

Australian consumers' views towards an environmentally sustainable eating pattern

Davina Mann*, Lukar Thornton, David Crawford and Kylie Ball

Institute for Physical Activity and Nutrition (IPAN), School of Exercise and Nutrition Sciences, Deakin University, 221 Burwood Highway, Burwood, VIC 3125, Australia

Submitted 14 August 2017: Final revision received 6 January 2018: Accepted 3 April 2018: First published online 15 May 2018

Abstract

Objective: The present qualitative study aimed to gain an in-depth understanding of participants' attitudes, knowledge, perceived effectiveness (a person's belief that his/her behaviour can contribute to environmental preservation) and behaviours relating to a sustainable eating pattern.

Design: One-to-one interviews (either face-to-face or by telephone) were conducted following a structured interview schedule, audio-recorded, transcribed verbatim and analysed using inductive thematic analysis in NVivo 10.

Setting: Victorian (Australia) adult participants recruited via online advertisements, flyers on community advertisement boards and letterbox drops.

Subjects: Twenty-four participants (mean age 40 years, range 19–69 years; thirteen female, eleven male) were interviewed.

Results: Participants reported that environmental impact was not an important influence on their food choice. Participants displayed limited knowledge about a sustainable eating pattern, with most unaware of the environmental impact of food-related behaviours. Most participants believed sustainable eating would be only slightly beneficial to the environment. Participants reported undertaking limited sustainable food behaviours currently and were more willing to undertake a food behaviour if they perceived additional benefits, such as promoting health or supporting the local community.

Conclusions: The study suggests consumers need further information about a sustainable eating pattern and the environmental impact of food choice. The findings highlight some of the barriers that will need to be addressed when promoting this kind of eating pattern and that a range of interventions will be necessary.

Keywords
Sustainable eating pattern
Environmental impact
Food choice
Qualitative research

It is increasingly recognised that food choices contribute substantially to the pressure that man places on the environment⁽¹⁾. Overall the food system accounts for approximately 19–29% of the world's greenhouse gas emissions⁽²⁾, is the largest cause of deforestation⁽²⁾, is responsible for 20% of energy use⁽³⁾, consumes 70% of available freshwater⁽³⁾ and covers 30% of all ice-free land⁽⁴⁾. In Australia, agriculture production alone contributed 16% of Australia's total greenhouse gas emissions for 2014, with the major contributor being livestock⁽⁵⁾.

Diets aligned with better nutrition profiles may have a lower impact on the environment than the less healthy diets currently observed in many Western countries^(6,7). Modelling has shown that following an eating pattern which is both healthy and sustainable would result in both population health and environmental benefits⁽⁸⁾. Therefore, it is imperative that eating patterns shift in order to

improve health and simultaneously help to reduce the environmental impact created by the food system^(9,10).

Providing precise estimates of the environmental impacts of food production is extremely complex^(11,12). Greenhouse gas emissions associated with food supply can vary significantly due to geographic region (distance travelled), growing conditions, transport mode (road *v.* air), packaging (wrapped *v.* unwrapped) and farming techniques (intensive *v.* organic). As such, definitions of sustainable eating patterns vary; however, some commonly agreed components include a diet that is mostly plant-based, contains less animal-based products, limits non-core foods and reduces overconsumption^(7,13,14). Other factors considered part of a sustainable eating pattern are the purchasing and consumption of seasonal and local produce^(9,15,16); the purchase of products with minimal packaging^(15–17); and taking account of the

transport method, for example avoiding products imported by air⁽¹⁸⁾. Although many synergies exist between the components of a healthy eating pattern and those of a sustainable eating pattern, some conflicts between the two arise, particularly in regard to fish and dairy consumption. As such, it is recommended that fish is consumed from sustainable sources and that dairy is consumed in moderation⁽¹⁹⁾.

Numerous theoretical models have been proposed in attempts to explain consumers' engagement in pro-environmental behaviours. Kollmuss and Agyeman's⁽²⁰⁾ model was used as a guiding framework in the present study, since it is widely used and incorporates important constructs likely to impact environmental-related food behaviours. This model proposes that pro-environmental behaviour is influenced by consumers' attitudes, knowledge and perceived effectiveness (also known as locus of control; a person's belief that his/her behaviour can contribute to environmental preservation), among other variables. The main focus of the present study was to explore participants' environmental knowledge related to sustainable eating. 'Environmental knowledge' can be described as the awareness and knowledge of an environmental issue and possible solutions to the problem^(21,22). Having knowledge of what constitutes a sustainable eating pattern and a desire to engage in these behaviours are important if consumers are to follow this kind of eating pattern^(23–26). It has been argued that being informed about environmental issues and possible solutions to the problem increases the likelihood of pro-environmental behaviours^(27–29). Not understanding the impacts, causes and solutions of the problem, and having contradictory information, may act as barriers for individuals to perform pro-environmental behaviours^(21,22,30,31).

Previous studies assessing consumers' sustainable food knowledge and behaviours have shown little consistency in methodology and the sustainable food behaviours assessed, with most previous studies failing to assess a comprehensive range of sustainable eating behaviours^(32–36). Although in reality there are numerous behaviours that could be considered part of a sustainable eating pattern, most previous studies have focused on only a small number, with meat consumption, seasonal and organic food consumption having been assessed the most frequently^(33–39). Few studies have assessed the combination of local and seasonal food concurrently^(35,40); transport method has been assessed only in two studies performed in Nordic countries^(26,37); and sustainable fish consumption only in one study⁽³³⁾. Additionally, the most comprehensive study that investigated nine sustainable food behaviours was skewed to a population of highly educated females⁽³³⁾. Therefore, comparison between studies is difficult. As such, little is known about consumers' understanding of an overall sustainable eating pattern or their current engagement in a comprehensive range of sustainable food behaviours. Additionally, little

information exists as to which if any particular attributes of a sustainable eating pattern consumers perceive as most important, why consumers engage or do not engage in sustainable food behaviours, or the factors driving these choices, as only one previous study has assessed the drivers of sustainable food behaviours⁽³⁹⁾. Similarly, sources of information that consumers are currently using to gain knowledge about sustainable eating patterns and the environmental impact of food choices, and consumers' trust in possible sources of this information, have been only briefly explored^(41,42).

Therefore, the present qualitative study aimed to examine: participants' knowledge of the environmental impact of the food system, including the impact of specific food characteristics (e.g. transport method) and behaviours (e.g. meat consumption); and their attitudes towards and perceived effectiveness in regard to a sustainable eating pattern. It also aimed to investigate consumers' current sustainable food behaviours, willingness to engage in these behaviours, and barriers and facilitators for doing so. Finally, the study assessed consumers' trust in potential sources of information about a sustainable eating pattern.

Methods

A qualitative study was undertaken involving semi-structured one-to-one interviews conducted either face-to-face or by telephone. Methods of the study are reported according to the Consolidated Criteria for Reporting Qualitative Research (COREQ)⁽⁴³⁾ guidelines.

Participant inclusion and exclusion criteria

To be eligible, study participants were required to be at least 18 years of age, to have some level of involvement in their household's food preparation and be able to speak English. Participants' age (years), highest level of education achieved, sex and how often they prepared or purchased food in their household were assessed. Participants' highest level of education was categorised into three groups: low (defined as not completing beyond Year 10 at school), medium (completed high school and/or a technical or trade school qualification) or high (university or tertiary education qualification).

Recruitment

Recruitment occurred from January 2016 to March 2016. A convenience sample was recruited via online advertisements (e.g. Deakin University association webpages, clubs and society websites such as Deakin University Psychology Society and Deakin University table tennis club; community Facebook and Internet pages such as sporting clubs and public services, e.g. Climbing Victoria and state emergency services websites; and Gumtree (online classifieds)), flyers on community advertisement

boards across the State of Victoria (e.g. local shopping and community centres, local lawn bowls club and rural state emergency services units) and letterbox drops in outer eastern suburbs of Melbourne, Australia. Recruitment flyers advertised the study as exploring consumers' views about the influences on what we eat. To ensure sample variability, demographic information (sex, age and education) was taken into account during recruitment. For example, females aged 20–30 years with a high level of education were over-represented early in the recruitment process. Steps were then taken to recruit participants from the under-represented demographics. Participants received a \$AU 20 voucher as reimbursement for their time.

Interview procedures

Each interview was conducted by the same female researcher (D.M., BHSc, BFS&N (Hons)), who had been trained in qualitative research methods and had prior experience conducting qualitative research (focus groups). After initial contact expressing their intent to participate, participants were made aware that the researcher was a PhD candidate and that she wanted to gather in-depth information about their views on the environmental impact of food choice and their priorities when buying and consuming food. Twenty-four interviews were conducted, with six interviews conducted face-to-face at Deakin University and eighteen conducted over the telephone. Interviews lasted between 30 min and 1 h with field notes recorded throughout.

Interview protocol and schedule

The semi-structured interviews followed an interview schedule developed based on the identified gaps in the relevant literature and the model of pro-environmental behaviour⁽²⁰⁾. The interview schedule (provided in the online supplementary material, Table S1) consisted of predominantly open-ended questions, as well as eight questions utilising a ten-point rating scale, for example 'On a scale from 1 = not at all important to 10 = extremely important, how important are the following things to you when you shop for food and drink at the supermarket?' The interview schedule was pilot-tested and refined with five participants and subsequently minor changes were made for clarity.

The questions were grouped into key themes exploring: participants' knowledge of an environmentally sustainable eating pattern and the environmental impact of food choice; participants' attitudes towards and perceived effectiveness of participating in a sustainable eating pattern; and environmentally sustainable eating behaviours currently undertaken by participants, barriers to undertaking these behaviours and willingness to engage in these behaviours in future. Current and potential sources of information about a sustainable eating pattern were also assessed.

Data collection and analysis

All interviews were audio-recorded, transcribed and made de-identifiable by the researcher, with each transcript given a unique identifier code (e.g. R1 = respondent 1). Saturation of the data was reached after twenty-four interviews as no new themes or ideas were emerging from the data⁽⁴⁴⁾.

A six-phase inductive thematic analysis as described by Braun and Clarke⁽⁴⁴⁾ was conducted. The qualitative data analysis software NVivo version 10 (QSR International Pty Ltd, 2012) was used to manage the data and assist in data analysis. To enhance rigour, a random sample of five transcripts were cross-coded by a research fellow in the same department. No significant discrepancies in coding occurred. Transcripts were not given back to participants. The mean response for each item of the questions utilising a scale was calculated. The mean for each item was then used to provide an indication on the relative ranking for each item/activity.

Results

Participant demographics

Twenty-four participants were interviewed. Participants' mean age was 40 years, with an age range of 19–69 years. Thirteen participants were female and eleven were male. Five participants were in the low education category, nine in the middle category and ten in the high category.

Thematic analysis

Due to the breadth of the data collected, the focus in the present paper is on the main recurring themes which emerged from the interviews; these include participants' knowledge of and attitudes towards a sustainable eating pattern, as well the sustainable food behaviours undertaken by participants and the perceived barriers to these behaviours. Other factors of the theory employed for the current study, although not the main focus of the present paper, are also touched upon below.

Several sub-themes emerged from the interviews. These were: consumers' lack of knowledge and information available; a connection between healthy and sustainable food behaviours; environmental impact not an important influence on food choice; and perceived barriers to consuming a sustainable eating pattern.

Knowledge

Lack of knowledge and information available. The majority of participants had never come across information about a sustainable eating pattern and no participants were aware of any advertisements or campaigns supporting a sustainable eating pattern:

'No, it is the first time I am hearing it.' (R12, female, age 29 years)

Participants displayed limited knowledge about an environmentally sustainable eating pattern, with many

participants stating that the question 'What is the first thing that comes to mind when you hear the term "an environmentally sustainable eating pattern"?' was difficult and they were unsure how to answer it:

'That is a very good question isn't it. I have to think about that a bit more.' (R9, male, age 68 years)

'Something which pops into my mind, ah ... honestly nothing really is popping into my mind.' (R11, male, age 19 years)

Participants underrated the environmental impact of the farming, processing and packaging of food products. Participants rated this activity as having the least impact on the environment out of seven human activities when ranked on a scale (full list in the online supplementary material, Table S1). A very small number of respondents believed that food did not have any impact on the environment:

'I don't think eating on itself has a lot of impact on the environment, I think there are many activities [that] do have an impact but I think eating on itself doesn't really harm the environment directly.' (R1, female, age 36 years)

Participants perceived human activities or food behaviours that have the most visible impacts, such as cutting down trees and forests and the litter from food packaging, to have the greatest environmental impact compared with other human activities and food behaviours or characteristics:

'Well, littering it is quite easy to see day to day, you look at the waterways it is quite easy to visually see the impact that it is having and yeah, I guess the same with deforestation, you see these forests disappearing and yeah, you can see animals don't have homes to live in and less environment.' (R5, male, age 27 years)

Out of nine prompted food behaviours and characteristics (full list in the online supplementary material, Table S1), when ranked on a scale, participants perceived eating lots of junk food, the production and packaging of food products and the transportation method and distance that food products travel to have the most impact on the environment. Eating lots of fruits and vegetables and eating lots of dairy were behaviours perceived to have the least impact on the environment. Eating fresh food products in season, eating lots of fish and eating lots of meat were considered to have a moderate environmental impact.

Participants held discrepant perceptions of the environmental impact for some food behaviours and characteristics. For example, the environmental impact of food waste was perceived to be dependent on how it was disposed of. It was believed that food waste could have almost no impact if disposed of correctly. However, if

disposed of incorrectly the impact was perceived to be significantly higher. Although many participants commented that there is 'a lot' or 'excessive' amounts of processing and packaging of food products, a few participants believed that the production, packaging and transport of food products was becoming more efficient and having less of an environmental impact:

'Depends on how it is being used typically ... depending on the type of waste you have got some people who compost and stuff to reuse it, but anything that is actually wasted and binned certainly wouldn't be helping the environment at all.' (R5, male, age 27 years)

'Yeah, it should have some sort of impact but gradually food production is getting more environmentally friendly with their ... they are producing more environmentally friendly packaging and other things.' (R22, male, age 33 years)

Participants were more concerned about the environmental impact caused by the distance that a food product had travelled rather than the transportation method. The impact that the distance a food product travels was mentioned far more frequently and by more participants compared with the environmental impact caused by different transportation methods (e.g. plane *v.* truck), which was discussed by only one participant:

'Because I think depending how far it has travelled could have a big impact on um ... like the emissions ... produced by the, you know, the transport of the food.' (R2, female, age 21 years)

'I think a lot like say international transport of food comes at a really high cost to the environment, I could be wrong there, but I think if you were talking about say the transport by truck or by rail it is probably nowhere near as significant.' (R4, female, age 27 years)

Nearly all participants were interested in further information about a sustainable eating pattern; however, no single source was overly trusted. Participants displayed scepticism about all information sources, stating that it is necessary to do your own research to make sure that information provided was credible and not just presenting the company or organisation's agenda. Participants were most likely to trust information presented if it made 'sense' or was evidence-based:

'To a degree because some of them are pushing their own barrow ... not to ... look I don't mistrust what they say, but it is balance perhaps.' (R23, female, age 69 years)

A connection between healthy and sustainable food behaviours. Sustainable food behaviours or characteristics were also considered those which were healthy or natural.

Many participants believed a sustainable eating pattern could also be considered healthy. Foods with minimal packaging or waste, growing your own food (e.g. a vegetable garden and raising your own livestock) and consuming mostly fruits and vegetables were the most frequent answers to 'Can you think of any characteristics of an eating pattern that might be healthy and also environmentally sustainable?' and 'In your opinion, what would environmentally sustainable eating include?' Eating organic, locally produced, natural foods, following a vegetarian diet or eating less meat were each mentioned by a smaller number of participants. Most participants were unable to provide any examples of food characteristics which would be healthy but not sustainable:

'Well it is healthy eating again. It is from nature, it is made from nature'. (R10, female, age 48 years)

'Yeah, a lot of the things you describe are also could be considered healthy.' (R8, male, age 28 years)

'I just think that well if it is good for the environment it is good for people and we all ought to be concerned by the ... by the effects of greenhouse gases and global warming.' (R9, male, age 68 years)

When asked about the environmental impact of meat and dairy, many participants stated that these products may have some environmental impact; however, these products were also considered to be healthy:

'Milk, cheese [and] yoghurt, from the medical point of view these are good foods, and these are not affecting that much the environment as well.' (R22, male, age 33 years)

'... these dairy products are useful. I mean useful ... I mean healthy ... but there are still some downsides.' (R6, male, age 35 years)

Attitudes

Environmental impact not an important influence on food choice. The environmental impact of a food item was never specifically mentioned by participants as an unprompted influence on food choice. Health, taste and price were perceived by participants as the most important (both prompted and unprompted) influences impacting food choice. How much a food or drink item impacts the environment was rated the least important influence on a ten-point scale out of seven influences (full list in the online supplementary material, Table S1):

'Cause when you are hungry you go to buy food and don't think that much about how much it is going to affect the environment.' (R22, male, age 33 years)

'I would probably say maybe like a six 'cause I haven't really thought about it.' (R2, female, age 21 years)

Behaviours

Half of the participants (when given a definition of an environmentally sustainable eating pattern) reported following aspects of a sustainable eating pattern but for health reasons or with the environment as 'back of mind'. A very small number of participants reported they were already following a sustainable eating pattern or undertaking sustainable food behaviours to reduce environmental impacts:

'I feel like I should do that because it is healthier and feel better by doing that, but rather than doing that for the environment. I hadn't even thought of that.' (R2, female, age 21 years)

'Not just for environmental reasons, what's really good for me.' (R10, female, age 48 years)

Participants were more willing to undertake sustainable food behaviours if there were further perceived benefits other than just helping the environment. Overwhelmingly, health was the main reason consumers followed or were willing to follow a sustainable eating pattern or undertake sustainable food behaviours. Other less frequently mentioned reasons included: buying local food to support local farmers and businesses, and to reduce food cost; and only eating fresh produce in season as it is cheaper and tastier:

'I do follow this type of eating pattern however; however, it is more for personal ... personal reasons that I do this. Environment yes is just an additional factor I see it as.' (R11, male, age 19 years)

'Because we want to keep Australia in ah ... growing things so farmers can earn good money and like that and obviously if we get things from overseas and it is not fair.' (R13, female, age 67 years)

Barriers

Perceived barriers to consuming a sustainable eating pattern. Many participants were willing to follow a sustainable eating pattern; however, the specific behaviours they were willing to undertake varied. For example, even though many participants were willing to follow a plant-based eating pattern with limited meat consumption, a few participants were adamantly unwilling as meat was seen as a necessary part of the diet:

'There are some aspects that I would like to follow but there are certain aspects like no dairy, no meat and things like that I consider part of my usual diet and even if there is some sort of environmental ... fall back with that, those are things that I like to eat taste wise, so I wouldn't really be prepared to follow it fully.' (R8, male, age 28 years)

'I still eat meat, I think it is important to have some meat for the iron and what have you. I would rather

eat a fresh product, than take a vitamin supplement, put it that way.' (R23, female, age 69 years)

The sustainable food behaviours that participants were most willing to undertake were the behaviours that could be considered the easiest to undertake or that require the smallest shift in their current eating pattern. For example, out of seven environmentally sustainable (full list in the online supplementary material, Table S1) food behaviours, 'only eating fish from sustainable sources' was the behaviour participants were most willing to undertake when ranked on a scale. However, as noted by participants, this was only if the fish would be reasonably priced and if it was easily available:

'... 'cause I think in principle I think it is a great idea, and also I don't eat a lot of fish.' (R24, male, age 57 years)

'Yeah, I don't eat much fish anyway, so um, yeah, once you find which sort is sustainable to eat it is not a big deal to change over.' (R5, female, age 27 years)

Participants believed it to be moderately difficult to follow a sustainable eating pattern in their neighbourhood, with the most frequently mentioned barriers including the price of sustainable food products (particularly organic produce), the time it takes to prepare and purchase sustainable food items and having adequate information or knowledge. For example, although participants were most willing to 'only eat fish from sustainable sources', many participants were unsure how to tell if a fish was from a sustainable source due to a lack of information or inadequate labelling:

'That's the thing and that's, that is, you know ... organic this and organic that, and you know, and it is ... so much dearer.' (R19, female, age 63 years)

'I think it would take a bit of effort but I think it would be very much achievable, um ... it would probably take a lot more time because you would probably have to source your food from different places, like you can't just go to Coles I think and you know have it all there in one place, um ... you probably would have to plan it out a bit more'. (R4, female, age 27 years)

'I am ... when I buy fish I don't know if they are sustainable or not, so I am willing, but I just don't where they come from.' (R21, female, age 25 years)

Although a few participants believed that following a sustainable eating pattern would be no more difficult on a limited budget, the vast majority believed that it would be harder to follow this eating pattern on a limited budget:

'Typically sort of whether it is junk food, packaged food, highly processed food is a lot cheaper.' (R8, male, age 28 years)

'Cause I think you can still find, I mean even if you have a low budget, you can still find fresh products, you know fruits and veggies.' (R6, male, age 35 years)

Participants had contrasting views on the availability of a sustainable eating pattern through supermarkets and markets. Having access to a large range of products through supermarkets or local markets was mentioned by many participants as a facilitator of following a sustainable eating pattern:

'We have lots of markets and big supermarkets where you find environmentally sustainable products there.' (R3, female, age 19 years)

In contrast, a smaller number of participants believed that supermarkets and markets have a poor availability of sustainable food items or did not stock such products:

'You might not be able to find that all at a Woolworths or Coles, you might need to go out and really search for it at markets and certain producers.' (R8, male, age 28 years)

Although most participants believed that changing to a sustainable eating pattern could help to avoid some of the damage to the environment, many participants believed that it would do so only to a small degree. A few participants also highlighted that it would have to be a collective effort by all consumers to make a real impact:

'Changing your eating patterns could make an impact. It would have to be over a larger scale though. 'Cause ... well, every one person does help over the overall scheme of things, it needs to be widespread change for a noticeable difference.' (R5, male, age 27 years)

Discussion

The current study provides qualitative evidence of a small group of Australians' views about a sustainable eating pattern and highlights consumers' general lack of knowledge and awareness towards the topic, which is consistent with previous research^(32,34,35,41,45). Although requiring wider exploration in diverse samples, these results suggest that current eating behaviours consumers engage in are less than ideal in terms of their environmental sustainability. Even though participants showed a positive attitude towards a sustainable eating pattern when introduced to the concept, a lack of knowledge, participants' unwillingness to follow these eating behaviours and further barriers to following a sustainable eating pattern may be contributing to low engagement in sustainable food behaviours.

A lack of knowledge and information currently available to consumers are potential barriers to engaging in sustainable food behaviours, with lack of knowledge cited by

participants in the current study and previous research as one of the greatest barriers to consuming a sustainable eating pattern^(32,46). These results suggest that information campaigns are necessary for improving consumers' awareness of an environmentally sustainable eating pattern and the environmental impact of food choices. However, whether such campaigns will be sufficient for changing behaviour is unknown. For example, respondents participating in focus group discussions in Scotland, Brazil, China, the UK and the USA⁽⁴¹⁾, when presented with information about the contribution of meat consumption to climate change, reported being not willing or unlikely to change their eating behaviours based on this information alone^(41,42). However, many participants reported that this information would help in prompting them to critically reflect on their own eating habits⁽⁴¹⁾. To the authors' knowledge, no other research has quantitatively reported on the influence of information provision on participants' willingness to engage in sustainable eating behaviours, and as such it is unknown if providing information of the environmental impact of food behaviours and characteristics would influence consumers' willingness or their current engagement. Although the present study provides novel preliminary findings about participants' trust in different sources for accessing information about a sustainable eating pattern, further exploration into what information about a sustainable eating pattern should be presented, how and by whom, to gain consumers' trust, should be undertaken before information is disseminated.

Given that participants in the present study had a low awareness about the environmental impact of the food system and food choice, it is unsurprising that most believed that following a sustainable eating pattern would help to avoid damage to the environment by only a small degree. This belief could potentially pose a further barrier for consumers to engage in a sustainable eating pattern as previous research suggests that people were more likely or willing to undertake a particular food behaviour when they perceived the food behaviour as being effective in helping to avoid environmental degradation^(34,47,48). Additionally, consumers may believe that reducing environmental impacts through diet requires a collective effort. Similar to the present study results, participants in focus group discussions in Scotland perceived reducing their meat consumption as ineffective unless it was a collective effort by the community⁽⁴²⁾. They also believed that the actions of one individual would fail to make an overall difference if others failed to also make changes to their diet⁽⁴²⁾. Although requiring further investigation, one implication of this finding is that interventions or messages aimed at promoting more sustainable eating patterns need to ensure that participants are aware that their individual food behaviours are important in helping to preserve the environment.

The present study advanced previous research by exploring the reasons why participants engage in, or were

willing to engage in, sustainable food behaviours. Very few participants engaged in sustainable food behaviours for environmental reasons; rather, factors such as health, price and taste were the main drivers of these behaviours. This is unsurprising given that participants have consistently rated the environmental impact of food choice as a lower priority than other attributes such as health, taste and price as an influence on food choice^(36,46,49-51). Therefore, it may be more beneficial to use health, taste and price as drivers to promote a sustainable eating pattern. As no research (to the authors' knowledge) has explored the possibility of promoting sustainable diet eating in conjunction with healthy eating, whether the combination of these two factors together would be more effective for promoting sustainable food behaviours than each aspect alone warrants further investigation.

A significant finding arising from the current study is the strong association that participants made between sustainable eating and healthy eating, which is similar to findings of past research^(39,46,52). These results suggest that participants may judge the environmental impact of a food product or behaviour more favourably if the product or behaviour is also considered to be healthy (i.e. a halo effect)⁽⁵³⁾. For example, participants associated the consumption of dairy foods with a healthy eating pattern but underestimated its environmental impact. Potential ramifications exist if consumers evaluate the sustainability of eating behaviours based on their perceived healthiness, as there are conflicts between a healthy and a sustainable eating pattern. It could potentially be beneficial to highlight the key food behaviours which would have the most environmental impact and ensure that messaging is simple to help consumers navigate some of the potential trade-offs.

Findings from the current study suggest that informing consumers about environmentally sustainable eating patterns is required to help shift consumers towards those eating behaviours. However, information provision is just one of a range of intervention strategies likely to be needed⁽¹⁴⁾. As highlighted by the model of pro-environmental behaviour⁽²⁰⁾ and confirmed by the present study results, other barriers both internal (e.g. perceived effectiveness) and external (e.g. availability) currently exist. This suggests that there is a need for a mix of intervention initiatives that address a range of determinants⁽¹⁴⁾.

It is important to consider both the strengths and limitations when interpreting the results from the present study. Selection bias may have occurred as those who were more interested in health, the environment and sustainability may have been more likely to participate. The wording of recruitment flyers and advertisements was designed to try and minimise this potential bias. Flyers and advertisements provided no indication that the study focused on the environment or sustainable food choices. The use of telephone interviews for the majority of participant interviews may have helped to reduce the

possibility of social desirability bias^(54,55). Although telephone interviews have the disadvantage of an absence of visual cues, they allow participants who otherwise are not able to attend a face-to-face interview to participate^(56,57). The qualitative approach of the study was a strength and allowed detailed insights into the topic to be captured that would not be possible through quantitative research approaches. There was a diverse variety of views represented from a range of participants with varying background demographics. It is important to note that in-depth interviews usually do not allow generalisation of the results. However, they provide valuable in-depth information⁽⁵⁸⁾.

Conclusion

The present study provides qualitative evidence of participants' low level of knowledge about a sustainable eating pattern and the environmental impact of the food system and food behaviours; their distrust of information sources; and the barriers to sustainable eating. Further investigations are warranted to confirm these findings and assess consumers' current knowledge, perceptions of the effectiveness of sustainable eating patterns, current sustainable food behaviours and barriers, and the possible links between these.

Acknowledgements

Financial support: K.B. is supported by a Principal Research Fellowship from Australia's National Health & Medical Research Council (NHMRC) (grant number 1042442). The contents of this manuscript are the responsibility of the authors and do not necessarily reflect the views of the NHMRC. This research received no other specific grant from any funding agency in the public, commercial or not-for-profit sectors. *Conflict of interest:* None. *Authorship:* D.M. contributed to conceptualisation of the work, performed all data collection, performed analysis on all samples, interpreted data, wrote the manuscript and acted as the corresponding author. L.T. contributed to conceptualisation of the work, supervised development of the work, helped in data interpretation and manuscript evaluation. D.C. contributed to conceptualisation of the work, supervised development of the work, helped in data interpretation and manuscript evaluation. K.B. contributed to conceptualisation of the work, supervised development of the work, helped in data interpretation and manuscript evaluation. *Ethics of human subject participation:* This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Deakin University Human Research Ethics Committee (HEAG-H 163_2015). Written informed consent was obtained from all subjects.

Supplementary material

To view supplementary material for this article, please visit <https://doi.org/10.1017/S1368980018001192>

References

1. World Health Organization & Food and Agriculture Organization of the United Nations (2003) *Diet, Nutrition and the Prevention of Chronic Diseases. Report of the Joint WHO/FAO Expert Consultation. WHO Technical Report Series* no. 916. Geneva: WHO.
2. Vermeulen SJ, Campbell BM & Ingram JSI (2012) Climate change and food systems. *Annu Rev Environ Resour* **37**, 195–222.
3. Aiking H, Boer J de & Vereijken J (2006) *Sustainable Protein Production and Consumption: Pigs or Peas?* Dordrecht: Springer.
4. Food and Agriculture Organization of the United Nations (2012) *Sustainable Diets and Biodiversity: Directions and Solutions for Policy, Research and Action* [B Burlingame and S Dernini, editors]. Rome: FAO.
5. Department of the Environment, Australian Government (2014) *Quarterly Update of Australia's National Greenhouse Gas Inventory: March 2014*. Canberra: Commonwealth of Australia.
6. Garnett T (2014) *Changing What We Eat: A Call for Research & Action on Widespread Adoption of Sustainable Healthy Eating*. Oxford: Food Climate Research Network.
7. US Department of Agriculture & US Department of Health and Human Services (2015) *Scientific Report of the 2015 Dietary Guidelines Advisory Committee*. Washington, DC: 2015 Dietary Guidelines Advisory Committee.
8. Springmann M, Godfray HCJ, Rayner M *et al.* (2016) Analysis and valuation of the health and climate change cobenefits of dietary change. *Proc Natl Acad Sci U S A* **113**, 4146–4151.
9. National Health and Medical Research Council, Australian Government (2013) *Australian Dietary Guidelines*. Canberra: NHMRC.
10. McMichael AJ, Powles JW, Butler CD *et al.* (2007) Food, livestock production, energy, climate change, and health. *Lancet* **370**, 1253–1263.
11. Riley H & Buttriss JL (2011) A UK public health perspective: what is a healthy sustainable diet? *Nutr Bull* **36**, 426–431.
12. Jungbluth N, Tietje O & Scholz RW (2000) Food purchases: impacts from the consumers' point of view investigated with a modular LCA. *Int J Life Cycle Assess* **5**, 134–142.
13. Health Council of the Netherlands (2011) *Guidelines for a Healthy Diet: The Ecological Perspective*. Publication no. 2011/08E. The Hague: Health Council of the Netherlands.
14. Garnett T, Mathewson S, Angelides P *et al.* (2015) *Policies and Actions to Shift Eating Patterns: What Works?* Oxford: Food Climate Research Network.
15. German Council for Sustainable Development (2013) *The Sustainable Shopping Basket: A Guide to Better Shopping*. Berlin: German Council for Sustainable Development.
16. Food and Agriculture Organization of the United Nations (2015) Dietary guidelines and sustainability. <http://www.fao.org/nutrition/education/food-dietary-guidelines/background/sustainable-dietary-guidelines/en/> (accessed September 2015).
17. Macdiarmid J, Kyle J, Horgan G *et al.* (2011) *Livewell: A Balance of Healthy and Sustainable Food Choices*. Godalming: WWF-UK.
18. Nemecek T, Jungbluth N, i Canals LM *et al.* (2016) Environmental impacts of food consumption and nutrition:

- where are we and what is next? *Int J Life Cycle Assess* **21**, 607–620.
19. Garnett T (2014) *What is A Sustainable Healthy Diet? A Discussion Paper*. Oxford: Food Climate Research Network.
 20. Kollmuss A & Agyeman J (2002) Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ Educ Res* **8**, 37–41.
 21. Bamberg S & Möser G (2007) Twenty years after Hines, Hungerford, and Tomera: a new meta-analysis of psychosocial determinants of pro-environmental behaviour. *J Environ Psychol* **27**, 14–25.
 22. Zsóka Á, Szerényi ZM, Széchy A *et al.* (2013) Greening due to environmental education? Environmental knowledge, attitudes, consumer behavior and everyday pro-environmental activities of Hungarian high school and university students. *J Clean Prod* **48**, 128–138.
 23. Tanner C & Kast SW (2003) Promoting sustainable consumption: determinants of green purchases by Swiss consumers. *Psychol Mark* **20**, 883–902.
 24. Pickett-Baker J & Ozaki R (2008) Pro-environmental products: marketing influence on consumer purchase decision. *J Consum Mark* **25**, 281–293.
 25. Thøgersen J (2005) How may consumer policy empower consumers for sustainable lifestyles? *J Consum Policy* **28**, 143–177.
 26. Mäkineniemi J-P & Vainio A (2014) Barriers to climate-friendly food choices among young adults in Finland. *Appetite* **74**, 12–19.
 27. Kaiser FG & Fuhrer U (2003) Ecological behavior's dependency on different forms of knowledge. *Appl Psychol* **52**, 598–614.
 28. Bailey R, Froggatt A & Wellesley L (2014) *Livestock – Climate Change's Forgotten Sector: Global Public Opinion on Meat and Dairy Consumption*. London: The Royal Institute of International Affairs.
 29. Department for the Environment, Food and Rural Affairs (2008) *A Framework for Pro-Environmental Behaviours*. London: Defra.
 30. Lorenzoni I, Nicholson-Cole S & Whitmarsh L (2007) Barriers perceived to engaging with climate change among the UK public and their policy implications. *Glob Environ Chang* **17**, 445–459.
 31. Kennedy EH, Beckley TM, McFarlane BL *et al.* (2009) Why we don't 'walk the talk': understanding the environmental values/behaviour gap in Canada. *Hum Ecol Rev* **16**, 151–160.
 32. Laureati M, Jabes D, Russo V *et al.* (2013) Sustainability and organic production: How information influences consumer's expectation and preference for yogurt. *Food Qual Prefer* **30**, 1–8.
 33. Pearson D, Friel S & Lawrence M (2014) Building environmentally sustainable food systems on informed citizen choices: evidence from Australia. *Biol Agric Hort* **30**, 183–197.
 34. Lea E & Worsley A (2008) Australian consumers' food-related environmental beliefs and behaviours. *Appetite* **50**, 207–214.
 35. Vanhonacker F, Van Loo EJ, Gellynck X *et al.* (2013) Flemish consumer attitudes towards more sustainable food choices. *Appetite* **62**, 7–16.
 36. Verain MCD, Dagevos H & Antonides G (2015) Sustainable food consumption. Product choice or curtailment? *Appetite* **91**, 375–384.
 37. Niva M, Mäkelä J & Kahma N (2014) Eating sustainably? Practices and background factors of ecological food consumption in four Nordic countries. *J Consum Policy* **37**, 465–484.
 38. Mäkineniemi J-P & Vainio A (2013) Moral intensity and climate-friendly food choices. *Appetite* **66**, 54–61.
 39. Hoek AC, Pearson D, James SW *et al.* (2017) Shrinking the food-print: a qualitative study into consumer perceptions, experiences and attitudes towards healthy and environmentally friendly food behaviours. *Appetite* **108**, 117–131.
 40. Tobler C, Visschers VHM & Siegrist M (2011) Eating green. Consumers' willingness to adopt ecological food consumption behaviors. *Appetite* **57**, 674–682.
 41. Wellesley L, Happer C & Froggatt A (2015) *Changing Climate, Changing Diets Pathways to Lower Meat Consumption*. London: The Royal Institute of International Affairs.
 42. Macdiarmid JI, Douglas F & Campbell J (2016) Eating like there's no tomorrow: public awareness of the environmental impact of food and reluctance to eat less meat as part of a sustainable diet. *Appetite* **96**, 487–493.
 43. Tong A, Sainsbury P & Craig J (2007) Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus group. *Int J Qual Health Care* **19**, 349–357.
 44. Braun V & Clarke V (2012) Thematic analysis. In *APA Handbook of Research Methods in Psychology*. vol. 2: *Research Designs: Quantitative, Qualitative, Neuropsychological, and Biological*, pp. 57–71. Washington, DC: American Psychological Association.
 45. Hartikainen H, Roininen T, Katajajuuri JM *et al.* (2014) Finnish consumer perceptions of carbon footprints and carbon labelling of food products. *J Clean Prod* **73**, 285–293.
 46. Owen L, Seaman H & Prince S (2007) *Public Understanding of Sustainable Consumption of Food: A Report completed for the Department for Environment, Food and Rural Affairs by Opinion Leader*. London: Defra.
 47. de Boer J & Schösler H (2016) Food and value motivation: linking consumer affinities to different types of food products. *Appetite* **103**, 95–104.
 48. Vermeir I & Verbeke W (2008) Sustainable food consumption among young adults in Belgium: theory of planned behaviour and the role of confidence and values. *Ecol Econ* **64**, 542–553.
 49. Department for the Environment, Food and Rural Affairs (2011) *Attitudes and Behaviours around Sustainable Food Purchasing*. London: Defra.
 50. Grankvist G & Biel A (2001) The importance of beliefs and purchase criteria in the choice of eco-labeled food products. *J Environ Psychol* **21**, 405–410.
 51. Wandel M & Bugge A (1997) Environmental concern in consumer evaluation of food quality. *Food Qual Prefer* **8**, 19–26.
 52. Rezaei G, Teng PK, Mohamed Z *et al.* (2012) Consumers' awareness and consumption intention towards green foods. *Afr J Bus Manag* **6**, 4496–4503.
 53. Lazzarini GA, Zimmermann J, Visschers VHM *et al.* (2016) Does environmental friendliness equal healthiness? Swiss consumers' perception of protein products. *Appetite* **105**, 663–673.
 54. Musselwhite K, Cuff L, McGregor L *et al.* (2007) The telephone interview is an effective method of data collection in clinical nursing research: a discussion paper. *Int J Nurs Stud* **44**, 1064–1070.
 55. Carr ECJ & Worth A (2001) The use of the telephone interview for research. *NT Res* **6**, 511–524.
 56. Novick G (2008) Is there a bias against telephone interviews in qualitative research? *Res Nurs Health* **31**, 391–398.
 57. Garbett R & McCormack B (2001) The experience of practice development: an exploratory telephone interview study. *J Clin Nurs* **10**, 94–102.
 58. Boyce C & Neale P (2006) *Conducting In-depth Interviews: A Guide for Designing and Conducting In-depth Interviews for Evaluation Input*. Watertown: Pathfinder International.