously validated Omnivores = 78Vegetarians (excluded all flesh foods) = 60	The POMS-V estimates vigor using 8 adjectives rated on a 5-point Likert-type scale ranging from 'not at all' to 'extremely'	Confounding variables	NS between the groups on vigor.	None
Beezhold et al. (2012)	USA	RCT	39 adults32 females & 7 males	NR	Participants were randomized to omnivore group (consumed meat and/or poultry at least once daily) = 13,fish group (avoided meat, poultry, & consumed at least 3–4 servings of seafood weekly) = 13, or vegetarian group (avoided all animal foods except dairy for 2 weeks) = 13 ^b Reported dietary compliance greater than 82 %	The POMS-V	NR	NS between the groups after the trial on vigor.	None
Boldt et al. (2018)	Europe	Cross-sectional	281 endurance runners159 females & 122 males (<i>Mage</i> = 40, <i>SD</i> = 11)	Social media, websites of marathon events, online running communities, email-lists, magazines for runners, health, vegetarian and/or vegan nutrition &	Omnivores (no dietary restrictions) = 123Vegetarian/vegan (no meat, no products from animal sources, such as meat, fish, milk, dairy products, eggs, honey) = 158	The WHOQOL-BREF: 26 items measuring 4 broad domains: 1) physical health, 2) psychological well-being, 3) social relationships, 4) environment on a 5-point Likert-type	NR	NS between the groups on psychological well-being.	None

(continued on next page)

Table 3 (continued)

Short Citation	Country	Design	Population	Recruitment Methods	Dietary Assessment	Positive Psychological Variables	Factors Adjusted in Analyses	Key Findings	Funding Sources & Notes
Krizanova & Guardiola (2021)	Spain	Cross-sectional	1068 university students; 406 males & 662 females between 18 and 54 years (<i>Mean</i> = 20.7, <i>SD</i> = 2.85)	lifestyle, sports fairs, fairs on vegetarian & and vegan nutrition & lifestyle, & personal contacts. Convenience sampling	“Please select the option that best describes your diet:” Vegan (ate fruits, vegetables legumes, cereals, do not eat red or white meats, dairy, eggs, seafood, fish) = 11 Lacto-ovo vegetarian (ate eggs, dairy products, do not eat fish, seafood, white or red meat) = 43 Lacto-pesco vegetarian (ate dairy, fish, seafood, do not eat meat) = 32 Flexitarian (did not eat meat at least once a week) = 139 Organic omnivores (ate organic meat) = 21 Omnivore (ate meat, fish, seafood, fruit, vegetables, cereals) = 822	scale; higher scores denote higher QoL Life satisfaction: a single item (“How satisfied are you at this moment with your life?”) on a 10-point Likert-type scale from 1 (<i>completely dissatisfied</i>) to 10 (<i>completely satisfied</i>) Subjective vitality: the conscious experiences of possessing energy and vivacity that reflects the eudaimonic dimension of well-being; measured using 6 statements (e.g., “I feel alive and vital.”) on a 5-point Likert-type scale from 1 (<i>totally false</i>) to 5 (<i>extremely true</i>)	Parents’ income, gender, relationship status, connection with relatives	NS differences among the groups on life satisfaction & vitality.	Spanish Agencia Estatal de Investigación, the European Regional Development Fund, the Regional Government of Andalusia, the European Regional Development Fund, the University of Granada The data were obtained from the authors; performed the relevant analyses & double checked the results with the authors.
Lavallee et al. (2019)	Germany, USA, Russia, China	Cross-sectional/Longitudinal	22,417 adults**13,006 females & 8,596 males (<i>Mean</i> = 39.10, <i>SD</i> = 11.68)	Data drawn from Bochum Optimism and Mental Health (BOOM) studies; representative individuals from respective countries recruited via telephone	**“Are you currently vegetarian?” Yes/No Vegetarians (excluded meat and/or fish) = 3,400 Nonvegetarians (included meat) = 18,603	The Positive Mental Health (PMH) scale is a 9-item questionnaire that was developed for the purpose of the study and assessed positive aspects of health and life experiences (e.g., “I am often free and in good spirits”, “I enjoy my life”). Items are answered on a 4-point Likert-type scale ranging from 0 (<i>do not agree</i>) to 3 (<i>agree</i>)	Age, gender, urbanicity, marital status, educational level, socioeconomic status, family influence	Cross-sectional: Vegetarians (Russian sample) had lower PMH than nonvegetarians. Longitudinal: NS between nonvegetarians & vegetarians on PMH (German, Chinese sample)	Alexander von Humboldt Foundation; the DFG Open Access Publication Funds of the Ruhr-Universität Bochum
Lindeman (2002)	Finland	Cross-sectional	Study 1: 308 women between 13 & 74	Convenience sampling	Study 1: Omnivores = 197 Semi-vegetarians	Study 1: The RSES assesses general self-esteem: a 10-item	NR	Study 1: Omnivores had greater self-esteem	None

(continued on next page)

Table 3 (continued)

Short Citation	Country	Design	Population	Recruitment Methods	Dietary Assessment	Positive Psychological Variables	Factors Adjusted in Analyses	Key Findings	Funding Sources & Notes
			years (<i>Age</i> = 29, <i>SD</i> = 10.81) <u>Study 2:</u> 226 women between 16 & 54 years (<i>Age</i> = 22.3, <i>SD</i> = 8.68)		(avoided red meat or only ate fish, vegetarian dishes) = 69Vegetarians = 42 <u>Study 2:</u> *Omnivores = 148 Semi-vegetarians = 60Vegetarians = 17	measure that uses a 5-point Likert-type scale from 1 (<i>strongly disagree</i>) to 5 (<i>strongly agree</i>);the higher the score the higher self-esteem <u>Study 2:</u> The Self-Worth subscale of the World Assumption Scale measured worthiness of the self with 4 items; uses a 5-point Likert-type scale from 1 (<i>strongly disagree</i>) to 5 (<i>strongly agree</i>);the higher the score the higher the belief in self-worth		levels than vegans & semi-vegetarians. <u>Study 2:</u> Omnivores & semi-vegetarians had greater self-worth than vegetarians.	
Nezlek et al. (2018)	USA	Cross-sectional	403 university students:153 males & 250 females (<i>Age</i> = 18.8, <i>SD</i> = 11.4)	Convenience sampling	“Which of the following seven categories best characterize your eating behavior?”Vegetarians (ate fruits, vegetables, grains, dairy, eggs, seafood products) = 24Semi-vegetarians (ate fish, white meat, red meat occasionally) = 56Omnivores = 323	Adopted from the RSES that assesses general self-esteem: a 4-item measure on a 7-point Likert-type scale from 1 (<i>very uncharacteristic of me today</i>) to 7 (<i>very characteristic of me today</i>) (e.g., “Today, on the whole, I was satisfied with myself.”);Life satisfaction: 2 items (“How was today?”, How satisfied were you with your life today?”) on a 7-point Likert-type scale from 1 (<i>terrible/very dissatisfied</i>) to 7 (<i>excellent/very satisfied</i>);Meaning in life: 2 items (“How meaningful did you feel your life was today?”, “How much did you feel your life had purpose today?”) on a 7-point Likert-type	Sex	Omnivores & semi-vegetarians (together) had greater self-esteem & meaning in life than vegetarians. NS differences between the groups on life satisfaction, positive activated, & deactivated emotions.	None

(continued on next page)

Table 3 (continued)

Short Citation	Country	Design	Population	Recruitment Methods	Dietary Assessment	Positive Psychological Variables	Factors Adjusted in Analyses	Key Findings	Funding Sources & Notes
						scale from 1 (not at all) to 7 (very much); Positive activated emotions (enthusiastic, alert, happy, proud, excited) and Positive deactivated emotions (calm, peaceful, relaxed, contented, satisfied); how strongly participants felt each day on a 7-point scale from 1 (did not feel this way at all) to 7 (felt this way very strongly)			
Pfeiler and Egloff (2018)	Germany	Cross-sectional	<u>Study 1:</u> 4496 adults 2351 females & 2145 males between 17 and 96 (<i>Age</i> = 51.84, <i>SD</i> = 18.36) <u>Study 2:</u> 5125 adults**2669 females & 2409 males (<i>Age</i> = 52.42, <i>SD</i> = 18.34)	<u>Study 1:</u> The German SOEP of the German Institute for Economic Research, a large longitudinal representative survey <u>Study 2:</u> The Innovation Sample of the SOEP - representative sampling from German population	<u>Study 1:</u> “Are you vegetarian or vegan?” Yes/No Vegetarians/vegans (do not eat meat & avoid fish; avoid any animal products) = 123 Omnivores (consumed meat) = 4,373 <u>Study 2:</u> “Do you predominantly or exclusively follow a vegetarian or vegan diet?” Yes/No Vegetarians = 278 Vegans = 28 Meat eaters = 4819	Study 1 & 2: Current life satisfaction: a single item (“How satisfied are you with your life, all things considered?”) on a scale from 0 (completely dissatisfied) to 10 (completely satisfied) Optimist attitude: a single item (“When you think about the future, are you.....”) on a 4-point scale from 1 (pessimistic) to 4 (optimistic)	Sociodemographic variables	<u>Study 1:</u> NS differences between vegetarians & meat eaters on life satisfaction & optimistic attitude. <u>Study 2:</u> NS differences between the groups on life satisfaction & optimism after controlling for socio-demographic of age, gender, education, income.	None
Pfeiler & Egloff (2020)	<u>Study 1:</u> Germany <u>Study 2:</u> Australia	<u>Study 1 & 2:</u> Cross-sectional	<u>Study 1:</u> 12,905 individuals; 6918 females & 5987 males between 21 & 102 years (<i>Age</i> = 56.21, <i>SD</i> = 16.69) <u>Study 2:</u> 15,532 individuals; 7302 males & 8230 females between 15 & 99 years	<u>Study 1:</u> German Socio-Economic Panel of the German Institute for Economic Research, a representative sample from private households & persons <u>Study 2:</u> Household, Income, and Labour Dynamics in Australia survey, a	<u>Study 1:</u> “Do you follow a mainly vegetarian or vegan diet?” Yes/No/None of the above Vegetarian = 593 Vegan = 72 Meat eaters = 12240 <u>Study 2:</u> “How often do you usually eat each of the following types?” Vegetarians (never consumed beef, veal, lamb, pork, dishes with major component of meat) = 383 Meat eaters	<u>Study 1:</u> Positive affect: a single item (happy) “Please indicate for each feeling how often or rarely you experienced this feeling in the last four weeks?” on a 5-point Likert-type scale from 1 (very rarely) to 5 (very often) Life satisfaction: a single item (“How satisfied	Sociodemographic variables (sex, age, education)	<u>Study 1 & 2:</u> NS differences between vegetarians & meat eaters on positive affect & life satisfaction after controlling for socio-demographic variables (age, education, sex)	None

(continued on next page)

Table 3 (continued)

Short Citation	Country	Design	Population	Recruitment Methods	Dietary Assessment	Positive Psychological Variables	Factors Adjusted in Analyses	Key Findings	Funding Sources & Notes
			(<i>Mean</i> = 45.44, <i>SD</i> = 18.95)	large, longitudinal, household-based study	(consumed at least some meat or fish) = 15,149	are you with your life, all things considering?"') on a 11-point Likert-type scale from 0 (<i>completely dissatisfied</i>) to 10 (<i>completely satisfied</i>) <u>Study 2:</u> Positive affect: 4 items ("How much of the time during the past 4 weeks have you been a happy person, have you felt calm and peaceful, did you feel full of life, did you have a lot of energy?"') on a 6-point Likert-type scale from 1 (<i>none of the time</i>) to 6 (<i>all of the time</i>);Life satisfaction: single item ("How satisfied are you with your life?"') on a 11-point Likert-type scale from 0 (<i>completely dissatisfied</i>) to 10 (<i>completely satisfied</i>)			
Timko et al. (2012)	USA	Cross-sectional	486 university students **374 females & 111 males between 18 & 40 + years of age (<i>Mean</i> = 24.90, <i>SD</i> = 9.54)	Psychology department research pools from two universities, flyers distributed to local health food stores, & via internet (general psychology study sites, pages devoted to vegetarianism)	[§] Self-report of vegetarian status and the FFQ by Osler and Heitmann (1996) used to verify self-report of 'true' vegetarian status.Vegans (excluded all animal products) = 35Vegetarians (ovo-, lacto- or lacto-ovo vegetarian) = 111Semi-vegetarians (consumed no red meat or pork, but occasionally consumed fish or poultry) = 75Omnivores (ate all foods including all meat & other animal products) = 265	The RSES assesses general self-esteem: a 10-item measure that uses a 4-point Likert-type scale from 0 (<i>strongly agree</i>) to 3 (<i>strongly disagree</i>)	NR	NS differences among the groups on self-esteem.	None
Velten et al. (2018)	GermanyChina	Cross-sectionalLongitudinal	15,396 university students from Germany (2,991)	Part of the BOOM studies & invitation via email	"Do you currently follow a vegetarian diet?" Yes/NoVegetarian	The PMH Scale measures eudaimonic &	Chinese students matched for gender & age	Cross-sectional: German sample - Vegetarian diet was	Alexander von Humboldt Foundation; the (continued on next page)

Table 3 (continued)

Short Citation	Country	Design	Population	Recruitment Methods	Dietary Assessment	Positive Psychological Variables	Factors Adjusted in Analyses	Key Findings	Funding Sources & Notes
			and China (12,405); **9441 females & 5956 males between 15 and 65 years (<i>Age</i> = 21.14, <i>SD</i> = 2.83)		(no meat, fish) = 3216Nonvegetarian = 12180	hedonic well-being. It consists of 9 non-specific judgments (e.g., "I feel that I am actually well equipped to heal with life and its difficulties.") on a 4-point Likert-type scale from 0 (<i>do not agree</i>) to 3 (<i>agree</i>)		associated with lower PMH. Chinese sample – NS differences between the groups. Matched sample - vegetarian diet was associated with lower PMH. <i>Longitudinal</i> : German sample – NS differences between the groups. Chinese sample – vegetarian diet was associated with lower PMH. Matched sample – NS differences between the groups.	DFG Open Access Publication Funds of the Ruhr-Universität Bochum

*Discrepancies between the total sample of participants and the diet groups.

**Discrepancies between the total sample of participants and the number of males/females.

Note: FFQ = Food Frequency Questionnaire; NR = Not Reported; The PMH = The Positive Mental Health; The POMS-V = The Profile of Mood States-Vigor; RCT = Randomized Control Trial; The RSES = The Rosenberg Self-Esteem Scale; SF = short form; QoL = Quality of Life; The WHOQOLA = The World Health Organization Quality of Life Assessment.

§ Studies reported validity/reliability of the dietary assessment.

Table 4
Conceptual and Operational Definitions of the Positive Psychological Outcomes.

Primary Outcomes	Conceptual Definitions	Operational Definitions
1. Life Satisfaction	NR	“How satisfied are you with your life today?” ^{p.5} (Lavallee et al., 2019; Levac et al., 2010; Lindeman, 2002; Loh et al., 2021; Krizanova & Guardiola, 2021; Nezlek et al., 2018; Pfeiler & Egloff, 2018; Pfeiler & Egloff, 2020)
2. Positive Mental Health	“...the presence of general emotional and psychological well-being” ^{p.2} (Menzel et al., 2021; Velten et al., 2018)	“I am often carefree and in good spirits, I enjoy my life, I manage well to fulfill my needs.” ^{p.150} (Mensink et al., 2016; Lavallee et al., 2019)
3. Self-Esteem/ Self-Worth	A part of well-being (Levac et al., 2010; Nezlek et al., 2018); domain satisfaction that is a part of psychological well-being (Leitzmann, 2014)	“On the whole, I am satisfied with myself.” ^{p.78} (Koh et al., 2015; Leitzmann, 2014; Levac et al., 2010; Markowski and Roxburgh, 2019; Baş et al., 2005; Lindeman, 2002; Nezlek et al., 2018; Timko et al., 2012)
4. Vigor/Vitality	“...the conscious experience of possessing energy and vivacity.” ^{p.10} (Lavallee et al., 2019; Munn et al., 2018; Krizanova & Guardiola, 2021; Ryan & Frederick, 1997)	“I feel alive and vital.” ^{p.10} “Sometimes I feel so alive that I want to burst.” ^{p.10} (Lavallee et al., 2019)
Secondary Outcomes		
1. Meaning in Life	NR	“How meaningful did you feel your life was today?” ^{p.5} (Levac et al., 2010; Nezlek et al., 2018)
2. Optimism	NR	“What do you think about the future, are you... optimistic/pessimistic?” ^{p.12} (Lindeman, 2002; Pfeiler & Egloff, 2018)
3. Positive Emotions	A part of well-being (Levac et al., 2010; Nezlek et al., 2018); affective component of subjective well-being (Loh et al., 2021; Pfeiler & Egloff, 2020)	Positive activated (e.g., enthusiastic, happy, excited) and deactivated emotions (e.g., calm, peaceful, content) (Levac et al., 2010; Loh et al., 2021; Nezlek et al., 2018; Pfeiler & Egloff, 2020)
4. Psychological Well-Being	NR	“How much do you enjoy your life?” ^{p.6} “To what extent do you feel your life to be meaningful?” ^{p.6} (Kubzansky et al., 2015; Boldt et al., 2018)

Note. NR = Not Reported.

Boldt et al., 2018; Krizanova and Guardiola, 2021; Lindeman, 2002; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Timko et al., 2012; Lavallee et al., 2019; Velten et al., 2018; Beezhold and Johnston, 2012). However, two of them did not provide details on *how* they assessed dietary patterns (e.g., a single item, established FFQs) (Boldt et al., 2018; Lindeman, 2002). They only stated that participants were classified into omnivorous, vegan/vegetarian, and/or semi-vegetarian dietary groups (Boldt et al., 2018; Lindeman, 2002). Please see Table 3 for details on the assessment methods used to examine dietary intake.

3.3.2.2.2. Positive psychological functioning. To assess positive psychological functioning, all studies employed established self-reported questionnaires (e.g., POMS-V, RSES) or author-developed assessments using single- or multiple-items (e.g., “How satisfied are you in this moment with your life?”) (Baines et al., 2007; Baş et al., 2005; Beezhold

et al., 2010; Boldt et al., 2018; Krizanova and Guardiola, 2021; Lindeman, 2002; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Timko et al., 2012; Lavallee et al., 2019; Velten et al., 2018; Beezhold and Johnston, 2012).

Specifically, out of the 12 studies examining primary outcomes, 8 employed well-established questionnaires, including the Rosenberg Self-Esteem Scale (Baş et al., 2005; Lindeman, 2002; Nezlek et al., 2018; Timko et al., 2012), the Short Form Health Survey and the Positive Mental Health Scale (Baines et al., 2007; Velten et al., 2018), and a Vigor subscale of the Profile of Mood States questionnaire (Beezhold et al., 2010; Beezhold and Johnston, 2012). Six out of the 12 studies used author-developed assessments ranging from single to 9 items to examine life satisfaction (Krizanova and Guardiola, 2021; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020), “positive mental health” (Lavallee et al., 2019), and vigor (Krizanova and Guardiola, 2021).

Of the 4 studies that examined the secondary outcomes, one used an established questionnaire (the WHOQOL (Boldt et al., 2018)), whereas the others employed assessments developed by authors using single-, 2-, 3-, 4-, or 10-item assessments (Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020). Table 5 presents the assessment methods used to assess positive psychological outcomes.

3.3.2.3. Potential confounders. Out of the 13 studies, 8 reported

Table 5
Positive Psychological Functioning Assessment Methods Used in the Studies and Reported Psychometric Properties.

Primary Outcomes	Assessment Methods	Reported Psychometric Properties
Life Satisfaction	o A single item (Krizanova and Guardiola, 2021; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020) o 2 items (Nezlek et al., 2018)	o Both NR
Positive Mental Health	o The SF-36 (Baines et al., 2007) o The PMH (Velten et al., 2018) o 9 items (Lavallee et al., 2019)	o NR o High internal consistency, Cronbach's alpha was 0.92 and 0.93 o Cronbach's alpha ranging between 0.85 and 0.91
Self-Esteem/ Self-Worth	o The RSES (Baş et al. 2005; Lindeman, 2002; Nezlek et al., 2018; Timko et al., 2012) o Self-worth subscale of the World Assumption Scale (Lindeman, 2002)	o RSES: Reliability & validity for Turkish adolescents; reliable & valid measure of global SE determined in a recent study o Cronbach's alpha ranged from 0.79 to 0.85
Vigor/Vitality	o The POMS-V (Beezhold et al., 2010; Beezhold et al., 2012) o 6 items (Krizanova and Guardiola, 2021)	o POMS-V: high degree of reliability with Cronbach's alpha between 0.84 and 0.95 o NR
Secondary Outcomes		
Meaning in Life	o 2 items (Nezlek et al., 2018)	o NR
Optimism	o A single item (Pfeiler and Egloff, 2018)	o NR
Positive Emotions	o A single item (Pfeiler and Egloff, 2020) o 4 items (Pfeiler and Egloff, 2020) o 10 items (Nezlek et al., 2018)	o All NR
Psychological Well-Being	o The WHOQOL-BREF (Boldt et al., 2018)	o Validity well established in many studies

Note: NR = Not Reported; The PMH = The Positive Mental Health; The POMS-V = The Profile of Mood States-Vigor; The RSES = The Rosenberg Self-Esteem Scale; SE = Self-Esteem; SF = short form; The WHOQOL-BREF = The World Health Organization Quality of Life Assessment.

controlling for different confounding variables (Baines et al., 2007; Beezhold et al., 2010; Krizanovna and Guardiola, 2021; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Lavallee et al., 2019; Velten et al., 2018), and 5 either did not report controlling/adjusting for any variables in their analyses or did not collect information on sociodemographic variables (Baş et al., 2005; Boldt et al., 2018; Lindeman, 2002; Timko et al., 2012; Beezhold and Johnston, 2012).

3.3.3. The relation between meat consumption, meat abstention, and positive psychological

3.3.3.1. Primary outcomes. Twelve studies examined the primary outcomes. Seven demonstrated no differences between meat consumers and meat abstainers (Baş et al., 2005; Beezhold et al., 2010; Krizanovna and Guardiola, 2021; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Timko et al., 2012; Beezhold and Johnston, 2012), 3 studies showed mixed results (Nezlek et al., 2018; Lavallee et al., 2019; Velten et al., 2018), and 2 studies found that meat consumers had better positive psychological functioning compared to meat abstainers (Baines et al., 2007; Lindeman, 2002).

Specifically, studies examining life satisfaction (Krizanovna and Guardiola, 2021; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020) and vigor (Beezhold et al., 2010; Krizanovna and Guardiola, 2021; Beezhold and Johnston, 2012), demonstrated no differences between meat consumers and meat abstainers, while the results on self-esteem and “positive mental health” were conflicting. In university students, Lindeman (2002) and Nezlek et al. (2018) (Lindeman, 2002; Nezlek et al., 2018) found that meat consumers had higher self-esteem compared to meat abstainers, while Baş et al. (2005) and Timko et al. (2012) (Baş et al., 2005; Timko et al., 2012) in their sample of university students demonstrated no group differences.

In cross-sectional analyses, Baines et al. (2007) showed that compared to meat abstainers, meat consumers had greater “positive mental health” (Baines et al., 2007), while Lavallee et al. (2019) and Velten et al. (2018) found mixed results (Lavallee et al., 2019; Velten et al., 2018). Also, in longitudinal analysis, Velten et al. (2018) demonstrated conflicting results — in their Chinese sample, they found that meat consumers had better “positive mental health” compared to meat abstainers, while their German and matched subsample demonstrated no group differences (Velten et al., 2018).

3.3.3.2. Secondary outcomes. Four studies examined secondary outcomes. Three showed no differences between meat consumers and meat abstainers (Boldt et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020) and 1 demonstrated mixed results (Nezlek et al., 2018). Specifically, studies that examined optimism, positive affect, and psychological well-being found no group differences (Boldt et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020). However, Nezlek et al. (2018) showed that meat consumers had a greater “meaning in life” than meat abstainers (Nezlek et al., 2018). Table 6 presents the results of the primary and secondary outcomes.

4. Discussion

The primary purpose of this review was to summarize the scientific literature on the relation between meat consumption/abstention and positive psychological functioning. Our secondary goal was to identify research gaps and provide recommendations and solutions for future progress.

We identified 13 primary studies that met our inclusion/exclusion criteria and examined the relation between meat consumption and meat abstention and positive psychological functioning. They included 89,138 participants aged 13 to 102 years from varied geographic regions, including Europe, Asia, North America, and Oceania. The most frequently examined positive psychological constructs were life

Table 6
The Results of the Primary and Secondary Outcomes of the Studies Included in the Scoping Review.

Primary Outcomes	Favored Meat Consumers (n = 47,863)	No Significant Differences (n = 79,210)	Favored Meat Abstainers (n = 0)
Life Satisfaction		Krizanovna and Guardiola (2021) Nezlek et al. (2018)* Pfeiler and Egloff (2018): Study 1 & 2 Pfeiler and Egloff (2020): Study 1 & 2	
Positive Mental Health	Baines et al. (2007) Lavallee et al. (2019)* Velten et al. (2018)*	Lavallee et al. (2019)* Velten et al. (2018)*	
Self-Esteem/Self-Worth	Lindeman (2002): Study 1 & 2 Nezlek et al. (2018)*	Baş et al. (2005) Timko et al. (2012)	
Vigor/Vitality		Beezhold et al. (2010) Beezhold and Johnston (2012) Krizanovna and Guardiola (2021)	
Secondary Outcomes	Favored Meat Consumers (n = 403)	No Significant Differences (n = 38,742)	Favored Meat Abstainers (n = 0)
Meaning in Life	Nezlek et al. (2018)*		
Optimism		Pfeiler and Egloff (2018): Study 1 & 2 Nezlek et al. (2018)*	
Positive Affect/Emotions		Pfeiler and Egloff (2020): Study 1 & 2 Boldt et al. (2018)	
Psychological Well-Being			

Note. *Lavallee et al. (2019) & Velten et al. (2018) showed mixed findings in their cross-sectional & longitudinal analyses; Nezlek et al. (2018) showed mixed results on four outcomes (see Table 3 for details).

satisfaction (4 studies), self-esteem (4 studies), “positive mental health” (3 studies), and vigor (3 studies) (Baines et al., 2007; Baş et al., 2005; Beezhold et al., 2010; Krizanovna and Guardiola, 2021; Lindeman, 2002; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Timko et al., 2012; Lavallee et al., 2019; Velten et al., 2018; Beezhold and Johnston, 2012) (see Table 6). Positive affect (2 studies), “meaning in life” (1 study), optimism (1 study), and psychological well-being (1 study) were less frequently examined (Boldt et al., 2018; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020) (see Table 6). Although most of the studies found no differences between groups, a small minority showed that meat consumers had greater self-esteem, “positive mental health”, and “meaning in life” when compared to meat abstainers (Baines et al., 2007; Lindeman, 2002). No studies favored meat abstainers (see Table 6).

Our equivocal findings may be interpreted in several ways. It is possible that diet has little or no impact on positive psychological health. For example, individuals choose to abstain from meat for myriad reasons, including ethical (e.g., animal suffering), ecological concerns (e.g., climate change), health (e.g., self-treatment), subterfuge (providing ‘cover’ for disordered eating), as well as cultural, religious, and familial purposes. Therefore, the psychological costs and benefits may be as varied as the reasons for eliminating meat from one’s diet. In other words, a ‘cost’ in one domain may offer ‘benefits’ in another. This complexity renders definitive conclusions equivocal.

Furthermore, across all studies, there was no evidence to support

causal relations between meat consumption/avoidance and positive psychological outcomes. However, two studies provided evidence suggesting equivocal temporal relations. Specifically, after a 2-year follow-up, Lavalée et al. (2019) (Lavalée et al., 2019) demonstrated no differences between meat abstainers and meat consumers on “positive mental health”. On the other hand, after four years, Velten et al. (2018) (Velten et al., 2018) showed that meat abstention (when compared to meat consumption) was associated with poorer “positive mental health” in their Chinese sample. These disparate findings from a *positive* perspective are consistent with research examining diet-health relations from a *disease* perspective (Dobersek et al., 2020; Dobersek et al., 2021).

4.1. Methods used in the primary research

4.1.1. Sampling and recruitment strategies

Vegans and vegetarians represent a minority in Western, industrialized populations where omnivory and meat consumption predominate. Therefore, all representative or randomly selected population-level data will exhibit a large disparity between subpopulations (sample size) of meat consumers vs. abstainers. Additionally, the findings from studies that examined these large, randomly selected, and representative samples (Baines et al., 2007; Baş et al., 2005; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Lavalée et al., 2019) are potentially more rigorous and generalizable than findings from small, nonrepresentative samples.

However, the use of biased and nonprobability sampling protocols poses a number of issues (e.g., selection bias and unreliable data) that render study results questionable — especially when coupled with self-reported psychological functioning. For instance, individuals and groups that are highly invested in their dietary choices are more likely to report greater levels of psychological well-being to avoid cognitive dissonance and maintain their self-appraisals and group membership (Festinger, 1962).

4.1.2. Dietary assessment methods

All studies used self-reported dietary status. This is *potentially* a significant limitation given the escalating and contentious debate on the validity of self-reported dietary data and the use of memory-based methods (M-BMs) such as FFQs and 24 hour-dietary recall interviews (24HR) (Archer et al., 2013; Archer et al., 2018; Archer et al., 2018; Archer et al., 2015; Dhurandhar et al., 2014; Dhurandhar et al., 2016; Schoeller et al., 2013; Subar et al., 2015; Subar et al., 2016). Briefly, the debate revolves around two facts.

First, it is now well-established that data produced from M-BMs and other self-report methods are physiologically implausible (Archer et al., 2018; Archer and Blair, 2015; Archer et al., 2013; Archer et al., 2018; Archer et al., 2018; Archer et al., 2015; Archer et al., 2017; Ferrari et al., 2002; Ioannidis, 2013; Schoeller et al., 2015; Tooze et al., 2016; Hearing To Review the Development, 2015). Critics argue that implausibility means that self-reported dietary data are not inaccurate but are invalid, unscientific, and “inadmissible” as scientific evidence (Archer et al., 2013; Archer et al., 2018; Archer et al., 2015). Therefore, *quantitative* estimates from FFQs and 24HRs are invalid.

This empirically supported critique was the reason we excluded studies that examined meat consumption on a continuous (quantitative) basis. Nevertheless, the fact that quantitative estimates of meat consumption are invalid does not preclude qualitative (dichotomous) classifications (meat consumers vs. abstainers). In other words, from a *qualitative* perspective, the implausibility and invalidity of *quantitative* dietary data are not fatal flaws.

Second, critics argue that without objective corroboration of dietary intake, it is impossible to quantify the error of self-reports due to intentional and nonintentional distorting factors, such as deliberate misreporting (i.e., deception/lying), social desirability, reactivity, misestimation, and false memories. In other words, people lie, mislead, and misremember when reporting their diets (Archer et al., 2018; Archer and Blair, 2015).

Critics argue that these distorting factors render all self-reported dietary data nonfalsifiable (pseudoscientific) and therefore invalid (Archer and Blair, 2015; Archer et al., 2018; Archer et al., 2018; Archer et al., 2015). To be precise, they argue that there is a large and systematic difference between what people say they eat (self-report) and their actual dietary intake (Archer et al., 2018; Archer and Blair, 2015; Archer et al., 2013). There is both empirical and ‘commonsense’ evidence supporting this critique. For example, many self-described vegans and vegetarians eat meat occasionally (Rosenfeld, 2018; Hodson and Earle, 2018; Rosenfeld and Tomiyama, 2019), and over time, many vegans return to meat consumption (Hodson and Earle, 2018; Rosenfeld and Tomiyama, 2019; Barr and Chapman, 2002; Milfont et al., 2021). Moreover, as the social value of being an ethically conscious consumer (e.g., a vegan) increases, the false reporting of veganism may increase.

Furthermore, it is not known if lapsed vegans add meat sparingly or if there is a tipping point in which they return to regular meat consumption. The former suggests that any distinction between meat consumers and abstainers is meaningless, whereas the latter suggests that self-reported status may be valid — albeit prone to misclassification. Nevertheless, we think that although the physiologic implausibility of self-reported dietary data renders *quantitative* (continuous) classifications of meat consumption invalid, this is not the case for *qualitative* (categorical/dichotomous) assessments if the potential for misclassification is acknowledged (Dobersek et al., 2020; Archer et al., 2018; Archer and Blair, 2015; Archer et al., 2013; Archer et al., 2018; Archer et al., 2018; Archer et al., 2015).

4.1.3. Psychological assessment methods and variables

All studies employed self-reported assessment methods to examine psychological functioning. These methods ranged from established, psychometrically sound questionnaires to untested single-item assessments. Specifically, the primary outcomes were examined using established questionnaires (Baines et al., 2007; Baş et al., 2005; Beezhold et al., 2010; Lindeman, 2002; Timko et al., 2012; Velten et al., 2018; Beezhold and Johnston, 2012) — with the exception of “life satisfaction” (see (Krizanova and Guardiola, 2021; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020)), while the secondary outcomes were assessed by author-developed methods (Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020).

Although all studies operationally defined positive psychological outcomes (i.e., how they were assessed), several authors did not provide their conceptual definitions (i.e., the meaning of the variables) (see (Baines et al., 2007; Baş et al., 2005; Beezhold et al., 2010; Boldt et al., 2018; Lindeman, 2002; Nezlek et al., 2018; Pfeiler and Egloff, 2018; Pfeiler and Egloff, 2020; Timko et al., 2012; Lavalée et al., 2019; Beezhold and Johnston, 2012). Importantly, when variables are not directly observable (i.e., abstract constructs), it is essential to clarify outcomes conceptually to avoid ambiguity, circular definitions, and tautologies.

4.1.4. Potential confounders

Given that females have greater variability in positive psychological functioning and have a higher prevalence of depression, anxiety, and mood disorders than males (Carr, 2022; Riecher-Rössler, 2017; Steptoe et al., 2012; Weissman and Klerman, 1977; Wood et al., 1989), the failure to stratify by sex will lead to questionable results and conclusions.

Specifically, females are more likely than males to restrict their eating patterns (Rosenfeld, 2018; Ruby, 2012; Mensink et al., 2016) and more likely to use restrictive dietary patterns to camouflage disordered eating behaviors (Rosenfeld, 2018; Curtis and Comer, 2006). Furthermore, females differentially alter their diet in response to physical or psychological stress (Kandiah et al., 2006; Yang et al., 2022; Zellner et al., 2006) and are more likely to seek help than males (Donner and Lowry, 2013; Galdas et al., 2005). Therefore, if sex (and/or other individual) differences are not accounted for properly, vegan and vegetarian

dietary patterns may be spuriously associated with poorer mental health when the relation can be more logically explained by differences between males and females in psychological functioning, social desirability (Guadagno and Cialdini, 2007), help-seeking behaviors, disordered eating and self-treatment (e.g., restrictive dieting).

4.2. Strengths and limitations of this scoping review

This review had several strengths. First, our decision to include only studies that provided a clear, *qualitative* distinction between meat consumers and meat abstainers allowed for a clear yet rigorous review. While many studies examined dietary patterns *quantitatively*, these were excluded because the physiologic implausibility of self-reported dietary intakes renders a continuum from meat abstention to meat consumption untenable and invalid. To be precise, without a clear, dichotomous distinction between groups, all results and inferences would be equivocal.

Second, although prior reviews examined the relation between diet and positive outcomes, they did not distinguish physical from psychological health (Govindaraju et al., 2018; Vajdi and Farhangi, 2020; Wu et al., 2017). Clearly, although physical and psychological health are inextricably linked — as evidenced by the co-morbidity of physical and psychological disorders (e.g., anorexia nervosa (Harbottle et al., 2008; Howat et al., 1999; Saad et al., 2010; Sidiropoulos, 2007; Sullivan, 1995; Kaye et al., 2020) — the physical aspects of health and disease can be differentiated from specific psychological phenomena. Therefore, to our knowledge, this is the first review that synthesizes the current literature on the relation between meat consumption/abstention with a focus solely on *positive psychological* functioning.

Our review had limitations. First, we included only studies written in the English language. This could potentially bias our findings in favor of ‘Western’ norms that include meat consumption. For example, our search criteria did not include papers published in languages such as Japanese or Hindi; therefore, we may have omitted studies from geographic regions in which vegetarian and/or plant-based diets are more prevalent.

Second, although our search was comprehensive and clearly defined, we omitted many studies because positive outcomes were not clearly defined or did not differentiate between physical and psychological health (e.g., see (Corley et al., 2020; Ding et al., 2021; Jiang et al., 2020; Koh et al., 2015). Nevertheless, a highly focused review has the potential to be more informative to the research, clinical, and lay communities.

Third, the prevalence of vegans in most populations is quite small (Kamiński et al., 2020; Statista, 2022). This often necessitated combining vegans and vegetarians into a single group. Thus, in some instances, results and inferences regarding those who eliminate all animal products (vegans) will be conflated with those that simply eliminate some animal products (i.e., meat) from their diets (vegetarians). This suggests the need for increased research on the differences between the various classes of meat abstainers.

Fourth, while many of the excluded studies examined positive psychological variables (e.g., optimism), diet was assessed on a continuous scale rather than categorically (Ronaldson et al., 2015; Hingle et al., 2014). The use of a continuous scale presents the possibility of misclassification in concert with the certainty of mis-quantification because levels of self-reported meat consumption/abstention are not equivalent to actual levels of consumption/abstention (Archer et al., 2013; Archer et al., 2018; Archer et al., 2018; Archer et al., 2015). Finally, valid causal inferences cannot be made because the majority of the studies used cross-sectional designs.

4.3. Suggestions for future direction

Our previous reviews (Dobersek et al., 2020; Dobersek et al., 2021), conducted from a diet-disease rather than diet-health perspective showed that study quality had a sizeable influence on the clarity of

results. For example, study quality explained 58 % and 78 % of between-studies heterogeneity in the differences in depression and anxiety, respectively (Dobersek et al., 2021). In other words, the more rigorous the study, the stronger the relation between meat abstention and depression and anxiety. The fact that many of the studies in the present review suffered from the same limitations as the studies we previously examined suggests that regardless of the ‘lens’ used to explore these relations — diet-health or diet-disease — the differences in results (or lack thereof) may be generated by the study quality and/or methodological rigor.

Therefore, in the future, researchers should avoid the limitations presented below and in our prior work (Dobersek et al., 2020; Dobersek et al., 2021). First, studies should employ objective and robust data collection protocols for dietary status and positive psychological functioning. For example, the limitations, implausibility, and invalidity of self-reported dietary data may be overcome via the use of biomarkers or ‘point-of-purchase’ (barcode) data. Nevertheless, purchase data may not always be an accurate representation of actual consumption (Ng and Popkin, 2012).

Second, when possible, psychological variables should be examined using objective assessments such as behavior (frequency of smiling, laughing), frequency of pharmaceutical prescriptions, and physician diagnoses. Objective assessments are necessary because subjective assessments, as detailed herein, are subject to distortion via social desirability, demand characteristics, and observer-expectancy effects. Given the replication crisis in psychology, the use of more rigorous, valid, and objective data collection methods for psychological functioning can potentially increase replications — and refutations — of the current findings.

Third, investigators must acknowledge and address the effects of nonprobability sampling and recruitment methods when using self-reported data collection methods independent of the study design. For example, an RCT with biased sampling and self-reported data can lead to less valid and effective data than cross-sectional studies because individuals who are highly invested in specific diets may be predisposed to misreporting — both intentionally and unintentionally. Additionally, although RCTs, when conducted properly, are more rigorous and informative than observational studies, it is difficult to conduct randomized studies of sufficient duration to impact affective outcomes (optimism, life satisfaction).

Fourth, in keeping with the nature of a ‘scoping’ review, we did not perform analyses of the quality or methodological rigor of the studies. Therefore, a quantitative appraisal of methodological quality is needed to corroborate our qualitative observations and inferences. Moreover, comparisons of the risk of bias in studies conducted from the health-centered vs. disease-centered perspective may be informative (Dobersek et al., 2020; Dobersek et al., 2021).

Finally, by definition, omnivores do not limit or restrict the types of foods and beverages they consume. As such, *ceteris paribus*, they eat a more varied diet and have less need of supplementation. Conversely, restrictive dieters, by definition, limit their intake and may require supplementation (Dobersek et al., 2020; Cofnas, 2019; Dwyer, 1991; Dwyer and Loew, 1994). Therefore, adhering to vegan and vegetarian diets requires greater knowledge, planning, and discipline than following omnivorous patterns (Dobersek et al., 2020). Furthermore, vegans and vegetarians face greater social stigma than omnivores (Milfont et al., 2021; Cheah et al., 2020; Markowski and Roxburgh, 2019). Given these facts, future research should examine constructs such as perseverance, resilience, grit, and mental toughness in vegans and vegetarians.

5. Conclusion

The purpose of this review was to inform future research by summarizing current evidence on the relation between meat consumption and positive psychological functioning. Overall, studies varied

substantially in both methods and outcomes. The majority of studies suggested no differences between meat consumers and meat abstainers on positive psychological variables. Although a small minority of studies showed that meat consumers had more positive psychological functioning, no studies suggested that meat abstainers did. Study designs precluded inference of causal relations, and none should be inferred. The present review demonstrates the need for future research, given the equivocal nature of the current literature on diet-health relations examined from a positive psychological perspective.

Funding source

This study was in part funded via an unrestricted research grant from the Beef Checkoff, through the National Cattlemen's Beef Association. The sponsor of the study had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Institutional Review Board: Not applicable.

Generative AI and AI-assisted technologies in the writing process: Not applicable.

CRedit authorship contribution statement

Urska Dobersek: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Mary Bender:** . **Alexandria Etienne:** Investigation, Data curation, Writing – review & editing, Visualization. **Gabriela E. Fernandez Gil:** Investigation, Data curation, Writing – review & editing, Visualization. **Claire Hostetter:** Investigation, Data curation, Writing – review & editing, Visualization.

Declaration of competing interest

UD previously received funding from the Beef Checkoff, through the National Cattlemen's Beef Association.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2023.102556>.

References

- Antonovsky, A., 1979. Perceiving the world as coherent. San Francisco: Jossey-Bass Inc, Publishers 123–159.
- Archer, E., 2018. In defense of sugar: a critique of diet-centrism. *Prog. Cardiovasc. Dis.* 61 (1), 10–19.
- Archer, E., Arjmandi, B., 2020. Falsehoods and facts about dietary sugars: a call for evidence-based policy. *Crit. Rev. Food Sci. Nutr.* 61 (22), 3725–3739.
- Archer, E., Blair, S.N., 2015. Implausible data, false memories, and the status quo in dietary assessment. *Adv. Nutr.* 6 (2), 229–230.
- Archer, E., Marlow, M.L., Williams, R.A., 2017. Government dietary guidelines: Uncertain science leads to questionable public health policy. 2017.
- Archer, E., Hand, G.A., Blair, S.N., 2013. Validity of US nutritional surveillance: National Health and Nutrition Examination Survey caloric energy intake data, 1971–2010. *PLoS One* 8 (10), e76632.
- Archer, E., Pavea, G., Lavie, C.J., 2015. The inadmissibility of what we eat in America and NHANES dietary data in nutrition and obesity research and the scientific formulation of national dietary guidelines. *Mayo Clin. Proc.* 90 (7), 911–926.
- Archer, E., Lavie, C.J., Hill, J.O., 2018. The failure to measure dietary intake engendered a fictional discourse on diet-disease relations. *Front. Nutr.* 5, 105.
- Archer, E., Marlow, M.L., Lavie, C.J., 2018. Controversy and debate: Memory based methods paper 3: nutrition's 'black swans': our reply. *J. Clin. Epidemiol.* 104, 130–135.
- Archer, E., Marlow, M.L., Lavie, C.J., 2018. Controversy and debate: Memory-Based Methods Paper 1: The fatal flaws of food frequency questionnaires and other memory-based dietary assessment methods. *J. Clin. Epidemiol.* 104, 113–124.
- Arksey, H., O'Malley, L., 2005. Scoping studies: towards a methodological framework. *Int. J. Soc. Res. Methodol.* 8 (1), 19–32.
- Baines, S., Powers, J., Brown, W.J., 2007. How does the health and well-being of young Australian vegetarian and semi-vegetarian women compare with non-vegetarians? *Public Health Nutr.* 10 (5), 436–442.
- Barr, S.I., Chapman, G.E., 2002. Perceptions and practices of self-defined current vegetarian, former vegetarian, and nonvegetarian women. *J. Am. Diet. Assoc.* 102 (3), 354–360.
- Bas, M., Karabudak, E., Kiziltan, G., 2005. Vegetarianism and eating disorders: Association between eating attitudes and other psychological factors among Turkish adolescents. *Appetite* 44 (3), 309–315.
- Beezhold, B.L., Johnston, C.S., Daigle, D.R., 2010. Vegetarian diets are associated with healthy mood states: A cross-sectional study in seventh day adventist adults. *Nutr. J.* 9 (1), 1–7.
- Beezhold, B.L., Johnston, C.S., 2012. Restriction of meat, fish, and poultry in omnivores improves mood: a pilot randomized controlled trial. *Nutr. J.* 11 (1), 1–5.
- Boehm, J.K., Peterson, C., Kivimaki, M., Kubzansky, L.D., 2011. Heart health when life is satisfying: evidence from the Whitehall II cohort study. *Eur. Heart J.* 32 (21), 2672–2677.
- Boehm, J.K., Chen, Y., Koga, H., Mathur, M.B., Vie, L.L., Kubzansky, L.D., 2018. Is optimism associated with healthier cardiovascular-related behavior? Meta-analyses of 3 health behaviors. *Circ. Res.* 122 (8), 1119–1134.
- Boldt, P., Knechtel, B., Nikolaidis, P., Lechleitner, C., Wirtzinger, G., Leitzmann, C., et al., 2018. Quality of life of female and male vegetarian and vegan endurance runners compared to omnivores—results from the NURMI study (step 2). *J. Int. Soc. Sports Nutr.* 15 (1), 33.
- Bolier, L., Haverman, M., Westerhof, G.J., Riper, H., Smit, F., Bohlmeijer, E., 2013. Positive psychology interventions: a meta-analysis of randomized controlled studies. *BMC Public Health* 13 (1), 1–20.
- Boyle, P.A., Buchman, A.S., Bennett, D.A., 2010. Purpose in life is associated with a reduced risk of incident disability among community-dwelling older persons. *Am. J. Geriatr. Psychiatry* 18 (12), 1093–1102.
- Brown, P., Brunnhuber, K., Chalkidou, K., Chalmers, I., Clarke, M., Fenton, M., et al., 2006. How to formulate research recommendations. *BMJ (clinical Research Ed)* 333 (7572), 804–806.
- Carr, A., 2022. Positive Psychology: The Science of Wellbeing and Human Strengths. Routledge.
- Cheah, I., Shimul, A.S., Liang, J., Phau, I., 2020. Drivers and barriers toward reducing meat consumption. *Appetite* 149, 104636.
- Chida, Y., Steptoe, A., 2008. Positive psychological well-being and mortality: a quantitative review of prospective observational studies. *Psychosom. Med.* 70 (7), 741–756.
- Cofnas, N., 2019. Is vegetarianism healthy for children? *Crit. Rev. Food Sci. Nutr.* 59 (13), 2052–2060.
- Colquhoun, H.L., Levac, D., O'Brien, K.K., Straus, S., Tricco, A.C., Perrier, L., et al., 2014. Scoping reviews: Time for clarity in definition, methods, and reporting. *J. Clin. Epidemiol.* 67 (12), 1291–1294.
- Corlett, R.T., 2011. Trouble with the gray literature. *Biotropica* 43 (1), 3–5.
- Corley, J., Cox, S.R., Taylor, A.M., Hernandez, M.V., Maniega, S.M., Ballerini, L., et al., 2020. Dietary patterns, cognitive function, and structural neuroimaging measures of brain aging. *Exp. Gerontol.* 142, 111117.
- Curtis, M.J., Comer, L.K., 2006. Vegetarianism, dietary restraint and feminist identity. *Eat. Behav.* 7 (2), 91–104.
- Dhurandhar, N.V., Schoeller, D., Brown, A.W., Heymsfield, S.B., Thomas, D., Sørensen, T. I., et al., 2014. Energy balance measurement: when something is not better than nothing. *Int. J. Obes. (Lond)* 39 (7), 1109–1113.
- Dhurandhar, N.V., Brown, A.W., Thomas, D., Allison, D.B., 2016. We agree that self-reported energy intake should not be used as a basis for conclusions about energy. *J. Nutr.* 146 (5), 1141–1142.
- Diener, E., Lucas, R.E., Oishi, S., 2002. Subjective well-being: The science of happiness and life satisfaction. *Handbook of Positive Psychology* 2, 63–73.
- Ding, K., Zhou, H., Gao, T., Xu, R., Chen, L., Cai, J., et al., 2021. Dietary patterns and cognitive function in older adults residing in rural China. *Asia Pac. J. Clin. Nutr.* 30 (2), 253–262.
- Dobersek, U., Archer, E., 2022. Dietary dilemmas. *Prog. Cardiovasc. Dis.* S0033–620 (22), 00097.
- Dobersek, U., Wy, G., Adkins, J., Altmeyer, S., Krout, K., Lavie, C.J., et al., 2020. Meat and mental health: A systematic review of meat abstinence and depression, anxiety, and related phenomena. *Crit. Rev. Food Sci. Nutr.* 1–14.
- Dobersek, U., Teel, K., Altmeyer, S., Adkins, J., Wy, G., Peak, J., 2021. Meat and mental health: A meta-analysis of meat consumption, depression, and anxiety. *Crit. Rev. Food Sci. Nutr.* 1–18.
- Donner, N.C., Lowry, C.A., 2013. Sex differences in anxiety and emotional behavior. *Pflügers Archiv-European Journal of Physiology* 465, 601–626.
- Dwyer, J.T., 1991. Nutritional consequences of vegetarianism. *Annu. Rev. Nutr.* 11 (1), 61–91.
- Dwyer, J., Loew, F.M., 1994. Nutritional risks of vegan diets to women and children: Are they preventable? *J. Agric. Environ. Ethics* 7, 87–109.
- EndNote20. EndNote 20, Clarivate Analytics 2022 2022 [].
- Ferrari, P., Slimani, N., Ciampi, A., Trichopoulou, A., Naska, A., Lauria, C., et al., 2002. Evaluation of under- and overreporting of energy intake in the 24-hour diet recalls in the European Prospective Investigation into Cancer and Nutrition (EPIC). *Public Health Nutr.* 5 (6b), 1329–1345.
- Festinger, L., 1962. A theory of cognitive dissonance. Stanford University Press.
- Galdas, P.M., Cheater, F., Marshall, P., 2005. Men and health help-seeking behaviour: literature review. *J. Adv. Nurs.* 49 (6), 616–623.

- Gibney, M.J., Forde, C.G., Mullally, D., Gibney, E.R., 2017. Ultra-processed foods in human health: a critical appraisal. *Am. J. Clin. Nutr.* 106 (3), 717–724.
- Goodmon, L.B., Middleditch, A.M., Childs, B., Pietrasiuk, S.E., 2016. Positive psychology course and its relationship to well-being, depression, and stress. *Teach. Psychol.* 43 (3), 232–237.
- Govindaraju, T., Sahle, B.W., McCaffrey, T.A., McNeil, J.J., Owen, A.J., 2018. Dietary patterns and quality of life in older adults: A systematic review. *Nutrients* 10 (8), 971.
- Guadagno, R.E., Cialdini, R.B., 2007. Gender differences in impression management in organizations: a qualitative review. *Sex Roles* 56, 483–494.
- Harbottle, E., Birmingham, C., Sayani, F., 2008. Anorexia nervosa: a survival analysis. *Eat. Weight Disord.* 13 (2), e32–e34.
- Harper, A.E., 1980. “Healthy people”: critique of the nutrition segments of the Surgeon General’s report on health promotion and disease prevention. *Am. J. Clin. Nutr.* 33 (7), 1703–1712.
- Hearing To Review the Development of the 2015 Dietary Guidelines For Americans; United States Congressional Record, House of Representatives, Committee on Agriculture. 104th Congress, 1st session, October 7th, Serial No. 114-29; Hearing before the Committee on Agriculture (2015).
- Hingle, M.D., Wertheim, B.C., Tindle, H.A., Tinker, L., Seguin, R.A., Rosal, M.C., et al., 2014. Optimism and diet quality in the Women’s Health Initiative. *J. Acad. Nutr. Diet.* 114 (7), 1036–1045.
- Hodson, G., Earle, M., 2018. Conservatism predicts lapses from vegetarian/vegan diets to meat consumption (through lower social justice concerns and social support). *Appetite* 120, 75–81.
- Howat, P., Brooks, E., Cavalier, D., 1999. Can calcium supplementation and exercise increase bone density in anorexia: A case study. *J. Am. Diet. Assoc.* 99 (9), A12.
- Huang X, Lin J, Demner-Fushman D, editors. Evaluation of PICO as a knowledge representation for clinical questions. AMIA annual symposium proceedings; 2006: American Medical Informatics Association.
- Ioannidis JP. Implausible results in human nutrition research. *British Medical Journal Publishing Group*; 2013.
- Jacobs, C., Dwyer, J.T., 1988. Vegetarian children: appropriate and inappropriate diets. *Am. J. Clin. Nutr.* 48 (3), 811–818.
- Jiang, Y.W., Sheng, L.T., Pan, X.F., Feng, L., Yuan, J.M., Pan, A., et al., 2020. Meat consumption in midlife and risk of cognitive impairment in old age: the Singapore Chinese Health Study. *Eur J Nutr* 59 (4), 1729–1738.
- Kamiński, M., Skonieczna-Żydecka, K., Nowak, J.K., Stachowska, E., 2020. Global and local diet popularity rankings, their secular trends, and seasonal variation in Google Trends data. *Nutrition* 79, 110759.
- Kandiah, J., Yake, M., Jones, J., Meyer, M., 2006. Stress influences appetite and comfort food preferences in college women. *Nutr. Res.* 26 (3), 118–123.
- Kaye, W.H., Wierenga, C.E., Bischoff-Grethe, A., Berner, L.A., Ely, A.V., Bailer, U.F., et al., 2020. Neural insensitivity to the effects of hunger in women remitted from anorexia nervosa. *Am. J. Psychiatry* 177 (7), 601–610.
- Koh, F., Charlton, K., Walton, K., McMahon, A.T., 2015. Role of dietary protein and thiamine intakes on cognitive function in healthy older people: a systematic review. *Nutrients* 7 (4), 2415–2439.
- Krizanova, J., Guardiola, J., 2021. Happy but Vegetarian? Understanding the Relationship of Vegetarian Subjective Well-Being from the Nature-Connectedness Perspective of University Students. *Appl. Res. Qual. Life* 16 (5), 2221–2249.
- Kubzansky, L.D., Boehm, J.K., Segerstrom, S.C., 2015. Positive psychological functioning and the biology of health. *Soc. Pers. Psychol. Compass* 9 (12), 645–660.
- Lavallee, K., Zhang, X.C., Michalak, J., Schneider, S., Margraf, J., 2019. Vegetarian diet and mental health: Cross-sectional and longitudinal analyses in culturally diverse samples. *J. Affect. Disord.* 248, 147–154.
- Leitzmann, C., 2014. Vegetarian nutrition: past, present, future. *Am. J. Clin. Nutr.* 100 (suppl 1), 496S–502S.
- Levac, D., Colquhoun, H., O’Brien, K.K., 2010. Scoping studies: advancing the methodology. *Implement. Sci.* 5 (1), 1–9.
- Lindeman, M., 2002. The state of mind of vegetarians: Psychological well-being or distress? *Ecol. Food Nutr.* 41 (1), 75–86.
- Loh, H.C., Hoo, F.K., Kwan, J.N., Lim, Y.F., Looi, I., 2021. A bibliometric analysis of global trends in vegan-related research. *Global Trends* 3 (2).
- Markowski, K.L., Roxburgh, S., 2019. “If I became a vegan, my family and friends would hate me”: Anticipating vegan stigma as a barrier to plant-based diets. *Appetite* 135, 1–9.
- Mensink G, Barbosa CL, Brettschneider A-K. Prevalence of persons following a vegetarian diet in Germany. 2016.
- Menzel, J., Abraham, K., Stangl, G.I., Ueland, P.M., Obeid, R., Schulze, M.B., et al., 2021. Vegan diet and bone health—results from the cross-sectional RBVD study. *Nutrients* 13 (2), 685.
- Milfont, T.L., Satherley, N., Osborne, D., Wilson, M.S., Sibley, C.G., 2021. To meat, or not to meat: A longitudinal investigation of transitioning to and from plant-based diets. *Appetite* 166, 105584.
- Munn, Z., Peters, M.D., Stern, C., Tufanaru, C., McArthur, A., Aromataris, E., 2018. Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Med. Res. Method.* 18 (1), 1–7.
- Nezlek, J.B., Forestell, C.A., Newman, D.B., 2018. Relationships between vegetarian dietary habits and daily well-being. *Ecol. Food Nutr.* 57 (5), 425–438.
- Ng, S.W., Popkin, B.M., 2012. Monitoring foods and nutrients sold and consumed in the United States: dynamics and challenges. *J. Acad. Nutr. Diet.* 112 (1), 41.
- O’Keefe, J.H., O’Keefe, E.L., Lavie, C.J., Cordain, L., 2022. Debunking the vegan myth: The case for a plant-forward omnivorous whole-foods diet. *Prog. Cardiovasc. Dis.*
- Organization, W.H., 1996. WHOQOL-BREF: introduction, administration, scoring and generic version of the assessment: field trial version, December 1996. World Health Organization.
- Peters MD, Godfrey C, McInerney P, Munn Z, Tricco AC, Khalil H. Scoping Reviews. In: Aromataris E, Munn Z, editors. *JBIM Manual for Evidence Synthesis* 2020.
- Peters, M.D., Marnie, C., Tricco, A.C., Pollock, D., Munn, Z., Alexander, L., et al., 2020b. Updated methodological guidance for the conduct of scoping reviews. *JBIM Evid. Synth.* 18 (10), 2119–2126.
- Peters, M.D., Godfrey, C., McInerney, P., Khalil, H., Larsen, P., Marnie, C., et al., 2022. Best practice guidance and reporting items for the development of scoping review protocols. *JBIM Evid. Synth.*
- Pfeiler, T.M., Egloff, B., 2018. Examining the “Veggie” personality: Results from a representative German sample. *Appetite* 120, 246–255.
- Pfeiler, T.M., Egloff, B., 2020. Do vegetarians feel bad? Examining the association between eating vegetarian and subjective well-being in two representative samples. *Food Qual. Prefer.* 86.
- Riecher-Rössler, A., 2017. Sex and gender differences in mental disorders. *Lancet Psychiatry* 4 (1), 8–9.
- Ronaldson, A., Molloy, G.J., Wikman, A., Poole, L., Kaski, J.-C., Steptoe, A., 2015. Optimism and recovery after acute coronary syndrome: a clinical cohort study. *Psychosom. Med.* 77 (3), 311.
- Rosenfeld, D.L., 2018. The psychology of vegetarianism: Recent advances and future directions. *Appetite* 131, 125–138.
- Rosenfeld, D.L., Tomiyama, A.J., 2019. When vegetarians eat meat: Why vegetarians violate their diets and how they feel about doing so. *Appetite* 143, 104417.
- Rozanski A, Bavishi C, Kubzansky LD, Cohen R. Association of optimism with cardiovascular events and all-cause mortality: a systematic review and meta-analysis. *JAMA Network Open.* 2019;2(9):e1912200-e.
- Ruby, M.B., 2012. Vegetarianism A blossoming field of study. *Appetite* 58 (1), 141–150.
- Ryan, R.M., Frederick, C., 1997. On energy, personality, and health: Subjective vitality as a dynamic reflection of well-being. *J. Pers.* 65 (3), 529–565.
- Saad, L., Silva, L.F., Banzato, C.E., Dantas, C.R., Garcia, C., 2010. Anorexia nervosa and Wernicke-Korsakoff syndrome: A case report. *J Med Case Reports* 4 (1), 1–5.
- Santos, V., Paes, F., Pereira, V., Arias-Carrión, O., Silva, A.C., Carta, M.G., et al., 2013. The role of positive emotion and contributions of positive psychology in depression treatment: systematic review. *Clinical Practice and Epidemiology in Mental Health.*
- Scheier, M.F., Carver, C.S., Bridges, M.W., 1994. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the Life Orientation Test. *J. Pers. Soc. Psychol.* 67 (6), 1063.
- Schoeller, D., Archer, E., Dawson, J.A., Heymsfield, S., 2015. Implausible results from the use of invalid methods. *J. Nutr.* 145 (1), 150.
- Schoeller, D.A., Thomas, D., Archer, E., Heymsfield, S.B., Blair, S.N., Goran, M.I., et al., 2013. Self-report-based estimates of energy intake offer an inadequate basis for scientific conclusions. *Am. J. Clin. Nutr.* 97 (6), 1413–1415.
- Schotanus-Dijkstra, M., Drossaert, C.H., Pijnter, M.E., Boon, B., Walburg, J.A., Bohlmeijer, E.T., 2017. An early intervention to promote well-being and flourishing and reduce anxiety and depression: A randomized controlled trial. *Internet Interv.* 9, 15–24.
- Seligman ME, Csikszentmihalyi M. Positive psychology: An introduction. Flow and the foundations of positive psychology: Springer; 2000. p. 279-98.
- Sidiropoulos, M., 2007. Anorexia Nervosa: The physiological consequences of starvation and the need for primary prevention efforts. *McGill J. Med.*: MJM 10 (1), 20.
- Sisto, A., Vicinanza, F., Campanozzi, L.L., Ricci, G., Tartaglioni, D., Tambone, V., 2019. Towards a transversal definition of psychological resilience: a literature review. *Medicina* 55 (11), 745.
- Statista. Meat consumption and vegetarianism in Europe - Statistics and Facts Statista.com2019 [Available from: <https://www.statista.com/topics/3345/meat-consumption-and-vegetarianism-in-europe/#editorsPicks>].
- Statista. Diets and nutrition in the U.S. in 2022 2023 [Available from: <https://www.statista.com/forecasts/997223/diets-and-nutrition-in-the-us>].
- Steptoe, A., Demakakos, P., de Oliveira, C., Wardle, J., 2012. Distinctive biological correlates of positive psychological well-being in older men and women. *Psychosom. Med.* 74 (5), 501–508.
- Subar AF, Freedman LS, Kirkpatrick SI, Boushey C, Potischman N, Guenther PM, et al. Reply to NV Dhurandhar et al. *The Journal of nutrition.* 2016;146(5):1142-3.
- Subar, A.F., Freedman, L.S., Tooze, J.A., Kirkpatrick, S.I., Boushey, C., Neuhouser, M.L., et al., 2015. Addressing current criticism regarding the value of self-report dietary data. *J. Nutr.* 145 (12), 2639–2645.
- Sullivan, P.F., 1995. Mortality in anorexia nervosa. *Am. J. Psychiatry* 152 (7), 1073–1074.
- Timko, C.A., Holmes, J.M., Chubski, J., 2012. Will the real vegetarian please stand up? An investigation of dietary restraint and eating disorder symptoms in vegetarians versus non-vegetarians. *Appetite* 58 (3), 982–990.
- Tooze, J.A., Freedman, L.S., Carroll, R.J., Midthune, D., Kipnis, V., 2016. The impact of stratification by implausible energy reporting status on estimates of diet-health relationships. *Biom. J.* 58 (6), 1538–1551.
- Tricco DPAC, Peters MD, McInerney PA, Khalil H, Alexander11 CMGLA, Munn Z. Methodological quality, guidance, and tools in scoping reviews: a scoping review protocol. 2021.
- Tricco, A.C., Lillie, E., Zarin, W., O’Brien, K.K., Colquhoun, H., Levac, D., et al., 2018. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann. Intern. Med.* 169 (7), 467–473.
- Vajdi, M., Farhangi, M.A., 2020. A systematic review of the association between dietary patterns and health-related quality of life. *Health Qual. Life Outcomes* 18 (1), 1–15.

- Velten, J., Bieda, A., Scholten, S., Wannemüller, A., Margraf, J., 2018. Lifestyle choices and mental health: A longitudinal survey with German and Chinese students. *BMC Public Health* 18 (1), 632.
- Weissman, M.M., Klerman, G.L., 1977. Sex differences and the epidemiology of depression. *Arch. Gen. Psychiatry* 34 (1), 98–111.
- WHO, 1948. Preamble to the Constitution of the World Health. Organization.
- WHO. Mental health: Strengthening our response 2018 [Available from: <https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response>.
- Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., et al., 2019. Food in the Anthropocene: the EAT–Lancet Commission on healthy diets from sustainable food systems. *Lancet* 393 (10170), 447–492.
- Woo, J., Chan, R., Leung, J., Wong, M., 2010. Relative contributions of geographic, socioeconomic, and lifestyle factors to quality of life, frailty, and mortality in elderly. *PLoS One* 5 (1), e8775.
- Wood, W., Rhodes, N., Whelan, M., 1989. Sex differences in positive well-being: A consideration of emotional style and marital status. *Psychol. Bull.* 106 (2), 249.
- Wu, X.Y., Han, L.H., Zhang, J.H., Luo, S., Hu, J.W., Sun, K., 2017. The influence of physical activity, sedentary behavior on health-related quality of life among the general population of children and adolescents: A systematic review. *PLoS One* 12 (11), e0187668.
- Yang, F., Li, R., Ren, X., Cao, B., Gao, X., 2022. Association between perceived levels of stress and self-reported food preferences among males and females: a stated preference approach based on the china health and nutrition survey. *Frontiers Public Health* 10.
- Zellner, D.A., Loaiza, S., Gonzalez, Z., Pita, J., Morales, J., Pecora, D., et al., 2006. Food selection changes under stress. *Physiol. Behav.* 87 (4), 789–793.