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Whole grain and high-fibre grain foods: How do knowledge, perceptions and attitudes affect food choice?

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Keywords

do, food, knowledge, choice?, perceptions, attitudes, affect, whole, grain, high-fibre, foods:

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Whole grain and high-fibre grain foods: how do knowledge, perceptions and attitudes affect food choice?

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Abbreviations: Accredited Practising Dietitian (APD); Daily Target Intake (DTI); Grains & Legumes Nutrition Council (GLNC).

Abstract

The health benefits of whole grains and dietary fibre are well established, however intakes of both remain low across the globe. Innovative added-fibre refined grain products may present a solution to increase fibre intakes given potential sensory barriers to whole grain intake. However, to consider the efficacy of such products, or potential alternative measures, an awareness of consumer knowledge, perceptions and attitudes towards both whole grain and added-fibre grain foods is needed. Focus groups (with adults with no formal nutrition education) were conducted to explore factors affecting consumer grain choice. Discussions were transcribed verbatim and analysed using inductive thematic analysis. Nine focus groups composed of 52 participants (23 men; 29 women) were conducted. Participants tended to report choosing 'grainy' bread but few other whole grain foods. Most participants were unaware of the long-term health benefits of whole grains, recommended whole grain intakes, or how to identify foods that were high in whole grains, thereby limiting motivation to increase intake. Additionally, scepticism surrounding the health value of carbohydrate-based foods appeared to hinder grain intakes in general. These findings suggest that further public education and promotion of whole grain benefits, with a focus on food-based targets and messaging, may be important in efforts to increase whole grain and subsequently fibre intakes. Added-fibre grain products may be a useful addition, specifically for avid whole grain-avoiders who are unlikely to accept whole grain sensory properties. However, as most participants were open to whole grain consumption, industry innovation should also focus efforts on increasing availability and variety of products high in whole grains.

Key words: whole grain; fiber; cereal; bread; diet; choice.

1. Introduction

Whole grain foods are considered beneficial to health, as epidemiological evidence suggests a clear inverse linear association between whole grain consumption and the risk of non-communicable diseases including cardiovascular disease, type 2 diabetes and colon cancer ⁽¹⁾. In fact, a recent study evaluating consumption across 195 countries found that in 2017, approximately three million deaths could be attributed to low whole grain intake, solely accounting for 27% of the 11 million deaths attributed to any dietary risk factor ⁽²⁾. Whole grains differ from refined grains used to make “white” grain foods in that the whole grain kernel, consisting of the bran, germ and endosperm, is retained. In processing of refined grains, the bran and germ are removed. The exact mechanisms explaining the health benefits of whole grains are not entirely established, although their high cereal fibre content, most of which is contained within the bran, likely plays a significant role ^(1;3). Additional constituents also retained within whole grain foods such as vitamins, minerals and various bioactive compounds may further contribute to these associations ⁽⁴⁾.

Despite the evidence for the benefits of whole grain intake, as well as the Australian Dietary Guidelines (ADG) recommending that when Australians consume grains they choose mostly whole-grain and/or high-cereal fibre foods ⁽⁵⁾, whole grain intake within Australia remains low. Based on results from the 2011-13 Australian Health Survey, the median daily whole grain intake was 21 g for adults (19-85 years) and 17 g for children/adolescents (2-18 years) ⁽⁶⁾, and approximately 30% of Australian participants consumed no whole grains on the days of the survey. Although the ADG do not include a quantifiable recommended whole grain intake, the Australian not for profit group, the Grains & Legumes Nutrition Council (GLNC) recommend a Daily Target Intake (DTI) of 48g whole grains per day ⁽⁷⁾, more than double the median intake. Unsurprisingly, Australians are also not consuming enough total dietary fibre, with average adult daily intakes of approximately 21g/d ⁽⁸⁾, compared to recommended Adequate Intake (AI) of 25 and 30g a day for women and men, respectively ⁽⁹⁾.

Past research has investigated consumer perceptions of whole grain foods to identify potential barriers to intake. Barriers may include perceived cost differences, longer cooking and preparation time needed, and an inability to identify whole grain foods ⁽¹⁰⁻¹²⁾. Another major barrier to whole grain intake reported commonly in the literature is dislike of their organoleptic properties (namely the taste, texture, appearance and smell), with individuals

often preferring the taste of less healthful and lower-fibre refined grain options such as white bread and pasta⁽¹¹⁻¹⁴⁾. It is not yet entirely clear whether cereal fibre consumed outside of the whole grain food matrix provides equal benefit to consumption of whole grain foods, and encouraging whole food diets within dietary messaging should always remain a priority. However, a potential solution to increase fibre intakes despite the common sensory barriers to whole grain intake, is through modification of refined grain products to include added cereal fibre, such as resistant starch or processed bran. An example of this is Hi-Maize®, a resistant starch made from high amylose maize (corn) which can be added to commercial breads, pastas, and breakfast cereals to boost fibre content without altering taste or texture⁽¹⁵⁾. High amylose maize starch has been found to have favourable effects on satiety^(16; 17), postprandial glucose and insulin response⁽¹⁸⁾, as well as increase faecal output and short chain fatty acid production^(19; 20), similar to the many benefits attributed to whole grain intake⁽⁴⁾. Notably however, most research compares effects to a lower-starch product^(16; 18; 19) or alternative extracted fibres^(17; 20), rather than a counterpart whole grain cereal. Therefore, while typical fibre additives provide beneficial health effects, the current evidence still prioritises whole grain intake.

To consider the usefulness of such products as a tool to improve the health value of grain choices, an awareness of consumer perceptions and attitudes towards added-fibre grain foods in comparison to whole grain foods, including current knowledge of whole grain and fibre benefits, is important. Previous studies show conflicting acceptability of added-fibre grain foods^(21; 22), and some consumer wariness of modified foods in general has been suggested⁽²³⁾. Notably, a large portion of research into acceptability of such foods was conducted over a decade ago and overseas, and consumption habits of grain foods within Australia⁽²⁴⁾, as well as interest in health-conscious food choices⁽²⁵⁾, appears to be shifting. Therefore, an updated insight into knowledge, perceptions and attitudes surrounding both whole grain and added-fibre grain foods within Australia is warranted.

Through a series of focus groups, this study aimed to explore how knowledge, perceptions and attitudes affect current choice of grain foods, particularly whole grain and added-fibre grain foods, held by Australian consumers. These findings may help in development of initiatives to address low intakes of whole grains and dietary fibre within Australia. This study will also provide some indication of consumer acceptance of added-cereal fibre grain

products as a means to increase cereal fibre intake within Australia, providing insight for both health professionals and the food industry.

2. Methods

This study was based on discussions had within focus groups, using a qualitative descriptive approach. Ethics was approved by the University of Wollongong Ethics Committee (approval number 2019/053). Initially, convenience sampling was used to recruit participants within the Illawarra and Greater Sydney regions. The inclusion criteria required that participants were over the age of 18, and had not had any formal nutrition or dietetics education. Participants were recruited through flyers distributed around the University campus, an advertisement posted to the University online staff newsletter, social media, and word of mouth. Flyers were also provided to local gymnasiums and organisations within Wollongong and Sydney, with request to distribute to members. No monetary incentive was offered to prospective participants, however they were informed that food would be provided.

Approximately half way through recruitment, a maximum variation sampling technique was utilised in efforts to target specific demographics that were underrepresented in recruitment thus far, and therefore widen the overall sample variation. Therefore advertising and word of mouth were used to recruit older participants and participants without tertiary qualifications, in a purposive manner. Dietary consumption patterns and the factors influencing this is likely to vary greatly depending on demographics of participants. As explained by Patton (1990), maximum variation sampling is therefore an effective technique for capturing "important shared patterns that cut across cases and derive their significance from having emerged out of heterogeneity" ⁽²⁶⁾. Recruitment of participants continued until saturation of data occurred (namely, no new themes were emerging from analysis).

Focus groups were held between March and July 2019 at several sites across the Illawarra and Greater Sydney regions, based on participant convenience. All focus groups were moderated by the lead researcher (EMB), an Accredited Practising Dietitian (APD), and where possible another facilitator (an APD experienced in focus group facilitation (EJB), and/or a Dietetics research student (SIF) were present for assistance and observation. The aim and purpose of the research was described to participants within a written information sheet. All participants provided informed, written consent prior to initiation of each focus group.

Participants were also provided an optional, anonymous questionnaire to collect general demographic information of the sample including age, gender, employment status, educational attainment, community type and yearly income.

Open-ended, semi-structured questions for use in the focus groups were developed by the principal investigators (Table 1). Questions were broadly grouped into four topics: defining and identifying whole grain foods, including distinguishing these from refined grain foods; understanding of the health benefits of whole grains and dietary fibre and any perceived differences between the two; perceptions of whole grain, refined grain, and added-fibre grain foods and awareness of whole grain recommendations. Questions included within the third topic included the use of three packaged breads (whole grain, white, and added-fibre bread) for participants to consider visually and order based on likelihood of purchase, health value and perceived taste. Bread was chosen as the example product for these discussion questions due to it being a main source of cereal fibre ⁽²⁷⁾ and whole grain ⁽⁶⁾ within Australian diets, availability of added-fibre varieties, and ease at which the three varieties of interest can be clearly distinguished. At the end of each focus group, participants were educated on the 48g Daily Target Intake (DTI) of whole grains, as recommended by the GLNC ⁽⁷⁾, and whole grain food choices to meet this target. After the first focus group, questions were altered slightly to enhance clarity, however, broad content remained the same.

Focus groups were audio-recorded, and the resulting data were transcribed verbatim by the first and second author within two days of occurrence. Data were analysed using inductive thematic analysis, following the six phase analysis guide as described by Braun and Clarke ⁽²⁸⁾. The data were first read for familiarity by the first (EMB) and second author (SIF) separately, and any initial ideas were noted. Next, codes were generated systematically across the data set in duplicate by both authors, and stored within qualitative data software NVivo 12 Plus (QSR International). These codes were then discussed by both authors and collated to develop broader, potential themes. Potential themes were reviewed to ensure cohesion within themed data, and that an accurate representation of the whole dataset had been established. As recruitment continued until data saturation was achieved, coding of data occurred simultaneously to data collection, and themes were continuously reviewed and updated until no new themes emerged. Once this occurred, themes were further refined for clarity, and eventually finalised with review from the third author (EJB). Meaningful quotes that best capture and reflect the main themes extracted were identified by the first author and included

as examples after agreement by all authors. To preserve anonymity, quotes have been de-identified and are labelled only according to focus group, participant gender and number, for example FG1M1.

3. Results

Each focus group included 4 to 8 participants (mean = 6 participants) and ran for 45-60 minutes. There were nine groups, composed of 52 participants in total. A relatively diverse mix of participants were recruited, with 58% of the total sample women, 48.0% aged below 45 years, and 46.2% having attained a bachelor degree or higher (Table 2). Eight themes were discovered forming three overarching, hierarchically-organised concepts: current grain choices (Theme 1); factors potentially influencing grain choices (Themes 2-5); and strategies to encourage healthy grain choices (Themes 6-8) (Figure 1).

3.1 Concept 1: Current grain choices

3.1.1 Theme 1: Participants typically choose a mixture of mostly refined grain and some whole grain foods

Most participants reported choosing some whole grain foods on a regular basis, almost always in the form of whole grain-containing breads. Conversely, participants reported that pasta and rice choices were usually refined grain versions.

Although most participants reported choosing whole grain breads regularly, they expressed that this may differ on certain occasions depending on the context of consumption, with other factors such as the composition of the rest of the meal, the associated memories of the food, their mood, or availability of food, all influencing their choices in particular situations. For example, a participant may choose whole grain bread for their regular daily sandwiches, however if they were having a sausage sizzle (an Australian term for a sausage sandwich) at a party or event, they would choose white bread, as this is the traditional bread it is made with.

“Even though I like white pasta and rice I pretty much only eat grain bread, I pretty much don’t eat white bread ever, except maybe in a sausage sizzle situation.”- FG3W1

“A sausage sizzle that’s from childhood and it has tasted the same ever since I was a kid and that’s what I need it to taste like now if I’m going to eat it, I don’t want to be disappointed.” - FG4W1

“If it’s a Friday I want white bread because I’m just over the week but if it’s a Monday I could go for whole grain.”- FG7W1

“Working in the hospital we get lunches every Wednesday so it’s usually like a white roll, Vietnamese roll, so definitely don’t get anything from that, except its nice and cheap and delicious.” – FG1M4

Four themes were found to potentially explain participant’s broader patterns of whole grain and refined grain choices, contained within the second concept.

3.2 Concept 2: Factors Potentially Influencing Grain Choices

3.2.1 Theme 2: Scepticism and lack of knowledge surrounding the health value of whole grains

All participants recognised that whole grain foods were a healthier option than refined grain foods, and most recognised them as a healthy food in general. However, participants struggled to name long-term health benefits. Participants stated that they recall whole grains as being promoted as healthy but never knew the specific reasons why.

“I don’t particularly think I could identify how it is different as such, like it’s healthy but I don’t know why.”- FG4M1

“And I think you know for years now we’ve been told that white bread is not as good for you as whole bread and you know without really even understanding why.”- FG8W1

Two broad health benefits of whole grains were frequently mentioned. The first relates to whole grain foods being perceived as natural, less-processed, and therefore containing fewer additives than refined grain foods. Participants also related this to whole grains being higher in nutrients, although specific nutrients were not named, other than dietary fibre.

“I’d say that with less processing you’d get more different parts of the grain which means that you’re getting more nutrients.” - FG1M1

“The white one is more processed and that can't be good because there's all sorts of stuff in there like bleach and preservatives.” - FG9W1

“I would say the fibre component for me because its unprocessed, it's obviously roughage... so you get the physical thing there that I see that you're actually taken in, so I would say yeah when I think of whole grains I think of fibre.” - FG9W2

Although fibre was frequently mentioned as one of the main healthy attributes of whole grains, almost all participants considered whole grain bread healthier than bread with added-fibre.

“I guess the whole point is to have something less processed, so it's kind of still processed so if you could pick the whole grain option which didn't need the additive then why wouldn't you just do that?” -FG3M1

“I think of that as just added fibre and I think I'd rather get it from the source itself rather than it being an additive so yeah I would see the whole grain as healthier.” - FG3W1

Secondly, participants were often also able to name some shorter-term benefits of whole grains, referring to their glycaemic index for satiety and fibre content for motility and digestion. Many participants stated that they did not know of any benefits of fibre beyond digestive motility.

“It makes you feel fuller, so you feel more like satisfied. Seems to last longer in you, so you don't get hungry so quickly. That's all I can think of. There's probably lots but I can't think of any more.” - FG9W3

“I guess more energy because it's low GI, so you're not going to burn it off really quickly, so I guess you feel like you're more filled for longer parts of the day.” - FG3M1

“I think of whole grains and different fibres and stuff strictly, as gross as it sounds, just for like stool formation, in terms of benefit.” - FG1M2

Fewer participants were able to identify whole grains as being protective against chronic disease, and those that could were often apprehensive of their knowledge in this area.

“It’s also heart healthy too isn’t it from memory, yeah and maybe just reduce the chance of getting a stroke perhaps ...what else did I read.” - FG2M2

“I’ve heard about cholesterol and stuff but I don’t know really enough to comment it’s just something I think I picked up somewhere.” - FG3M2

“I’m feeling a bit blank. Well we talk about things like diabetes and things like that, don’t you?” - FG3W5

In addition to a lack of knowledge of specific health benefits, participants reported scepticism regarding the health value of grain foods and carbohydrate-rich foods in general.

“Then stuff like pasta, I always think of as unhealthy as well but I’m not sure why.” - FG6W2

“Carbs are my enemy.” - FG9W4

“I don’t associate anything healthy with it (whole grain) really. If something calls out fibre yes ok I understand, but if something calls out whole grain, my first thought is wheat, flour, bread, no.” - FG5W2

Grain foods were often not considered as a priority in a healthy diet, and participants sometimes suggested that a diet that lacked any grain foods could still be healthy. Fruits and vegetables were consistently named as the markers of a healthy diet.

“Why is it three? (sic serves of whole grain) Because like there’s so many cultures and... for most of human history we weren’t even eating grains?” -

FG3M1

“I guess I probably don’t eat enough whole grains if there is something that should be eaten...But that’s not my goal at all, I’d never think like ‘I haven’t had any whole grains today!’ I would think ‘I haven’t had any vegetables today’.” -

FG3W2

“Sometimes it seems like all recommendations and stuff I’ll focus on fruits and veggies but it’s hard to fit all of the recommended stuff in each day so I won’t worry about grains as much as I worry about other stuff.” - FG6W2

Additionally, participants reported to consider content of particular components to be a better indication of health value in products than whole grain content. Overwhelmingly, participants considered sugar content as most relevant to the health value of food products.

“Oh and then I’ll look at the ingredients list and go, sugar! 30%! I’m not having that cereal.” - FG3W4

“Sugar is killing us but, I think everything else pales into insignificance to sugar.”- FG8M1

“If I see the term whole grain in the packaging that usually gets my attention, but then I find myself looking at the sugar and the fat contents... and I try and decide whether the fact that its whole grain is kind of lost by the fact that it’s got other additives in it.” - FG5W3

3.2.2 Theme 3: Limited ability to identify foods high in whole grains

As explained within Concept 1, participants most commonly reported choosing whole grains breads. Bread also tended to be the most commonly identified source of whole grain, and participants struggled to name sources beyond this.

“I almost never identify wholemeal with cereal even though on a more regular basis I’d say I buy wholemeal cereal like All Bran... I kind of almost completely associated it with bread.” - FG4W2

“Things with their husk...but also as soon as you say whole grain I just think immediately of bread.” - FG5M1

“I often don’t think about pasta... I think of rice, I certainly think of rice as a grain intake but I don’t think about pasta.” - FG5W3

“My first thought was not rice whatsoever, not that I’ve ever even thought where does rice fit in the grand scheme of things but when we were talking I didn’t even think rice was part of it.” - FG5W2

Participants across groups tended to agree that identification of whole grain food products was based mainly on the presence of visible intact grains and seeds, overall darker colour, and the words ‘whole grain’ printed on the product label.

“Yeah I suppose I mainly thought of bread and then like a really a brown bread not just a white bread.” - FG5M2

“Yeah I think it’ll be a magic component if you can actually see the full seeds in there.” - FG1M4

“Oh yeah it always...it states whole grain if it is whole grain. I don’t think it says anything much if it’s refined.” - FG7W2

When discussing breads specifically, participants sometimes commented that the absence of intact grains and seeds might suggest that a product is not a source of whole grains. Participants believed whole grain required seeds, seen as “grains”.

“If I can’t see the seeds I’m not really going to go for it... I find it annoying to eat with the seeds but I would never pick it unless it had the seeds in it, I would go straight to white bread. It’s almost like ok well I can see the seeds in it and the grains in it so I know... it’s almost like confirming that I’ve made the right decision.” - FG5W2

Mixed opinions were expressed as to whether milled whole grains and products that use milled whole grains, such as wholemeal flour, breads and crackers, would be considered whole grains.

“I feel like I’d also say like wholemeal flour, I would include, even though its ground down, it still had the husk included in the grinding.” - FG3W2

“I think of Weet-bix™ and Vita Brits® or whatever it is and some of those cereals that are promoted as “whole grain” but I’m never quite sure how processed they are.” - FG5W3

3.2.3 Theme 4: No awareness of recommended quantities to eat

No participants were familiar with the whole grain DTI within Australia to consume 48g of whole grains (3 servings). Most participants assumed that their daily intake would be inadequate, and expressed that it is often overwhelming to attempt to meet all dietary recommendations.

“How could you actually do it because I think with fruit you’re supposed to have 2 or 3 serves and I have heard 5 serves of vegetables a day, so then if you want to sort of add grains, it’s very difficult to sort of say how are you going to meet all of these nutritional needs because you also have to incorporate protein and dairy and all of those sorts of things.” - FG5W1

“I don’t know what is enough but I know I don’t eat it.” - FG2W2

“3 Weet-bix™ would be a serve wouldn’t it?” - FG2M2

“Two slices of bread because then it would be a sandwich.” - FG5M2

Many participants were surprised to find the DTI more achievable than they initially assumed. Participants often found that one or two small changes would allow them to meet the DTI, and expressed motivation to make that change.

“When you say it like that it seems like it is feasible, that you can do it, whereas when you’re thinking about it before you said that you’re thinking oh god how much do I have to eat.” - FG5W4

“That’s actually doable. I used to have 3 Weet-bix™ for breakfast, now I might only have 2, but I might just jack it up to the 3.” - FG9W2

Although, upon learning the DTI, some participants that were meeting or exceeding recommendations made comment that they must be eating too much, before the DTI was explained to be a minimum.

“Well yeah my minimum is being reached very easily but I think I’m eating way more than I need to in a day.” - FG6M2

“Are we over doing it?!” - FG8W1

3.2.4 Theme 5: Taste and texture dictate all choices to some extent

Among the participants that consumed some whole grains, they reported preferring the taste of these products compared to the taste of refined grain counterparts, which some expressed was a stronger deciding factor than perceived health value. While cost was also expressed as

an additional consideration, it was generally reported that if taste and perceived health value expectations were met, cost would not be a limiting factor.

“I just prefer the taste I don’t really like the sugar laden white bread ones... when I was growing up I had parents that would always get that one so I’ve grown up having that one.” - FG1M1

“I’d go the whole grain. Just for taste. Being better for you doesn’t really bother me.” - FG7M1

“I’d definitely take the brown because I like the taste of it and I think it’s better for me, whether it is or not is another thing. So I don’t look at it and say I’m eating this because of the fibre or whatever, I just like it.” - FG9W3

“I eat a lot of bread so (cost) wouldn’t really bother me now, I would have once for sure thought about the cost but not really, I eat it all the time so it’s just nice to have.” – FG6M2

“With things like bread where I feel like the price point differences aren’t very significant, I wouldn’t mind paying a dollar more.” – FG1M2

Notably however, many participants stated that they choose multigrain bread (which is not necessarily whole grain) over wholemeal or whole grain breads because they prefer the taste and texture.

“I like multigrain. I tend to pick multigrain, and then white, and then wholemeal or whole grain. I don’t like the taste of whole grain, but I like the taste of multigrain.” - FG3W1

“I think yes, multigrain I would like, like the ones that are sort of mostly white bread but with grains within them, I’m keen for, but the breads that are like just brown straight across, dry.” - FG5M1

Similarly, participants reported that they never choose certain whole grain products, such as wholemeal pasta, because they do not like the taste and texture.

“I’ve tried whole meal pasta it’s like... I assume it’s healthier, but it doesn’t taste as nice.” - FG6W1

“It’s funny that you mention pastas because I do not like the taste of wholemeal pastas I will never choose wholemeal pastas.” - FG1W1

While most participants reported to consume some whole grain, there were participants that reported eating exclusively refined grain foods, and they did so because they did not like the taste of whole grains.

“I pick white bread cause I like white bread, I’m sorry.” - FG2M1

Through the focus group discussions, participants described approaches that may increase incentives to choose healthier grain foods. These have been collated into three themes, within Concept 3.

3.3 Concept 3: Strategies to encourage healthy grain choices

3.3.1 Theme 6: Increased promotion of nutrition benefits of whole grains is desirable

Participants expressed that there is a need for information covering specific health benefits of whole grains to be more readily available.

“Most people know about the food triangle and most people know that cereals and whole grains and breads are in that triangle...but it’s not something that I could honestly say that I’ve heard too much about...I can’t ever recall having a serving attached to that. So it’s interesting and I think people would eventually respond to informed, credible information but I’m not sure that it’s out there that easily.” - FG5W3

“Probably there’s not enough talk about whole grain I think there’s a lot of talk about calories and fat and carbohydrates umm maybe fibre but not really whole grains and how that the sort of really impacts you and what you need and that type of thing and I think there’s poor information.” - FG8W2

Similarly, many participants stated that they perceived a gap in food product advertising covering the benefits of whole grains, and that this may also be effective at increasing incentive to choose whole grain products.

“I think there’s an advertising gap that people probably would benefit by being more whole grain aware and whether that’s an intensive advertising promotion at a point in time collectively by all interested parties I’m not sure but I think that people are trying to have healthier lifestyles and I think I thought I was fairly aware, had no idea about the whole grain content 48g, the 3 serves a day.” -

FG5W3

“They don’t push whole grains as much as they do the high sugar and the carbs and sodium. You don’t hear as much advertisement besides the basic.” - FG2F3

“It seems to be everything else, low sugar, low fat, low GI, low... but you don’t really see...extra grains or whole grains.” - FG2W2

3.3.2 Theme 7: Food based recommendations and targets are preferred

Participants reported that they preferred messages and recommendations that were simple to understand in the context of their diets, and made reference to the previous food-based campaigns ‘Gofor2&5©’, an Australian campaign encouraging two pieces of fruit and five vegetable serves each day.

“I think I found it most useful if I was like educated on it ... the 2 fruit and 5 veg stuck with me and that’s what I go by each day, so if I was to know that I had to have the equivalent of three slices of bread a day I would try to work that into my diet.” - FG1M2

“But I think that the visual stimulus you gave us as well, associating a serving with an image like you can see one slice of bread is a serving so you can work out how many servings of bread will equate to how many servings I need, I think is important as well.” - FG4M3

Similarly, upon learning what one serving of whole grain approximately equated to in commonly consumed grain foods, participants commented that the Weet-bix™ (whole grain breakfast cereal) and whole grain bread (one biscuit/one slice of bread = one whole grain serve) were easy to remember and incorporate into their diets to meet the whole grain DTI. In comparison, approximate servings of loose whole grain foods such as oatmeal or rice were provided in household servings (for example, ½ cup), and participants expressed that these were more difficult to visualise.

“Yeah I thought it would be a lot more than just as I said 3 Weet-bix™ or 3 slices of bread, because if I did have wholemeal or wholegrain I’d actually easily get that because I have two sandwiches which would be four slices of it.”- FG5M2

“Surely with breads and the morning biscuits it’s easier to judge a serve whereas if you get out some pasta or some rice you’re not going to individually count each gram or grain or stick.” - FG1M1

“I have the diet book and one of the things I find really helpful in that book is that it actually has like images of like a handful of whatever ingredient that you’re going to use so you can really visualise it...and I know what size I should be aiming for.”- FG1M3

3.3.3 Theme 8: For avid whole grain avoiders, added-fibre grain foods may be useful

Perceptions of added-fibre refined products, specifically referring to the example added-fibre white bread, were mixed. Among participants who regularly consumed any whole grain products, there was distrust of added-fibre products health benefits, and many participants seemed to think the labelling was simply a marketing technique. These participants tended to report that they would see no difference between these breads and standard white breads, so the decision between refined grain products would be based primarily on cost or brand difference.

“I would never buy the (added fibre white) just because of the fact it says “super” to me that says that they’ve had to add something to it to make it ok... so it’s obviously been doctored a little bit and has additives and that means that the original product is not good for you at all.” - FG1M3

“It also makes you wonder is there any bodies that say yes this is high fibre you’re allowed to put this advertising on it or do they just like to slap whatever they want on to it.” - FG1M1

“If I just had two options between these white breads, I would just choose the cheapest to be honest.” – FG1F1

However, participants that do not consume any whole grain, reporting a strong aversion to the taste and texture, were more likely to accept high-fibre white bread, often reporting that they perceive these products as a compromise between taste and health.

“I would choose the high fibre bread because I know that I shouldn’t be choosing white bread but I feel like I’m getting away with it if I’m choosing that one, like I’m getting some slight health benefit still... I’m sneaking in the high fibre while tricking myself into thinking I’m being healthy, and still having white bread.”

- FG5M1

“High fibre bread because it’s white but it’s still high in fibre. Just tastes better.”

- FG7W1

4. Discussion

To date, there is limited research exploring the knowledge, perceptions and attitudes influencing grain food choices within an Australian context. The present study indicates that there is a lack understanding regarding how to make healthy grain food choices, including inadequate knowledge of the health benefits of whole grains, an inability to identify good sources of whole grains, and limited awareness of recommended intakes, which were suggested as limiting factors in consumers choosing more whole grain foods. Although an aversion to the taste and texture of some whole grain products was an additional consideration in choice, in which case added-fibre products may be of value, participants expressed that an increased promotion of whole grain foods may be effective in encouraging healthy grain choices.

The findings in the present study are similar to those found in previous studies in the United Kingdom (UK), where participants detailed a basic awareness of whole grains as being healthier than refined grains⁽¹¹⁾, and were able to name certain short term benefits such as increased satiety, but felt unsure of many health benefits beyond this⁽¹³⁾. A 2001 questionnaire-based study from the UK found that 18-34% of residents (depending on area examined) were unaware of any link between whole grain and chronic disease⁽²⁹⁾. Despite this research being conducted almost two decades ago, our results seem to suggest knowledge in this area has not improved.

In addition, participants here reported scepticism regarding the health value of grain foods and carbohydrate-rich foods in general, which likely adds confusion to opinions surrounding the health value of whole grains, and may further affect food choice. An Australian study found that grain intakes within Western Australia are declining, with people being more likely to actively reduce grain food intake in 2012 compared to 1995, while also having less knowledge of grain food recommendations⁽³⁰⁾. While the proportion of bread consumed as

whole grain increased within these years, the decline in total bread consumed meant that overall intake of whole grain bread had not changed within the 17 years, a concern given the increased varieties available on the market ⁽³⁰⁾. Anti-grain and similar low-carbohydrate based diets have gained considerable popularity globally, explained by Gunnarsson and Elam as the result of skilful persuasive communication techniques used by advocators of the diet ⁽³¹⁾. This is a growing challenge that needs to be given specific consideration in efforts to increase population whole grain intake.

The apparent prioritisation of other food properties over whole grain content in dictating food choices must be considered in promotion of whole grain foods. Participants considered sugar content as highly relevant to the health value of food products, as also found in previous studies ⁽³²⁾, and were often sceptical that products which may be labelled as containing whole grain are actually high in sugar and are highly processed, rendering the whole grain content irrelevant. It is important to consider the value of whole grains, or any singular nutrient or food, in the context of promoting overall diet quality. For this reason, it is reasonable that recommended products should be nutritious beyond their whole grain content. There are calls to restrict whole grain labelling to foods that contain a certain amount of whole grain and also meet acceptable standards for other nutrients, for example being low in sodium, saturated fat and added sugars ⁽³³⁾, so as not to mislead consumers.

Within Australia, the use of whole grain content claims requires food products to meet the Nutrient Profiling Scoring Criterion, a point system broadly ranking the nutrition quality of foods ⁽³⁴⁾. However, products are currently permitted to carry the term 'whole grain' on their label if they contain any amount of whole grain ingredient ⁽³⁵⁾. Considering whole grain labelling on otherwise non-nutritious products appeared to contribute to scepticism regarding the health value of whole grains, restrictions of whole grain labelling to otherwise healthful food, such as employed within other countries ⁽³⁶⁾, may be an important consideration in efforts to improve the effectiveness of whole grain food promotion. This may be a prudent recommendation to manufacturers and regulators, such that merely listing whole grain as an ingredient in an otherwise less healthful product may be counterproductive.

Participants of the current focus groups suggested that messages and recommendations that were simple to understand in the context of their diets would be most effective in influencing their choices, highlighting the importance of food-based recommendations and food-based

campaigns, such as the previous Gofor2&5© fruit and vegetable campaign, which has proven successful ⁽³⁷⁾. Although the DTI suggested in Australia is 48g of whole grain, participants thought this information was more effectively delivered as three serves of whole grain foods per day. Generally, we eat foods not nutrients, so serve sizes of foods may be the most suitable way to promote intake. For loose whole grain foods where serving size is provided in household measures (for example, ½ cup), messaging and recommendations that provide both descriptive (eg ½ cup) and visual (a picture in ‘life-size’ scale) depictions of what is classified as a serving may be best understood.

The foods focused on within promotional efforts and messaging may also be relevant. Within the present focus groups, participants reported choosing whole grain breads, and to a lesser extent breakfast cereals, more regularly than other grain choices such as rice and pasta, which would typically be refined grain choices. This finding is supported in intake studies using survey data, which found that breads and cereals were the largest contributors to whole grain intake within Australia ⁽⁶⁾. This may suggest that certain whole grain foods such as breads are more acceptable than others, and efforts to increase whole grain intakes may be most successful if centred on choices within this category. In contrast, participants that reported taste aversions to whole grain foods often referred specifically to wholemeal pasta, and so attempted change in choices within the pasta category would likely be met with greater resistance.

Still, there was evidence of confusion regarding the best sources of whole grain food choices within breads and cereal choices, where there can be great variation. Many participants suggested that multigrain breads are a higher source of whole grain than wholemeal breads (which are whole grain in Australia), perhaps related to the mixed opinions on the extent to which processing should impact a food’s whole grain classification. Previous research has also found that UK adolescent participants tended to equate multigrain with whole grain ⁽¹¹⁾. As multigrain breads within Australia are typically lower in whole grain content than wholemeal breads, participants relying on multigrain bread alone may also be overestimating their intakes. For food-based recommendations and messaging to be most effective they should therefore go a step further and incorporate specific examples of food products (for example, specific varieties, or even brands of bread) that are high sources of whole grains, as recommended previously ⁽³²⁾.

Furthermore, increasing ease of identification of whole grain products in store may be necessary. As part of the Danish Whole Grain Partnership, a successful campaign which has seen daily intakes of whole grains in Denmark increase from 36g/10MJ to 82g/10MJ since 2008 ⁽³⁶⁾, an orange whole grain logo was created to allow consumers to easily identify products high in whole grain, as well as to encourage manufacturers to develop products with higher whole grain content ⁽³⁶⁾. Within Australia, the GLNC have a similar initiative in the form of a voluntary whole grain content claim. Rather than a logo, registered manufacturers can include a phrase on packaged whole grain foods, ranging from ‘contains whole grain’, ‘high in whole grain’, to ‘very high in whole grain’, for foods containing at least 8, 16 or 24 grams of whole grain, respectively ⁽³⁴⁾. However, this is not a legislated label, and as mentioned previously, food products within Australia that contain any whole grain ingredients may include the term ‘whole grain’ on labelling, irrespective of the amount ⁽³⁵⁾. Therefore without government engagement through formal food regulation, consumers may be confused, and voice this mistrust through avoidance of certain foods.

The majority of participants within the focus groups indicated that due to distrust regarding the health value of added fibres, they would not readily choose added-fibre food products. However, the exception to this finding were ‘whole grain avoiders’, those who reported choosing no whole grain foods. In contrast to other participants, whole grain avoiders did express interest in added-fibre products as a compromise between desired taste and perceived health value, with most suggesting that factors such as potential added cost would not be a disincentive. For these people, whole grain promotion strategies may not be as effective, and added-fibre grain products may therefore be a viable solution to increase fibre intakes within this specific target group. However, given the comparative benefits of added fibres compared to whole grain foods are not fully established, efforts made within the food industry to increase the health value of products should also focus on incorporating whole grains into a wider range of grain products, which also may be more acceptable for consumers who are sceptical of added-fibre products. Although, for such products to be successful and accepted by whole grain avoiders, whole grain ingredients must be incorporated at an amount that will make a significant contribution to intake while also not compromising on expected taste and texture.

Although many participants here expressed that promotion of whole grain health benefits would be impactful in encouraging healthier grain choices, previous research has shown that

this is not always enough⁽³⁸⁾, and additional strategies taking into account food availability⁽³⁹⁾ and affordability⁽⁴⁰⁾ may also be important. In our study, these factors were mentioned as potential considerations in choice, although were generally reported as secondary factors to taste and perceived health value. By contrast, other studies have shown availability and affordability to be major purchasing influencers^(10; 11; 40).

Previous whole grain promotion campaigns that have been most successful in increasing intakes, such as the Danish Whole Grain Partnership⁽³⁶⁾, have utilised multi-pronged approaches, including efforts to impact the food environment by increasing availability of whole grain foods. This was achieved through a combined involvement of government, health promotion agency affiliations and food industry, and included changes to the national dietary guidelines, targeted communication through social media promotion, an introduction of the whole grain marketing logo, as well as increased production and availability of whole grain containing products⁽⁴¹⁾. Therefore, an approach including promotion of whole grain health benefits, as well as changes to the food environment such as regulation of whole grain food labelling and innovation in appealing whole grain products may be most effective in addressing the potential limiting factors to healthier grain choices identified here. The Australian Government's *Healthy Food Partnership*⁽⁴²⁾, has the potential to drive such a strategy within Australia, as it also encourages cooperation of government, food industry and public health agencies.

This study utilised a qualitative approach in order to explore the existing perceptions dictating grain food choices at a greater depth than what would be possible through quantitative methods such as a survey. The total sample size of 52 participants, made up of a relatively diverse demographic achieved through purposive sampling, allowed for collection of a range of opinions and perspectives in shaping the extracted themes. Despite the relatively large total sample size, each focus group contained no more than 8 participants, and groups tended to be individually homogenous (due mainly to the location of the groups), which can help facilitate open discussion and engagement of all participants^(43; 44).

Although this study has several strengths, there are some limitations that need to also be considered. While a relatively diverse sample of participants were recruited, the sample was still well-educated, with 46% of participants holding a bachelor degree or higher, compared to approximately 31% of the Australian population in 2018⁽⁴⁵⁾. Furthermore, as participation

was voluntary and mainly based on expressed interest, it is possible that individuals with a greater interest in health, nutrition or grain foods are more likely to participate. This self-selection bias may be more likely as a considerable amount of recruitment was conducted through the University and health-promoting organisations such as gymnasiums, where attendees may already have higher health literacy or interest. Given the moderators of the study were APDs, there is also a chance of social desirability bias in participants comments and discussion. Lastly, because the specific aims of this research, and subsequently the semi-structured questions asked, focused primarily on consumer knowledge and perceptions of grain foods, the findings from these groups may underestimate the role of factors such as cost and availability in determining consumer grain food choices. These factors were mentioned and discussed, but not specifically explored in the groups.

5. Conclusion

While participants did report that they tend to choose some whole grain foods, knowledge of the health benefits of whole grains was lacking, likely limiting incentive for increased intake. Furthermore, participants were generally unaware of recommendations surrounding whole grain intake, or specific food choices to help meet these recommendations. Scepticism surrounding the health value of carbohydrate-based foods was recurring within the focus groups, and appeared to be an additional barrier hindering grain food intake in general. While there are likely a multitude of factors that influence consumer grain food choices, further promotion of the benefits of whole grains and whole grain foods, with a focus on food-based targets and messaging, may be useful in encouraging whole grain intake, particularly in groups with few other limitations (for example cost) on their food choices. In order to achieve this effectively, a multi-pronged approach is needed including efforts from the government, public health sector, and the food industry. Added-fibre grain products appear to be a useful tool for avid whole grain avoiders to increase cereal fibre intakes, as this group is unlikely to accept whole grain sensory properties. However, innovations by the food industry in increasing the fibre content of grain foods should occur in conjunction with efforts to increase availability and variety of naturally high whole grain products that are palatable and appealing to consumers. This is particularly important considering the comparative benefits of added-fibre products are not yet clear, and further research directly comparing the effects of added-fibre intake to whole grain intake is still needed.

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Table 1. Semi-structured focus group guide

Topic 1: Defining and identifying whole grain foods

1. Do you know what the term whole grain means? How is it different to refined grain?
 2. Can you name some whole grain foods?
 3. How would you identify whole grain foods at the supermarket?
-

Topic 2: Understanding of health benefits of whole grains and dietary fibre

4. Can you name any health benefits of whole grains?
 5. Can you name any health benefits of dietary fibre? How do these differ from whole grain benefits?
-

Topic 3: Perceptions of whole grain, refined grain, and added-fibre grain foods

6. Which of these breads (whole grain, white, added-fibre) are you most likely to choose, and why?
 7. How healthy do you think each of these foods is? Which is the healthiest? Why?
 8. How tasty do you think each of these foods is? Which is the tastiest? Why?
 9. Do you consider foods labelled whole grain and high-fibre differently? What are the differences?
-

Topic 4: Awareness of whole grain recommendations

10. Do you think you eat enough whole grain foods? Should you eat more or less?
 11. Are you aware of how many serves of whole grain foods are recommended? What is a serve?
 12. If you had two identical food items, one labelled as containing 16g of whole grain and one containing 1 serve of whole grain, which would you choose and why?
-

Table 2. Focus group participant demographics (n=52)¹

Gender			
Man	23 (44.2)	Woman	29 (55.8)
Age			
18-25 y	15 (28.8)	45-55 y	5 (9.6)
26-35 y	6 (11.5)	56-65 y	17 (32.6)
36-45 y	4 (7.7)	65+ y	5 (9.6)
Employment			
Full time	26 (50.0)	Retired	8 (15.4)
Part time	3 (5.8)	Student	9 (17.3)
Casual	5 (9.6)	Unanswered	1 (1.9)
Educational attainment			
Some high school	4 (7.7)	Master's degree	3 (5.8)
Completed high school	13 (25.0)	PhD/doctoral degree	1 (1.9)
Certificate/diploma	10 (19.2)	Unanswered	1 (1.9)
Bachelor's degree	20 (38.5)		
Geographical area			
Urban	12 (23.1)	Suburban	38 (73.1)
Rural	2 (3.8)		
Yearly income			
<\$50,000	21 (40.4)	\$120,000-\$150,000	2 (3.8)
\$50,000-\$80,000	15 (28.8)	>\$150,000	1 (1.9)
\$80,000-\$120,000	8 (15.4)	Unanswered	5 (9.6)

¹Values are n (%)

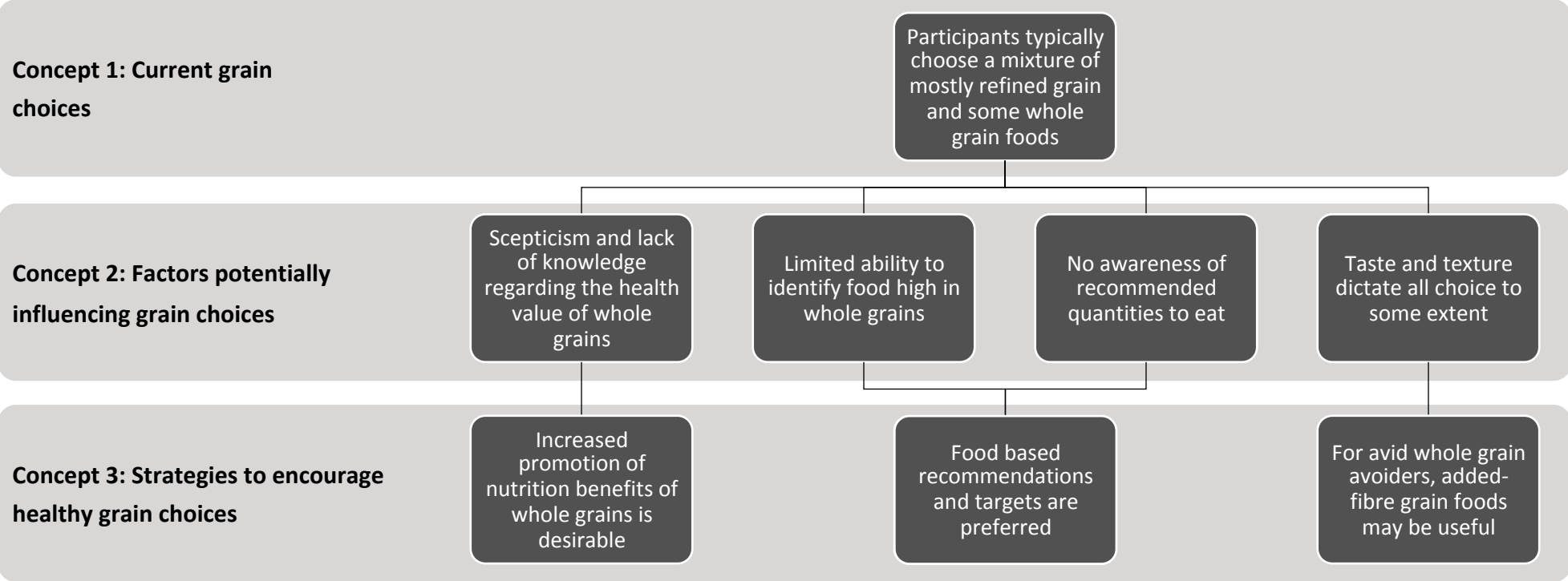


Figure 1: Concepts and related themes emerging from focus groups