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Perceptions of the Benefits and Barriers to Vegetarian Diets and the Environmental Impact of Meat-Eating

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Abstract: This pre-registered study investigated beliefs about climate change, the impact of meat consumption on the environment, and willingness to reduce meat intake in a large community sample of Australian social media users (*N* = 740). It also conceptually replicates Lea and Worsley's (2003) study on Australians' perceptions of the benefits and barriers to a vegetarian diet. Although most participants indicated a belief in climate change, only half agreed that agriculture and animal husbandry are a leading cause of climate change. Participants believed reducing and eliminating meat intake to be some of the least effective actions against climate change, contributing to a low willingness to change meat intake. Compared with Leah and Worsley, a significantly greater proportion of participants agreed with most of the benefits (11 of 15) and barriers (12 of 14) to vegetarianism. Both perceived benefits and barriers to vegetarianism significantly predicted participant meat consumption (red meat, poultry, and seafood). Overall, results indicate an increase in the number of people who are aware that meat-eating has environmental impacts, although they believe its impact to be significantly less than other pro-environmental behaviours (e.g., using public transport, recycling things more, and using more energy from renewable sources).

Keywords: attitudes; beliefs; climate change; meat; sustainability; vegetarianism

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1. Introduction

Although some media and political figures continue to sow doubt [1], there is an overwhelming consensus among climate scientists that human-induced climate change is happening; what used to be a 97% consensus rate is now greater than 99% [2]. Indeed, the latest report from the Intergovernmental Panel on Climate Change [3] states that "Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1 °C above 1850–1900 in 2011–2020" (p. 4). Without dramatic reductions in greenhouse gas (GHG) emissions, efforts to achieve the Paris Agreement goals of limiting global temperature to a maximum of 1.5 °C or even 2 °C above pre-industrial levels will fail this century [3–5]. The current policies in place today will lead to an estimated 1.9–3.7 °C of warming by the end of the century [6]. The situation is especially dire in Australia, which has been identified as a 'climate change hotspot' that is particularly vulnerable to climate change [7]. Natural disasters cost Australia AUD $13.2 billion in 2017 alone, and this figure is expected to more than triple by 2050 [8]. The most recent state of the environment report [9] notes that "the state and trend of the environment of Australia are poor and deteriorating as a result of increasing pressures from climate change, habitat loss, invasive species, pollution and resource extraction" (p. 10).

Worldwide, an estimated 80 billion animals a year are raised and killed for food [10]. The average per capita meat consumption in Australia was estimated at 110 kg in 2018 [11], more than triple the global average [12]. When it comes to how much animal agriculture impacts the environment, estimates vary considerably. In 2006, a report from the Food and

Agriculture Organisation (FAO) estimated that livestock, primarily cattle, were responsible for 18% of global GHG emissions [13]. In 2013, a follow-up FAO report estimated that livestock produced 14.5% of GHG emissions [14], and more recently, Twine [15] drew on FAO data to argue that this figure should be at least 16.5%. Xu and colleagues [16] estimate that as much as 57% of global greenhouse gas emissions from producing animal-based foods are roughly double that of plant-based foods.

In 2019, the EAT-Lancet Commission on Food, Planet, Health released a report that emphasised a predominantly plant-based diet, containing little to no red meat, as most beneficial for individual health, the global community, and the environment [17]. Subsequent modelling [18] suggests that "vegetarian and vegan diets that focused on legumes and whole grains in place of animal products in current diets" (p. e804) were the most affordable of a range of dietary patterns that have been assessed as healthier and more sustainable than current diets. That said, not all meats (and not all plant-based foods) have an equal impact. Lifecycle assessments of meals from several different cuisines indicated that whole-food vegan meals consistently had the lowest environmental impact [19]. The vegetarian meals had 3 times the Global Warming Potential (GWP) of vegan meals, and meat-based meals had 14 times the GWP of vegan meals. The impact of meals made with beef was particularly high (32 times the GWP of vegan meals), whereas the impact of meals made with chicken was only 6 times the impact of vegan meals.

Confronting the climate crisis requires action from everyone, from business leaders and politicians to scientists, teachers, and creative professionals [6,9]. What people put on their plate is one important piece of the puzzle. Clark et al. [20] suggest it is likely necessary to reduce global GHG emissions from global food systems to meet the 1.5 °C or 2 °C target and note that a transition to plant-rich diets would greatly reduce emissions. Although there is a growing body of research demonstrating the environmental impact of meat-eating, more work is required to understand how it is perceived by laypeople [21–23]. Better understanding people's beliefs about and willingness to engage in pro-environmental dietary behaviours is vital to helping better inform initiatives and campaigns addressing climate change.

1.1. Public Perceptions of the Environmental Impact of Agriculture

Numerous studies suggest that reducing meat intake is not seen as an effective mitigation action. In a study of American university students, participants rated eating less meat (8%) and adopting a vegetarian diet (4%) as the least effective actions, whilst recycling (81%) and re-using containers and bottles (73%) were perceived to be the most effective pro-environmental actions [24]. Similar findings were also found in British [25], Dutch [26], Flemish [27], Scottish [28], and Swiss samples [29]. In a representative sample of 1099 Australian meat consumers, only one third of the sample reported concern about the environmental impact of meat consumption; concern was higher among the cluster of participants who were younger, more educated, higher income, and living in metropolitan areas [30]. Qualitative research with an Australian community sample similarly found that most participants believe making sustainable food choices would only slightly benefit the environment [31]. Although many participants said they were willing to follow a mostly plant-based diet, some participants were adamantly opposed, as they believed they needed to consume meat for health-related reasons. The consistent pattern across these studies is that meat-eating is often perceived to be an insignificant contributor to climate change, and that many people think reducing meat intake would have little effect on the environment.

1.2. Perceived Benefits and Barriers to a Vegetarian Diet

Although a global shift toward predominantly plant-based diets would be a meaningful way to mitigate global warming [17,18,20,32] a large percent of the population does not share this view. Furthermore, studies on lay perceptions of plant-based diets are limited, usually focusing on vegetarian diets, rather than plant-based diets per se. Two reviews of the literature on the psychology of vegetarianism indicated that the most common reasons

people in Western cultural contexts adopt a vegetarian diet are concern for health and animal welfare [33,34]. Contrast this with India, where motivations for vegetarian diets are focused more on concerns for tradition and following religious teachings [35,36].

Two decades ago, Lea and Worsley [37] conducted a study asking 601 Australians their beliefs about the barriers and benefits of a vegetarian diet. The top three benefits were all related to health: "Eat more fruits and vegetables", "Decrease saturated fat intake in my diet", and "Control my weight". One of the items, "Help the environment", was perceived to be a benefit by 22% of participants, but the item is broad and does not explicitly refer to the direct environmental impact of meat-eating. The main barriers reported by participants were enjoying eating meat and an unwillingness to change their eating habits.

More recently, Corrin and Papadopoulos [21] reviewed 24 papers looking at attitudes toward and perceptions of vegetarian diets. A handful of papers included in the review specifically looked at the perceived benefits and barriers of vegetarian diets. Positive health outcomes were consistently perceived to be the main benefits of a vegetarian diet. Environmental sustainability and animal welfare were the least agreed-upon benefits of a vegetarian diet. Participants commonly believed that the livestock industry had a minimal impact on the environment, especially when compared to other human activities such as transport, fossil fuel consumption, and energy production.

The main barriers to adopting a vegetarian diet reported by Corrin and Papadopoulos [21] were health concerns (e.g., iron intake), unwillingness to make dietary changes, and enjoyment of eating meat. Notably, these main reported barriers all relate to personal beliefs and not concern about social perception and/or stigma, which others have proposed to be a main barrier. For example, in a study of 2436 Flemish participants, lack of interest and awareness, limited cooking skills, and taste emerged as the main barriers to adopting a vegetarian-based diet [38].

More recently, Bryant and colleagues [39] have drawn attention to the role of eating habits, social norms, and (motivated) ignorance about animal welfare as common barriers preventing people from adopting vegetarian or vegan diets. Rothgerber and Rosenfeld [22] similarly argue that in many societies, people remain wilfully ignorant of the treatment of animals farmed for food, and that this makes it easier for them to eat meat without feeling conflicted about doing so. However, in both of these reviews, the focus was on the animal welfare implications of eating meat, rather than the impact on the environment. Given the increasing urgency of the climate crisis, it is important to better understand consumer perceptions of the environmental impact of meat, and their willingness to shift to more plant-forward diets.

1.3. The Present Study

This study investigated beliefs about the links between meat consumption and climate change, and people's willingness to reduce their meat intake alongside other pro-environmental strategies. It also included a conceptual replication of Lea and Worsley's (2003) study [37], examining how Australians' perceptions of the benefits and barriers to a vegetarian diet may have changed over a period of nearly 20 years. Finally, we examined the relationship between participant meat consumption and their perceptions of the barriers and benefits of a vegetarian diet. The study was preregistered, with three exploratory research questions and one a priori hypothesis.

RQ1: How do Australians perceive the environmental impact of meat-eating?

RQ2: Relative to other climate change mitigation strategies, how effective do Australians think reducing meat intake is, and how willing are they to engage in this strategy?

RQ3: How do Australians perceive the barriers and benefits of a vegetarian diet in 2019, and how has this changed since Lea and Worsley (2003) [37]?

H1: Participants' meat intake will positively predict agreement with barriers to vegetarian diets and negatively predict agreement with the benefits of vegetarian diets.

2. Method

2.1. Participants

Using G*Power 2.1.9.2 [40], we determined that a minimum of 530 participants was required to detect a 10% difference in agreement between two samples with an α of 0.01 and a power of 0.80. We recruited participants in July and August of 2019 via advertising targeting Australian Facebook users aged 18 and older, inviting them to take part in an undergraduate student study on "why people eat the food they eat". The inclusion criteria required participants to be at least 18 years of age, reside in Australia, and be conversant in English.

The questionnaire received a total of 934 responses. We deleted five cases due to participants reporting that they were under 18 or did not reside in Australia. We excluded twenty percent (n = 189) of responses from analysis due to a completion rate of <67%. The remaining 740 participants completed >95% of the questionnaire. In total, we excluded 194 cases from the analysis.

Table 1 lists demographic information for the present sample and that of Lea and Worsley. The mean age was 39.12 (SD = 16.20), with a range from 18 to 84 years of age. Although we anticipated a large proportion of female participants, given that research about food and diets typically attracts a larger female audience [41,42], the proportion in our sample was higher than expected (85.5%).

Table 1. Demographic characteristics of participants.

Variable	Present Study (2019)	Lea and Worsley (2003)
Sample size	N = 740	N = 601
Age	M = 39.13; SD = 16.20 19–24 (20.9%), 25–44 (40.1%), 45–64 (27%), 65+ (8.1%)	15–18 (4.2%), 19–24 (3.8%), 25–44 (40.9%), 45–64 (33.4%), 65+ (21.2%)
Gender	Female (85.5%), Male (10%), Non-binary (3.9%), Other (0.5%)	Female (56.8%), Male (43.2%)
Diet	Omnivore (55.5%), Reducetarian (16.8%), Partial vegetarian (7.8%), Vegetarian (10.9%), Vegan (8.9%)	Omnivore (91.3%), Vegetarian (1.5%), Semi-vegetarian (7.2%)
Ethnicity	British/Irish (60.1%), European (45.8%), South Asian (4.9%), East Asian (4.7%), Middle Eastern (1.4%), Latino/Latina (0.9%), African (0.9%), Aboriginal and/or Torres Strait Islander (1.6%), Other (10.8%)	Country of birth Australia (74.2%), Other country (25.8%)
Education	Year 10 (2.4%), Year 12 (16.1%), TAFE (15.8%), Bachelor's Degree (35.9%), Postgraduate degree (29.7%)	
Political Leaning	Very left-wing (25.9%), Left-wing (30.0%), Left-centrist (18.8%), Centrist (14.2%), Right-centrist (6.3%), Right-wing (3.6%), Very right wing (1.2%)	
Location	Major city (62%), Inner regional (22.2%), Outer regional (13.6%), Remote (1.4%), Very remote (0.7%)	

Note. Participants were able to select more than one ethnicity if applicable.

We conducted chi square tests to compare the distribution of gender, diet, and age between Lea and Worsley's [37] sample and ours, but we could not compare the two samples on the demographic variables not reported by Lea and Worsley (e.g., education level, location). We only compared adult participants by age, as we did not have minors in our study. There was a significant difference in gender (x^2 = 136.88, $p < 0.001$), diet (x^2 = 76.16, $p < 0.001$), and age (x^2 = 117.49, $p < 0.001$) between the two populations. The major differences were that we had a higher proportion of female participants, and that we had a higher proportion of participants in the 19–24 group, whilst Lea and Worsley had a higher proportion of participants in the 65+ group. We note that Lea and Worsley only recruited participants in South Australia, whereas we did not restrict participation to any state or territory.

2.2. Procedure

This study was approved by the La Trobe University Low Risk Human Ethics Committee, and was pre-registered on the Open Science Framework (https://osf.io/fv43z/?view_only=a673a8fba338403ab26af3edb4ef5f47, accessed on 6 June 2019); study materials and a copy of the dataset are also available there. Participants read the Participant Information Consent Form and indicated their consent to participate in the study before being provided a link to the questionnaire, which was hosted on Qualtrics. Participants were screened based on age and where they resided. If they were 18 years of age or older and lived in Australia, the questionnaire continued for them; if they were not, the questionnaire terminated. The median completion time was 9.6 min.

The questionnaire included multiple scales that assessed dietary behaviour, perceived benefits and barriers to vegetarian diets, beliefs about pro-environmental actions, and attitudes toward climate change and its relationship with agriculture. The scales are presented below.

2.2.1. Demographics

Participants indicated their age, gender, location (e.g., major city, inner regional), ethnicity, education (e.g., Year 10, Bachelor's degree), and political leanings (on a scale ranging from 1: very left wing to 7: very right wing).

2.2.2. Dietary Behaviour

Participants self-categorised their meat intake and dietary habits (e.g., "I am an omnivore. I eat all kinds of meats."). Participants also recorded how many days in a typical week they ate certain food categories (i.e., fruit, vegetables, poultry, eggs, red meat, dairy, and seafood) on a scale of 0 to 7 days.

2.2.3. Perceived Barriers and Benefits of Vegetarian Diets

Participants' beliefs about the barriers and benefits of a vegetarian diet were assessed using Lea and Worsley's [37] measure. Although the original measure consisted of 49 items, we focused on 29 items (15 barriers and 14 benefits). The remaining items were excluded as <20% of participants in the Lea and Worsley study agreed with the items. However, we retained one item for benefits and four items for barriers (e.g., "Increase the efficiency of food production"), due to conceptual interest. Example barrier items include "My family eats meat" and "I need more information about vegetarian diets". Example benefit items include "Eat more fruits and vegetables", and "Help animal/welfare rights". An additional item, "Reduce greenhouse gas emissions" was added, as the original item, "Help the environment", was too vague for the purpose of this study.

Before responding to each set of potential barriers and benefits, participants were asked to list what they thought were 3 common barriers and 3 common benefits to vegetarian diets. We had planned to use these qualitative data as part of another project and thus did not include them in this paper.

For the full list of items, see Tables 2 and 3. Participants responded on a 5-point Likert scale from strongly disagree to strongly agree.

Table 2. Levels of agreement with barriers to vegetarian diets.

Item	% Agree		χ^2	p
	Lea and Worsley (2003)	Present Study (2019)		
I like eating meat	79	74	4.73	0.030
I do not want to change my eating habit or routine	56	58	0.36	0.547
I think humans are meant to eat meat	44	48	2.15	0.143
My family eats meat	43	73	127.41	<0.001

Table 2. *Cont.*

Item	% Agree		χ^2	p
	Lea and Worsley (2003)	Present Study (2019)		
I need more information about vegetarian diets	42	41	0.12	0.734
There is too limited a choice when I eat out	35	65	115.70	<0.001
My friends eat meat	32	54	64.14	<0.001
My family/spouse/partner will not eat vegetarian food	30	46	35.15	<0.001
I would be (or am) worried about my health (other than lack of iron or protein)	28	43	31.38	<0.001
There is not enough protein in vegetarian diets	28	42	29.90	<0.001
I do not know what to eat instead of meat	21	43	69.86	<0.001
Vegetarian diets are not filling enough *	18	34	43.13	<0.001
Vegetarian options are not available where I shop or in the canteen or at my home *	14	34	71.62	<0.001
I do not want people to stereotype me negatively (e.g., that I must be strange) *	8	23	55.36	<0.001
People would (or do) think that I am a wimp or not "macho" enough *	4	13	32.94	<0.001

Note. The Bonferroni-corrected alpha level is 0.003. Non-significant comparisons are displayed in grey text. * Items included despite low agreement in Lea and Worsley (2003) [37].

Table 3. Levels of agreement with the benefits of vegetarian diets.

Items	% Agree		χ^2	p
	Lea and Worsley (2003)	Present Study (2019)		
Eat more fruits and vegetables	74	86	31.62	<0.001
Decrease saturated fat intake in my diet	65	71	5.85	0.016
Control my weight	40	48	9.09	<0.003
Help animal welfare/rights	36	75	205.95	<0.001
Prevent disease in general (e.g., heart disease, cancer)	36	63	98.09	<0.001
Help reduce greenhouse gas emissions	NA	71	NA	NA
Be healthier by decreasing my intake of chemicals, steroids and antibiotics which are found in meat	31	50	50.17	<0.001
Stay healthy	30	65	158.55	<0.001
Eat a greater variety of interesting foods	25	51	91.24	<0.001
Increase my control over my own health	23	52	118.54	<0.001
Help the environment	22	74	364.05	<0.001
Save money	21	55	160.36	<0.001
Be fit	21	34	27.17	<0.001
Have plenty of energy	20	36	40.66	<0.001
Increase the efficiency of food production *	15	52	196.60	<0.001

Note. The Bonferroni-corrected alpha level is 0.003. Non-significant comparisons are displayed in grey text. * Item included despite low agreement in Lea and Worsley (2003) [37].

2.2.4. Beliefs about and Willingness to Perform Pro-Environmental Actions

We adapted a measure by Skamp et al. [43] that explored participants' beliefs and willingness to perform pro-environmental behaviours. We selected six of the original sixteen actions based on relevance to the research question: "Recycle more things", "Use public transport", "Eat less meat", "Buy fewer new things", "More energy from renewable sources", and "Avoid food products that were imported by plane". We also added a

seventh item, "Stop eating meat". Participants indicated how much they believed each action would help reduce global warming on a scale ranging from 0 (no impact at all) to 10 (massive impact). They then indicated how willing they would be to undertake the action on a scale ranging from 0 (not at all willing) to 10 (completely willing).

2.2.5. Attitudes toward Climate Change and Its Relationship with Agriculture

We used a 5-item scale from de Boer et al. [44] to assess attitudes toward climate change and its relationship with agriculture. Participants responded to five statements (e.g., "Agriculture and animal husbandry together are one of the major causes of climate change") on a 7-point Likert scale (Strongly disagree to Strongly agree). All items are presented in Figure 1.

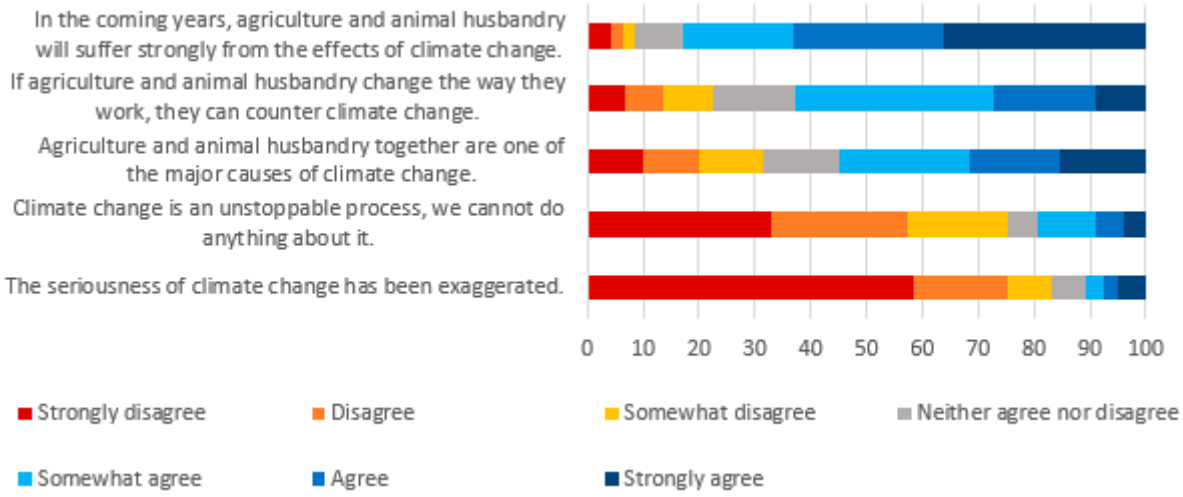

Figure 1. Participants' attitudes toward climate change and its relationship with agriculture.

3. Results

3.1. Data Analysis

Calculating and checking standardised (z) scores revealed no univariate outliers (values outside ± 3.29; [45,46]). All variables were normally distributed (skewness did not exceed ±2 and kurtosis did not exceed ±7; Kim [45]). Scatter plots were used to examine linearity and homoscedasticity, with no violations of these assumptions found. Similarly, for the multiple regressions, assumptions of linearity and homoscedasticity were tenable. A copy of the dataset is available on the OSF (https://osf.io/fv43z/?view_only=a673a8fba338403ab26af3edb4ef5f47, accessed on 20 January 2023).

3.2. Reliability

Internal reliability was high for perceived barriers to a vegetarian diet ($\alpha = 0.83$) and perceived benefits of a vegetarian diet ($\alpha = 0.92$), and acceptable for attitudes toward climate change and its relationship with agriculture ($\alpha = 0.79$).

3.3. Perceived Benefits and Barriers to Vegetarian Diets

To compare contemporary Australians' views against those reported in Lea and Worsley [37], we conducted a series of chi square tests comparing the percentage of participants who agreed. We separately examined perceived benefits and barriers, and Bonferroni-corrected each set for family-wise error.

Of the fifteen barriers, eleven differed significantly between the two samples (see Table 2), such that a higher percentage of participants in the present sample agreed with them than did participants in Lea and Worsley's [37] sample. The four items where agreement did not significantly differ between the two samples were "I like eating meat",

"I do not want to change my eating habit or routine", "I think humans are meant to eat meat" and "I need more information about vegetarian diets".

Of the fourteen benefits, agreement levels for thirteen items differed significantly between the two samples (see Table 3), such that a higher percentage of participants in the present sample agreed with them than did participants in Lea and Worsley's [37] sample. The only item not significantly different between the samples was "Decrease saturated fat intake in my diet". Figures 2 and 3 display detailed distributions of responses in the present sample.

3.4. Attitudes toward Climate Change and Its Relationship with Agriculture

Most participants indicated a belief that climate change will strongly affect agriculture (83%), and that industry can act to counter these effects (63%). In contrast, roughly half of participants (55%) agreed that agriculture and animal husbandry are a leading cause of climate change. A small minority believed that climate change is an unstoppable process (19%), or that the seriousness of climate change has been exaggerated (11%). See Figure 3 for a distribution of participants' responses.

3.5. Beliefs in Efficacy and Willingness to Perform Pro-Environmental Actions

Among omnivores and reducetarians, perceived efficacy of reducing meat intake for environmental sustainability significantly positively correlated with willingness to do so ($r = 0.65$, $n = 496$, $p < 0.001$). Similarly, a significantly positive correlation was found with perceived efficacy and willingness to eliminate meat consumption ($r = 0.71$, $n = 480$, $p < 0.001$).

We conducted Bonferroni-corrected post hoc comparisons of means for beliefs and for willingness, once for the entire sample and once for omnivores and reducetarians only (see Table 4 for the entire sample and Table 5 for the sub-sample of participants who reported eating meat). Participants viewed eating less meat as the least effective action against global warming, followed by stopping eating meat and avoiding food products imported by plane. In contrast, people were least willing to stop eating meat, followed by avoiding food products imported by plane, using public transport, and eating less meat.

Table 4. Beliefs and willingness to perform pro-environmental actions (all diet groups).

Items	Beliefs *M* (*SD*)	Willingness *M* (*SD*)
Eat less meat (50% reduction)	5.50 (2.73) $_{a}$	7.12 (3.27) $_{c}$
Stop eating meat	6.05 (3.08) $_{b}$	5.36 (3.75) $_{a}$
Avoid food products imported by plane	6.17 (2.77) $_{b}$	6.32 (3.03) $_{b}$
Recycle things more	6.71 (2.78) $_{c}$	8.77 (2.10) $_{f}$
Use public transport	6.76 (2.49) $_{c}$	6.69 (3.14) $_{bc}$
Buy fewer new things	7.06 (2.76) $_{d}$	7.69 (2.61) $_{d}$
More energy from renewable sources	8.31 (2.36) $_{e}$	8.45 (2.39) $_{e}$

Note. $n = 700$ for beliefs; $n = 663$ for willingness. Means that do not share a subscript differ at $p < 0.05$ or greater.

Table 5. Beliefs and willingness to perform pro-environmental actions (omnivores and reducetarians).

Items	Beliefs *M* (*SD*)	Willingness *M* (*SD*)
Eat less meat (50% reduction)	5.06 (2.73) $_{a}$	6.11 (3.25) $_{b}$
Stop eating meat	5.22 (2.95) $_{a}$	3.63 (2.97) $_{a}$
Avoid food products imported by plane	6.00 (2.88) $_{b}$	6.16 (3.17) $_{b}$
Use public transport	6.74 (2.54) $_{d}$	6.47 (3.24) $_{b}$
Recycle things more	6.78 (2.77) $_{e}$	8.64 (2.20) $_{e}$
Buy fewer new things	6.88 (2.85) $_{e}$	7.51 (2.75) $_{c}$
More energy from renewable sources	8.14 (2.47) $_{df}$	8.21 (2.58) $_{d}$

Note. n for beliefs = 497; n for willingness = 471. Means that do not share a subscript differ at $p < 0.05$ or greater.

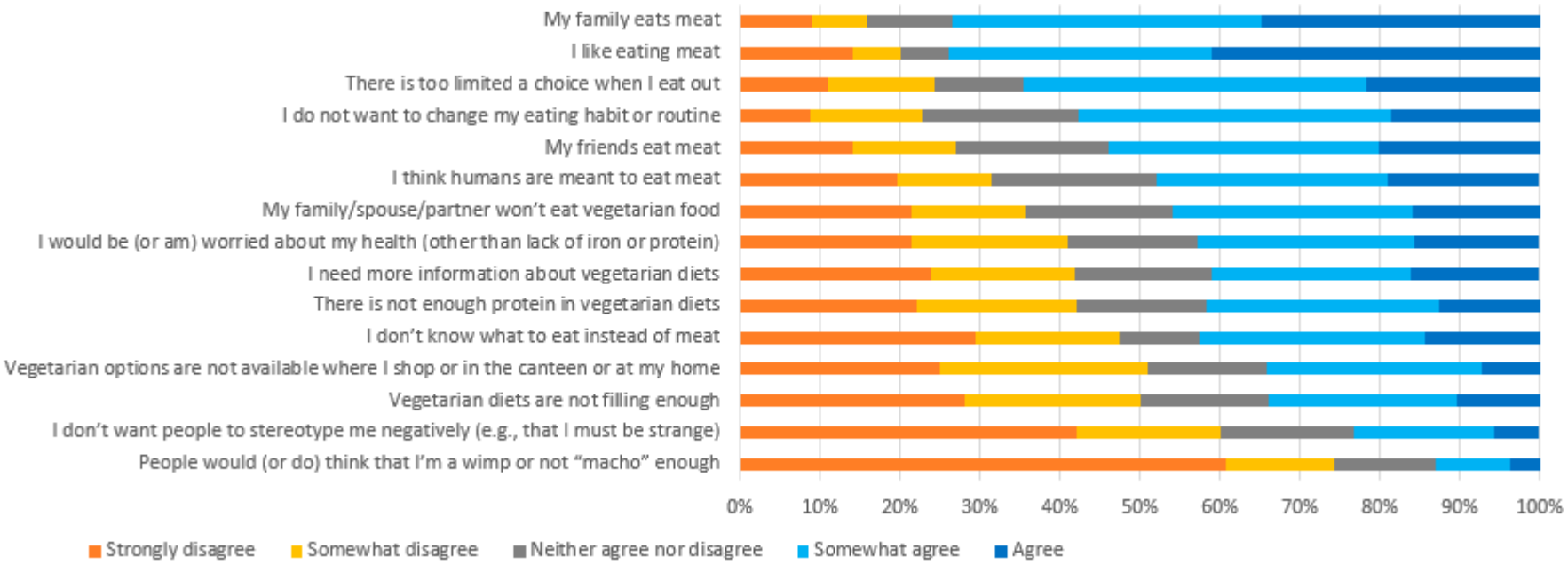

Figure 2. Frequency of responses to the perceived barriers to vegetarian diets.

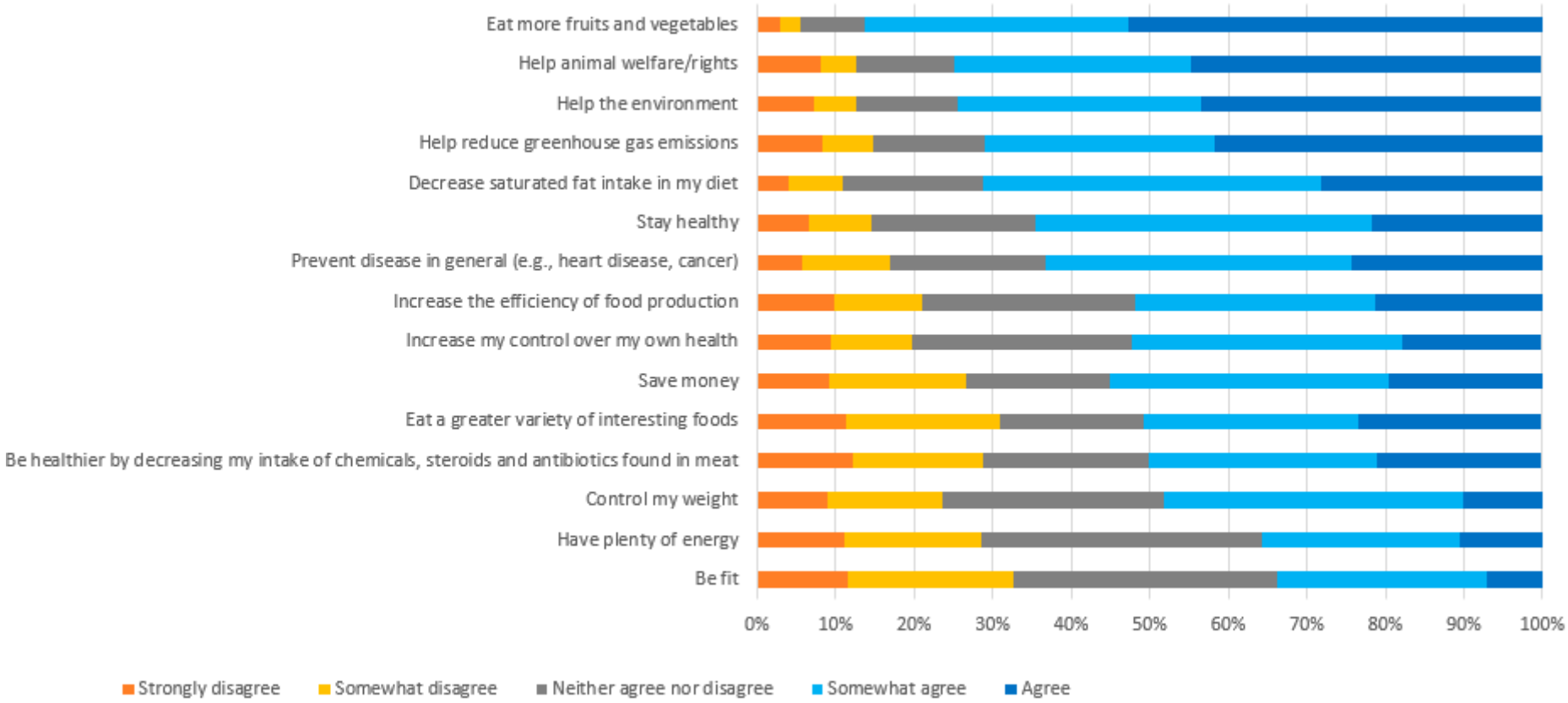

Figure 3. Frequency of responses to the perceived benefits of vegetarian Diets.

3.6. Relationship between Perceived Benefits and Barriers and Meat Consumption

We conducted three multiple regressions, using perceived barriers and benefits of a vegetarian diet to predict intake of red meat, poultry, and seafood consumption, respectively.

Perceived barriers and benefits significantly predicted red meat consumption [$F(2, 728) = 117.04$, $p < 0.001$, $R^2 = 0.24$]. Mean perception of benefits ($\beta = -0.41$, $p < 0.001$) contributed the most to the model, followed by barriers ($\beta = 0.20$, $p < 0.001$).

Perceived barriers and benefits significantly predicted poultry consumption [$F(2, 733) = 38.31$, $p < 0.001$, $R^2 = 0.09$]. Mean perceptions of barriers ($\beta = 0.21$, $p < 0.001$) and benefits ($\beta = -0.18$, $p < 0.001$) contributed similarly to the model.

Perceived barriers and benefits predicted seafood consumption [$F(2, 722) = 7.78$, $p < 0.001$, $R^2 = 0.02$]. Mean perceptions of benefits ($\beta = -0.11$, $p = 0.003$) significantly contributed to the model, but barriers did not ($\beta = 0.07$, $p = 0.061$).

4. Discussion

4.1. Knowledge of Environmental Impact of Meat-Eating

Although research consistently indicates the negative environmental impact of meat, previous studies found that many consumers were relatively unaware of this [23,30,47,48]. In our study, most participants reported a belief in climate change and global warming, with 83% of participants believing climate change had not been exaggerated. Furthermore, 55% of participants believed animal husbandry and agriculture to be leading causes of climate change, a considerably higher rate than many past studies [21,31].

4.2. Perceived Benefits and Barriers to Vegetarianism

Since this study involved comparing findings between two populations, comparing demographics between the two populations is important. Our sample had a greater number of participants (740 vs. 601) and recruited from all Australian states and territories, whilst Lea and Worsley [37] recruited participants from South Australia only. Our sample consisted of more females (85% vs. 56%) and included five diet groups (e.g., omnivore, reducetarian, partial vegetarian, vegetarian, and vegan) instead of three. Twenty-seven percent of our sample was vegan, vegetarian, or partial vegetarian, whilst only 8% of Lea and Worsley's sample were vegetarian or semi-vegetarian. An increase in plant-based diets was expected and is representative of contemporary Australia's diet landscape [49,50]. This broader spectrum of participants makes our study more of a conceptual (rather than direct) replication of Lea and Worsley (2003) [37].

Compared to Lea and Worsley's [37] sample, a significantly higher percentage of our participants agreed with eleven of the fifteen assessed barriers. The top three barriers to going vegetarian for our participants were "I like eating meat", "My family eats meat", and "There is too limited a choice when I eat out" (i.e., taste, availability, and social factors). The top three barriers for Lea and Worsley were "I like eating meat", "I do not want to change my eating habit or routine", and "I think humans are meant to eat meat" (i.e., taste and personal beliefs). Although taste remains the top barrier, our results suggest that concerns with social factors and availability now outrank beliefs about the necessity of eating meat. This is surprising, given that restaurants and supermarkets have become increasingly responsive to the rise in plant-based diets, and consequently, plant-based options are more available than ever before [49,51]. This puzzling finding could perhaps be explained by omnivores not being aware of or looking for plant-based options, therefore perceiving that there are few options available. The least-agreed-to barrier was "People would (or do) think that I am a wimp or not 'macho' enough", suggesting that participants were less likely to endorse a link between meat eating and masculinity than in past research [52].

Similarly, compared to Lea and Worsley [37], a significantly higher percentage of our participants agreed with thirteen of the fourteen benefits of vegetarianism. The top three benefits in our sample were "Eat more fruits and vegetables", "Help animal/welfare rights" and "Help the environment". In contrast, the top three benefits in Lea and Worsley's study were "Eat more fruits and vegetables", "Decrease saturated fat intake in my diet"

and "Control my weight". Thus, a strong focus on the health benefits of vegetarianism appears to have now broadened to include concern for animals and the environment. This is concordant with findings from a 2020 survey of Australian social media users, where over 80% of participants agreed that following a plant-based diet is environmentally friendly [51]. The least agreed-to benefit was "be fit", suggesting that participants understood that just consuming a vegetarian diet in the absence of exercise does not guarantee physical fitness.

4.3. Relationship between Perceived Benefits and Barriers and Meat Consumption

Mean levels of agreement with both barriers to and benefits of vegetarian diets were strong, significant predictors of red meat consumption, accounting for nearly one-quarter of the variance. Predictive power for other types of meats was not as strong; perceived barriers predicted poultry consumption better than perceived benefits, while only perceived benefits predicted a small amount of variance in seafood consumption. It is unclear why perceived benefits and barriers were more tightly linked to red meat consumption, although it is possible that red meat is perceived to be more of a prototype of meat than poultry and seafood [53].

4.4. Beliefs in Efficacy and Willingness to Perform Pro-Environmental Actions

Participants perceived using more energy from renewable sources to be the most effective pro-environmental action, followed by buying fewer new things. In stark contrast, they perceived eating less meat to be the least effective action, followed by eliminating meat. These findings are consistent with past studies [21,23,24,30,31,48] that showed people perceived reducing meat intake as a relatively ineffective pro-environmental action. As predicted, participants were also particularly unwilling to reduce or eliminate meat consumption, and the relationship between perceived efficacy and willingness was strongly positive.

4.5. Strengths and Limitations of the Study

The large sample size (final *N* of 740) and geographic diversity are major strengths of this study. To our knowledge, this is the first study to demonstrate the utility of Skamp et al.'s [43] scale about beliefs and willingness to do pro-environmental actions with an adult population (rather than with school-aged children). This study also provides a much-needed update on Australian attitudes toward vegetarian diets since Lea and Worsley [37]. The findings from this study are especially relevant, given the increasing focus on the relationship between food choices and environmental sustainability [16–20].

We must also emphasise that our participants were sampled entirely from Australian residents with Facebook accounts, who were willing to complete an undergraduate student's study on 'why people eat what they eat'. Although we took pains to not mention sustainability in the study advertisement, it is likely that participants are more interested in food and eating than the average Australian, and our sample was not representative. Our sample consisted predominantly of women (85%) and people with left-wing political views (73%), even though we explicitly avoided mentioning politics, environmental issues, sustainability, or meat in the study advertisement. This is somewhat typical of past psychological research [41,42], but it does limit the generalisability of our findings.

Another limitation relates to the de Boer et al. [44] scale of statements on climate change and its relationship with agriculture. Our results indicated that most participants understood how climate change affects agriculture, but far fewer understood how agriculture affects climate change. This scale also only looked at agriculture and animal husbandry as a cause of climate change, and it would be worthwhile for future studies to compare a variety of causes of climate change to gain a better understanding of individuals' beliefs.

4.6. Future Research

Future research looking at the general public's knowledge and beliefs about climate change, vegetarianism, and the environmental impact of meat-eating could benefit from a

broader focus. To better understand beliefs and changes in beliefs about climate change, future studies should ask participants to rate multiple causes alongside each other, as we only looked at the link between climate change and animal agriculture. Future studies should also attempt to have a more even balance of genders to increase the generalisability of their findings. To uncover a more accurate representation of public awareness about the environmental impact of meat-eating, future studies could assess this first before presenting other information to reduce the influence of the halo effect on responses [54].

The present study's findings could be used to better understand how to better encourage people to reduce meat consumption to more sustainable levels. For example, one could create a variety of different campaigns that promote specific benefits (e.g., health, ethical, environmental) and/or address perceived barriers, and ask participants their beliefs and willingness before and after seeing a campaign. This could help uncover which campaigns are most practically effective and could guide bespoke initiatives and campaigns, rather than trying a 'one size fits all' approach. For example, recent work by Smillie and colleagues with adults in Australia, Canada, New Zealand, the UK, and the USA found that persuasive messaging promoting the adoption of plant-based diets to reduce one's carbon footprint was more effective for people who scored higher on the personality trait of openness/intellect [55].

5. Conclusions

Climate change is one of the major issues facing both Australia and the world, with direct negative impacts on humans, non-human animals, and ecosystems. As outlined in the latest Australian state of the environment report [9], "adequately resourced, innovative, responsive and collaborative management measures will foster investment and renewed action to turn things around" (p. 11), but immediate action is needed. Since one of the major contributors to GHG emissions is the animal agriculture industry, reducing or eliminating meat intake is one of a range of relatively easy, quick, and individualised actions that many people could undertake to help reduce their personal contributions to GHG emissions. Despite this, our participants considered reducing and eliminating meat intake to be relatively ineffective in addressing climate change and reported a low willingness to engage in either action. It is critical that future work examine the reasons behind the disconnect between research and public perceptions, and how to inspire people to move toward more sustainable dietary choices.

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