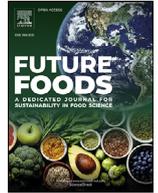




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## Comparing early hemp food consumers to non-hemp food consumers to determine attributes of early adopters of a novel food using the Food Choice Questionnaire (FCQ) and the Food Neophobia Scale (FNS).

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## ABSTRACT

Hemp foods were legalised for human consumption in the Australian market on November 2017. This provided an opportunity to explore differences in food choice attributes between hemp food consumer groups early in the diffusion process. An online questionnaire disseminated one year after the introduction of hemp foods employed the Food Neophobia Scale (FNS) and Food Choice Questionnaire (FCQ) as well as attitudinal questions on hemp. It was hypothesised that consumers would display attitudes consistent with acceptance of other novel foods, that is, early consumers of hemp would report lower food-neophobia and non-consumers would demonstrate a greater complexity of decision making. Additionally, it was expected non-consumers of hemp food would place a higher concern on hemp's association with the illicit aspects of hemp. Results were not as expected. Early consumers of the novel food reported higher levels of food-neophobia which was inconsistent with expectations and past research. However, greater importance was placed on health, mood, natural content, familiarity, and ethical concern. There were no differences between hemp and non-hemp consumers in their concern for roadside drug testing. Findings suggest the diffusion process may be advanced further than expected in consumers aware of hemp food's recently legalised status. Implications are discussed.

## 1.0. Introduction

An increased interest in the acceptance of novel foods, that is, foods to which a consumer has not been previously exposed (Frewer and Fischer, 2010), is borne of an increasing global population that should reach nine billion by the year 2050. Globalisation has resulted in increased exposure of the world's population to foods from other cultures, and increased multicultural culinary experiences have altered normative perceptions for many (Barrena *et al.*, 2015; Tan *et al.*, 2015). The increasing global population presents a challenge to food security as many traditional food production techniques will become environmentally unsustainable at the levels required to meet world food demands (Admassu *et al.*, 2020). Hemp foods might suitably address many food security issues. The hemp plant, *Cannabis sativa*, from which hemp foods are produced is environmentally sustainable due to a reported low water need and natural pest resistance (Schlutenhofer and Yuan, 2017), can be economically lucrative (Pavlovi *et al.*, 2016) with high yields and shorter growth cycles compared with many traditional crops (Schlutenhofer and Yuan, 2017), and has many nutritional benefits. Nutritional benefits of hemp include being high in levels of plant

protein, high in dietary fibre, a rich source of Omega 3 and 6, and contains all of the amino acids essential to human life (Callaway, 2004; Callaway *et al.*, 2005). Hemp as a food source was unavailable in Australia prior to the change in legislation in November 2017 (FSANZ, 2017; New South Wales Government, 2016). Hemp's rich history combined with the recent change in legal status has provided an ideal exemplar to evaluate the introduction of a unique novel food into the Australian consumer market. This study aims to understand which factors contribute to the early adoption of hemp by comparing attributes of individuals who have consumed hemp food to those who have chosen not to, one year after its introduction to the Australian market.

The process of diffusion of a product throughout a population becomes an underlying factor in our understanding of the acceptance of novel food products. Rogers' (1976) application of diffusion of innovation in new product acceptance, and its subsequent redefinition (Rogers, 2003), remains a widely accepted framework for acceptance of novel products throughout a population (Sääksjärvi and Hellén, 2019). Diffusion is reported to be determined by "a chain of influence from the earlier adoption groups to the later adoption groups" (Sääksjärvi and Hellén, 2019, p. 587), therefore placing importance on understand-

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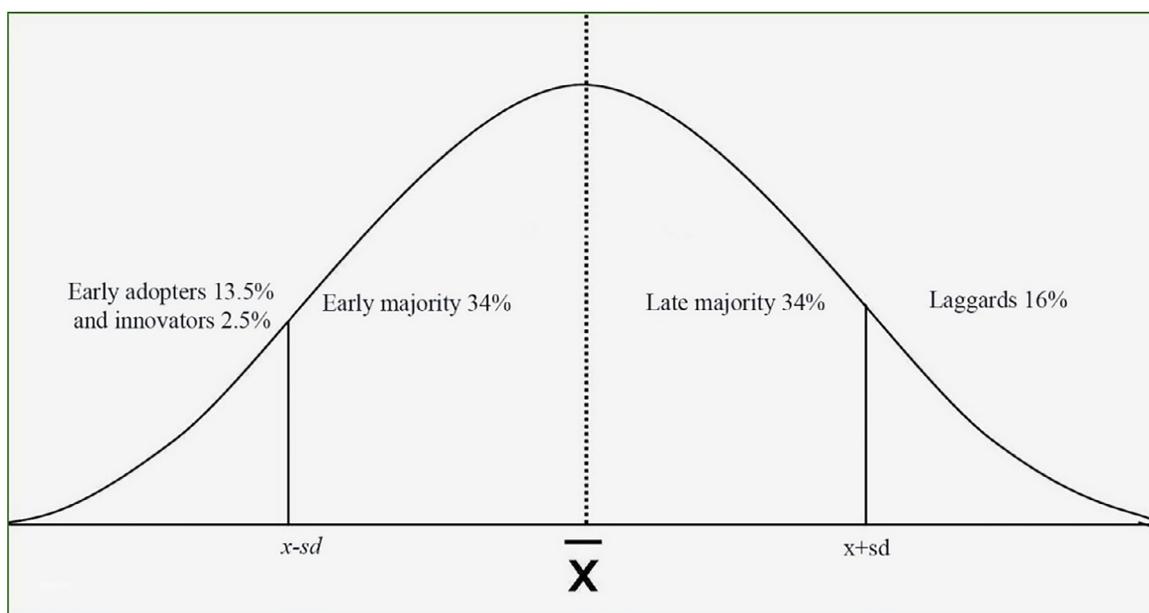


Fig. 1. Categorisation of groups according to Rogers' model of diffusion (Rogers, 2003, p. 240).

ing group differences not only in the early adoption of a product, but also in predicting *where* group influence from early adopters to later adoptees becomes an instrumental part of the diffusion process. The current study sought to evaluate group differences between hemp food consumer groups at an early point after its introduction to the Australian market in order to help define the factors integral to the diffusion process.

Diffusion of a novel product does not occur in isolation but within a broader context of policy, structure, and systems (Rogers, 2003). However, understanding the motivations of consumers to adopt a product and how perception differs between adoption groups provides insight to the trajectory of a novel product within this system. Each adoption group is defined according to where in the diffusion process a consumer first uses a novel product, and are shown in Fig. 1. Each group display characteristics common among its members that cumulatively influence their perception and attitude toward a novel product, with these characteristics occurring within a whole population in a normal distribution, as would be expected of behavioural and personality traits (Rogers, 2003). Innovators and early adopters share some attributes that result in their having early product knowledge, be open to innovation, and serve as role models within the diffusion process to trigger further adoption in others. In contrast, adoption by early and late majority groups is largely due to peer pressure, and laggards are the last within a social system to adopt a novel product, needing reassurance of a product's worth and knowledge of the product that alleviates suspicion of it before final acceptance. Non-adopters are considered separate to the adopter groups under the diffusion model and are those consumers whose traits contribute to a value judgement of how beneficial the novel product is to them, and who decide that there are insufficient benefits to its adoption. While non-adopters will *never* take up the novel product, there will be stages throughout the diffusion process defined by (Rogers, 1976; Rogers, 2003) where consumers who will ultimately become adopters have not yet accepted the novel product. During this time, understanding the attributes of each of the groups and the sequential nature of the process might help define where along the adoption continuum time line the acceptance of a product currently sits.

More recent models of diffusion of novel products incorporate feedback loops to define the social factors influencing product adoption (Vargo *et al.*, 2020) and while it is beyond the scope of this paper to evaluate the dynamics of social influence on product adoption, it is im-

portant to mention that this model continues to place importance on path dependence of the process, particularly the need to understand the attributes of each of the adoption groups within the sequential diffusion process.

For clarity of definition between the theorised and study sample groups, the study cohorts will be described in this paper as *hemp group* and *non-hemp group*, and Rogers' innovation groups referred to by their empirically reported names as demonstrated in Fig. 1. The hemp group are defined as those study participants who reported having consumed hemp food at the time of the study, and the non-hemp group are defined as those study participants who reported knowing that hemp food had been legalised, knew of a place that hemp food was sold, and had not at the time of the study consumed hemp food. It was anticipated that the hemp group would comprise mostly early adopters as well as some early majority adopter members, and that the non-hemp group would largely comprise those who would remain non-adopters but may also include some early and late majority adopters and laggards who had not yet made the decision to consume but would do so at some time in the future. Non-hemp group members who reported not knowing a place where hemp food could be purchased were excluded from the study.

It was anticipated that understanding the predicted trajectory of the diffusion process might reap benefits for the hemp food industry, and provide insight into the diffusion of a novel food product in the Australian population. Intrinsic to the diffusion process is the compatibility of the novel product to the belief systems, needs and values of consumers adopting the product (Rogers, 2003). The rate and degree of diffusion of a novel product is reported to occur throughout a population according to these factors, including specific value judgements of potential adoptees, and their amenability to certain external effects, including product promotion and price (Vargo *et al.*, 2020). The Food Choice Questionnaire (FCQ: Steptoe *et al.*, 1995) has been empirically demonstrated to be a reliable and valid measure of several of the factors that impact on these value judgements (Markovina *et al.*, 2011) and was adopted as a measure of these factors in the current study.

Food neophobia is often considered to be the greatest barrier to acceptance of novel foods (Pliner and Hobden, 1992). Food neophobia, literally meaning a fear of new food, is considered an enduring personality trait of evolutionary origins which can be conceptualised as the avoidance factor along a "neophobia-neophilia continuum" (Nezlek and Forestell, 2019; Pliner and Hobden, 1992, p. 107) according to con-

sumers' propensity to avoid novel foods, or be drawn toward them. It has been consistently found to be not only a significant barrier to the acceptance of novel food (Jaeger *et al.*, 2017; Mancini *et al.*, 2019; Sogari *et al.*, 2019; Soucier *et al.*, 2019; Verbeke, 2015; Wilkinson *et al.*, 2018), but also a barrier to dietary change, particularly where behavioural modification is needed to address diet related health problems, and has been demonstrated to be associated more generally with reduced dietary varietal intake (Jaeger *et al.*, 2017; Monneuse *et al.*, 2004; Siegrist *et al.*, 2013). Food neophobia has been reported to be inversely related to food satisfaction, as well as more generally to life satisfaction (Schnettler *et al.*, 2013). According to Rogers' (2003, p. 143) description of adopter groups, "laggards tend to be suspicious of innovation and change agents", with any adoption of novel products "lagging far behind awareness-knowledge" of the novel products. The highest rates of food neophobia would be expected to be reported by both laggards, and those consumers whose aversion contributes to their choice to never consume the food, the non-hemp group. It was hypothesised that the avoidance of hemp food demonstrated by the non-hemp group in the current study was largely representative of trait food neophobia, and that this group would score higher in the FNS than the hemp consumers.

H1: The non-hemp group would score higher on food neophobia as measured by the Food Neophobia Scale compared to the hemp group.

Factors contributing to food choice behaviour are drawn from evolutionary survival needs, neuropsychological processes in response to sensory input, biological and learned responses, and a myriad of sociocultural influences (Frewer and Fischer, 2010). Vabo and Hansen (2014) reported from a broad review of consumer marketing and food science literature that while many factors contributed similarly to both food choice and food preference, there were many facets of food choice that were distinct from food preference. Where preference for foods is largely developed early in life, much of it in the first five years, food choice is a dynamic phenomenon which can change along with situational and personal changes (Vabo and Hansen, 2014). Additionally, socially constructed associations based on previous experience and beliefs can influence consumers' evaluation of food in the marketplace (Greehy *et al.*, 2013). These dynamics of food choice may apply to hemp foods where, for example, an association with hemp's illegal cousin, marijuana, might negatively impact acceptance. Rasco (2010) reported a similar phenomenon where consumer perceptions toward specific aquatic foods were detrimentally affected by negative associations made to mercury, drug residue, and environmental contaminants through the actions of activists. While consumer concerns were reported to be unfounded, it was clear that negative consumer perceptions had a negative impact on fish consumption. Therefore, despite many similarities with other novel foods the association hemp has with marijuana, or more specifically with tetrahydrocannabinol (THC), creates a unique circumstance which should be evaluated in conjunction with hemp food acceptance. It was hypothesised that in a similar way that consumer perceptions of aquatic foods was impacted through negative associations, the association of hemp food with marijuana would impact the acceptance of hemp food.

H2: The non-hemp group would demonstrate a greater degree of association of hemp food with the negative aspects of marijuana than the hemp group.

Additional factors considered to be influential in the dynamics of food choice include those measured by the Food Choice Questionnaire (FCQ: Markovina *et al.*, 2015; Steptoe *et al.*, 1995). Since its inception, the FCQ has been employed within a multitude of contexts evaluating the acceptance of novel foods. Adopting a shortened version of the FCQ, Annunziata *et al.* (2015) found price, convenience, health concerns, and suspicion of reliability of product information contributed to negative attitudes toward functional foods for older consumers. Jaeger *et al.* (2017) found health, mood, convenience, and sensory appeal were

more important considerations for New Zealand consumers than natural content, price, and weight control across a variety of foods, and that familiarity increased in importance for consumers high in food neophobia. Schlup and Brunner (2018) found health and convenience have significant positive relationships with a willingness to consume a novel food, insects, while a higher importance placed on familiarity meant that consumers were inclined to prefer more familiar products, resulting in a significant negative relationship with willingness to consume the insects. Findings from several studies (Annunziata and Vecchio, 2013; Barrena, 2017; Perrea *et al.*, 2017; Schlup and Brunner, 2018; Siegrist *et al.*, 2013; Stanton, 2019; Tańska *et al.*, 2017; Vecchio *et al.*, 2016; Verbeke, 2015), each employing the FCQ to determine factors influencing novel food acceptance, support the suitability of the measure in determining differences in food choice priorities between the hemp and non-hemp groups. It was hypothesised that a higher priority placed by the non-hemp group on factors contributing to food choice might indicate greater complexity in the decision to consume, a notion supported in the literature where it was reported there is an increase in complexity of the decision making process as food neophobia increased (Barrena and Sánchez, 2012). The anticipated capture of late adopters and laggards within the non-hemp group was expected to contribute to an overall higher level of food neophobia for that group.

It was expected that eight constructs have a static relationship to choice for each individual throughout the diffusion model. In contrast, price, acts in a different way as its influence is fluid, differing in importance according to the current status of the diffusion of the novel product rather than the attributes of the product itself (Rogers, 1976; Rogers, 2003). Socioeconomic factors are determined to play an important role in the adoption decision early in the diffusion process but have a much lesser impact later in the diffusion process when pressure of social norms cause economic considerations to be placed aside, adding to the complexity of the decision making process.

The notion of increased complexity in decision making for individuals reluctant to accept novel foods is supported by a means-end-chain methodology evaluation of the emotional influence on purchase behaviour toward novel foods (Barrena, 2017). The relationship of food choice motivation with complexity in the decision making process leads to a prediction that factors measured by the FCQ will have a higher reported importance in the current study for those consumers less willing to consume the novel food, the non-hemp consumers' group members.

H3: The non-hemp group would place higher importance on factors influencing food choice motivation as measured by the FCQ compared to the hemp group.

## 2.0. Method

### 2.1. Participants

Participants were recruited through the Qualtrics® online survey platform according to a predetermined quota for a nationally representative sample by state, age, and gender from a database of potential participants who had previously indicated an interest in responding to surveys. Participants were paid a nominal remuneration of approximately \$4 value in online vouchers. Screening for pattern responders and lie screening resulted in 2354 usable datasets. Less than half ( $n = 1073$ ) of the respondents reported being aware that hemp foods had been legalised in Australia. Those that reported not being aware that hemp food was available ( $n = 1281$ , 54.4%) were excluded. After normality testing, including removal of extreme outliers, and removal of respondents who were unaware of where to purchase hemp food, 748 complete datasets remained, consisting of 344 hemp group and 404 non-hemp group members. Demographics for the two groups are presented in Table 1.

Hemp group members ( $n = 342$ ) were aged 18-72 ( $M = 39.18$ ,  $SD = 11.93$ ) years and non-hemp group ( $n = 404$ ) were 18-74 ( $M = 43.8$ ,

**Table 1**  
Demographics for hemp group and non-hemp group members.

		Hemp group		Non-hemp group	
		n	%	n	%
Gender	Male	126	36.6	159	39.4
	Female	218	63.4	245	60.6
Education	Doctorate	6	1.7	12	3.0
	Post Grad	42	12.2	43	10.6
	Bachelor	99	28.8	116	28.7
	Trade/Diploma	96	27.9	106	26.2
	Year 12	73	21.2	91	22.5
	< year 12	28	8.1	36	8.9
Age	18-30	85	24.7	87	21.5
	31-40	117	34.0	102	25.3
	41-50	81	23.6	80	19.8
	51-60	39	11.3	69	17.1
	61-75	22	6.4	66	16.3

**Table 2**  
Cronbach's alpha for each of the factors measured by the FCQ.

Food choice factor	Cronbach's alpha	Standardised Cronbach's alpha	n
Health	0.862	0.868	6
Mood	0.880	0.880	6
Convenience	0.819	0.820	5
Sensory appeal	0.711	0.709	4
Natural content	0.875	0.877	3
Price	0.795	0.800	3
Weight control	0.796	0.796	3
Familiarity	0.824	0.824	3
Ethical concern	0.747	0.747	3

$SD = 14.84$ ) years. All Australian states and territories were represented in each group.

## 2.2. Apparatus

### 2.2.1. Online questionnaire

The online questionnaire asked non-identifying demographic questions such as age, gender, highest level of education obtained, and post-code of residence. Respondents were also asked whether they had been aware prior to their participation in the study that hemp foods had been legalised in Australia and were now available for purchase for consumption. Survey platform algorithms permitted a secondary line of questioning for those who responded positively for prior knowledge of hemp food legalisation, answering questions on whether they had tried hemp foods, how often they consumed them, which products, and questions regarding their attitudes and beliefs about hemp food, including whether they knew of a place where hemp food could be purchased. Participants' attitude toward the association of hemp food to the negative effects of marijuana was measured by their agreement on a seven point Likert scale, from strongly disagree to strongly agree, with the statement "Eating hemp food might result in a positive roadside drug test".

### 2.2.2. Food choice questionnaire: FCQ

Food choice motivations and the importance placed on discrete food choice factors were measured using the FCQ (Steptoe et al., 1995). Each of the sub-scales capture a discrete factor of the motivation to consume a food, including: Health, Mood, Convenience (Conv<sup>1</sup>), Sensory appeal (Sens<sup>2</sup>), Natural content (Natural<sup>3</sup>), Price, Weight control (Weigh<sup>4</sup>), Familiarity (Famil<sup>5</sup>), and Ethical concern (Ethic<sup>6</sup>). The instrument has reported high test-retest reliability, and Cronbach's alpha for each of the nine factors is reported by the scale developers to be high, .70 to .87. Cronbach's alpha for each of the sub-scales for the current study indicated good internal consistency and are listed in table 2.

Each item was measured on a four point scale from 1 = not at all important, to 4 = very important. Scores were added and recorded for each sub-scale.

### 2.2.3. Food neophobia scale: FNS

Food neophobia was measured using the Food Neophobia Scale (FNS: Pliner and Hobden, 1992). Participants were asked to respond to a 7-point Likert scale from strongly disagree to strongly agree for both positively and negatively worded statements. Five positively worded items were reverse scored, with scores then added for a total food neophobia score. Cronbach's alpha for the 10 items was .872, indicating good internal consistency in the current study.

## 2.3. Procedure

Data was collected on the Qualtrics® platform with de-identified data forwarded to the first author. Analyses were conducted in IBM® SPSS Version 27.

## 3.0. Results

Prior to the analyses the data was checked for normality and adherence to assumptions for parametric statistics. Extreme univariate outliers (1.5% of the overall sample) were removed from the relevant scale/subscale. Multivariate normality was assessed for all subscales of the FCQ, and four datasets returned Mahalanobis distances greater than the critical value for  $df$  for nine variables, which is 27.88 (Pallant, 2013, p. 298). These were removed prior to analysis. Normality statistics are listed in Table 3, and while skew and kurtosis are outside recommended values for small samples, the very large dataset ( $n = 748$ ) and low ratio (1:1.14) of cohort samples indicated the sample to be sufficiently robust to proceed with parametric analyses as discussed in Tabachnick and Fidell (2013, p. 72). Inter item correlations are reported in Table 4.

An independent samples t-test was conducted to test the first hypothesis that the non-hemp group would score higher on food neophobia than the hemp group. The findings showed a significant difference between the hemp group ( $M = 21.19$ ,  $SD = 8.55$ ) and non-hemp group ( $M = 18.83$ ,  $SD = 6.31$ );  $t(621.31) = 4.22$ ,  $p < .001$  (two tailed) with a small effect size (eta squared = .02). While a significant finding has been reported, the difference is not in the expected direction. The hemp group showed a significantly higher level of food neophobia compared to the non-hemp group. The hypothesis has not been supported.

The second hypothesis stated that the non-hemp group would demonstrate a greater association of hemp food to the negative aspects of cannabis, to wit marijuana, through a concern of testing positive at a roadside drug test than the hemp group. An independent samples t-test was conducted between the hemp group ( $M = 3.18$ ,  $SD = 2.05$ ) and non-hemp group ( $M = 3.44$ ,  $SD = 1.78$ ) for concern over testing positive and found no significant difference at the .05 level:  $t(684.723) = -1.799$ ,  $p = .072$ . The hypothesis has not been supported.

The third hypothesis stipulated that the non-hemp group would endorse a higher level of complexity to the decision making process by placing higher value on factors which are known to contribute to food choice than the hemp group. A one-way between groups multivariate analysis of variance (MANOVA) with Bonferroni adjustment for multiple comparisons was performed. The dependent variables were the subscale scores for the FCQ; health, mood, convenience, natural content, price, weight control, familiarity, natural content, and ethical concern. The independent variable was hemp consumer status. There was a statistically significant difference between the hemp group and non-hemp group on the value of the food choice motivations as measured by the FCQ,  $F(9, 738) = 6.427$ ,  $p < .001$ ; Wilks Lambda = .920; partial eta squared = .08. When the results for the FCQ sub-scales were considered separately using a Bonferroni adjusted alpha level of .006, significant differences were reported for five of the nine subscales (health, mood, natural content, familiarity, and ethical concern) and are reported in Table 5. There were no significant differences reported between groups on the factors of convenience, sensory appeal, price, and weight control.

Despite the finding of significant differences between groups on factors of health, mood, natural content, familiarity, and ethical concern,

**Table 3**  
Normality and score statistics for the FNS, subscales of the FCQ, and the hemp THC question.

Scale	Min	Max	Median	Skew Statistic	Std. error	Kurtosis Statistic	Std. error
FNS total	10	40	18	0.983	0.089	0.511	0.179
Health	12	24	20	-0.595	0.089	-0.434	0.179
Mood	6	24	16	-0.042	0.089	-0.814	0.179
Convenience	6	20	15	-0.329	0.089	-0.507	0.179
Natural	3	12	10	-0.571	0.089	-0.562	0.179
Price	4	12	10	-0.367	0.089	-0.635	0.179
Weight	3	12	8	-0.252	0.089	-0.826	0.179
Familiarity	3	12	6	0.707	0.089	-0.296	0.179
Ethical	3	12	9	-0.387	0.089	-0.762	0.179
Sensory	6	16	13	-0.396	0.089	-0.540	0.179
Hemp THC	1	7	4	0.289	0.089	-0.968	0.179

**Table 4**  
Correlations for subscales of the Food Choice Questionnaire (FCQ) ( $n = 748$ ).

	Health	Mood	Conv <sup>1</sup>	Sens <sup>2</sup>	Natural <sup>3</sup>	Price	Weigh <sup>4</sup>	Famil <sup>5</sup>	Ethic <sup>6</sup>
Health	1	0.476**	0.387**	0.423**	0.645**	0.316**	0.529**	0.291**	0.484**
Mood		1	0.475**	0.488**	0.388**	0.340**	0.446**	0.529**	0.402**
Conv <sup>1</sup>			1	0.431**	0.280**	0.581**	0.363**	0.497**	0.369**
Sens <sup>2</sup>				1	0.307**	0.292**	0.280**	0.374**	0.419**
Natural <sup>3</sup>					1	0.149**	0.398**	0.194**	0.521**
Price						1	0.278**	0.265**	0.240**
Weigh <sup>4</sup>							1	0.375**	0.285**
Famil <sup>5</sup>								1	0.299**
Ethic <sup>6</sup>									1

\*\*Correlation is significant at .01(2-tailed).

**Table 5**  
Results of MANOVA for differences between the hemp group and non-hemp group on food choice motivations as measured by the FCQ.

Subscale	Hemp consumers $n=344$		Non-hemp consumers $n=404$		$F$	sig	Partial Eta <sup>2</sup>
	$M$	$SD$	$M$	$SD$			
Health	20.49	3.10	19.56	3.22	<b>15.926</b>	<b>&lt;0.001</b>	<b>0.021</b>
Mood	16.73	4.54	15.01	3.24	<b>9.065</b>	<b>0.003</b>	<b>0.012</b>
Conv <sup>1</sup>	15.31	3.19	15.01	3.24	1.545	0.214	0.002
Sens <sup>2</sup>	12.80	2.34	12.79	2.25	0.008	0.928	0.000
Natural <sup>3</sup>	9.97	2.12	8.99	2.27	<b>37.503</b>	<b>&lt;0.001</b>	<b>0.048</b>
Price	8.52	1.90	9.40	1.97	0.677	0.411	0.001
Weigh <sup>4</sup>	8.28	2.59	8.26	2.44	0.010	0.919	0.000
Famil <sup>5</sup>	6.34	2.68	5.81	2.33	<b>8.488</b>	<b>0.004</b>	<b>0.011</b>
Ethic <sup>6</sup>	9.14	2.31	8.43	2.45	<b>16.592</b>	<b>&lt;0.001</b>	<b>0.022</b>

the hypothesis that the non-hemp group would place higher importance on the factors motivating food choice as measured by the FCQ than the hemp group has not been supported as differences were not in the direction expected. However, these findings influence the conclusions to be drawn from the study and will be discussed in further detail.

#### 4.0. Discussion

**4.1.** The current study sought to define differences between individuals who had consumed hemp and those who had not, one year after its legalisation, with the aim of understanding differences in motivation toward adoption of a novel product, hemp food. Using Rogers' (1976; 2003) model of diffusion of a novel product throughout a population, it was firstly hypothesised that trait food neophobia would contribute to the non-adoption of hemp food, demonstrated by a higher score on the food neophobia scale (Pliner and Salvy, 2006) for the non-hemp group. While a difference was reported between the groups, it was not in the direction expected. Members of the hemp group reported higher levels of trait food neophobia than the non-hemp group. Rogers' (2003) outline of attributes for adoption groups leads to a suggestion that the unexpected inverse direction of the difference between the study cohorts might indicate that laggards have been captured in the hemp group which was

thought to be comprised primarily of the early adopters of hemp food. Food neophobia is expected to correlate with suspicion of a novel product and avoidance behaviour (Pliner and Salvy, 2006; Rogers, 2003) as would be expected to be displayed by laggards and non-adopters. While there is no standardised time frame for diffusion of a novel product throughout a population and variation between similar products can be several decades (Rogers, 2003), the finding of higher food neophobia in those who have already consumed hemp food suggests the hemp group has captured a greater diversity of consumers than merely the early adopters. One conclusion that might be drawn from this is that diffusion of hemp food has reached a later stage than was anticipated prior to the study.

Exclusion of a large portion of the original study sample for not having knowledge of hemp food's recently legal status was regarded by the researchers as one indication of the early stage of diffusion of hemp food throughout the Australian population. The findings here, however, may indicate that marketing and conveyance of consumer information might be lacking and diffusion is occurring according to the model within a subset of the population only. It is a concern for the hemp food industry if lack of consumer awareness may be costing the industry potential sales.

The unexpectedly higher scores on food neophobia for the hemp group might also suggest that a factor other than food neophobia is having a greater influence on the decision to consume hemp food. Although food neophobia has been consistently empirically supported as being one of the strongest predictors of novel food acceptance (Pliner and Hobden, 1992), other factors which have at times been demonstrated to have an even greater influence over novel food acceptance include the social setting in which a novel food is consumed (Veeck, 2010) and other social norms (Jensen and Lieberoth, 2019), an expectation of poor sensory properties (Hartmann and Siegrist, 2016) and inversely, recommendations from peers on the palatability or safety of the food (Sidali et al., 2019). Another factor that may have led to the unexpected findings in the current study is the existence of a previously unidentified phenomenon that influences acceptance when novel foods are highly complex. Despite not being available as a food in Australia in recent times, a myriad of hemp products provide associations for consumers in both a positive and negative capacity. Consumers' subjective associations mean hemp may not present in a uniform manner across the consumer market, with adoption of hemp food influenced by the association that has the greatest degree of saliency for each consumer.

It was suggested from the literature that negative associations might impact novel food acceptance, leading to the anticipation in the current study that an association of hemp food with its illegal cousin, marijuana, might provide this negative perception. A measure of consumer concern over roadside drug testing was used to evaluate consumer perception of this association. However, no significant difference was reported between the hemp group and non-hemp group, with all respondents reporting being largely unsure of whether they considered the association to have any influence at all. The finding that attitudes between groups did not differ on concerns over roadside drug testing suggests that either; neither group had largely considered the association prior to the study, or both groups were unable to reach a conclusion regarding the validity of industry assurances that consuming hemp food would not result in a detectable level of THC. Homogeneity across the groups on attitudes toward drug testing indicates the attitude may be normally distributed throughout the sample, therefore supporting the notion of diffusion having largely occurred. In applying the diffusion model, it would be expected that differences between the adopter and non-adopter groups become less obvious as the full range of attributes across adopter groups combine to provide a representative population sample where traits are normally distributed.

Other factors found to have an influence on novel food acceptance are those measured by the FCQ, where it was predicted that the non-hemp group would place a greater level of importance on these factors than the hemp group. This was not realised, despite a difference reported between the groups it was the hemp group who placed higher importance on some motivational factors. Again the notion of diffusion having occurred much further through the population than had been expected can be suggested by these findings. The increased complexity of the decision making process for later adopters which has been reported in the literature could potentially have been reflected in the current findings if we are to accept that the hemp group in the current study is in reality comprised of a wider scope of members of adoption groups than was expected. Supporting this notion is the finding that the FCQ subscales where a significant difference has been reported between the groups are also those which relate to attributes of hemp and which are promoted as benefits to consumption, particularly; health, being naturally sourced, and ethical concern.

Jaeger et al. (2017) reported ethical concern increased in importance for consumers as food neophobia increased. A systematic review of cross cultural and single country studies' use of the FCQ (Cunha et al., 2018) revealed ethical concern to be consistently reported as the least important factor in general food choice, yet has a significant influence on acceptance of novel foods. Higher importance placed on ethical concern when deciding to consume hemp food suggests the promotion of novel foods as being ethically produced might allay some fears of neophobic

consumers. Lupton and Turner (2018) found 3D printed meat potentially produced from laboratory produced animal cells alleviated ethical concerns over animal welfare, and Perrea et al. (2017) reported that ethical image was a significant contributor to positive consumer evaluation of novel foods produced using high intensity ultrasound or infusion heat treatment, two emerging novel food production technologies with high degrees of innovation or association to extraneous factors as is the case for hemp food. In keeping with the notion that an unknown phenomenon might be at play where novel foods are highly complex, the importance of ethical production might also have a unique influence where novel foods are highly complex. Another potential explanation is the possibility that empirically supported models of food choice and diffusion of new foods do not adequately account for the myriad of factors involved in these processes. As the complexity of the novel food increases it may be necessary to also introduce increasingly complex evaluation methods for the foods.

It has been suggested previously that consumers who have reservations about the consumption of novel foods place greater importance on health, quality, and nutritional value (Barrena, 2017, p. 184), with these consumers appearing to engage in a greater depth of cognitive evaluation of choice. This was reflected by the findings in the current study, where consumers who reported having higher levels of food neophobia also reported placing increased value on health, mood, natural content, and the importance of the food being ethically sourced. Additionally, each of these factors are considered to be positive attributes of hemp food and suggests consumers are responding to the marketing information for hemp food, placing priority on these factors in the decision process. It has been demonstrated that both positive and negative emotions, perceptions, and motivations play a role in the complexity of decision making in food choice and that "one or the other will dominate, depending on the type of consumption choice being faced" (Barrena, 2017, p. 186). For consumers who show an increased level of concern, for example non-adopters, it would be expected that a higher level of complexity would be employed in the decision making process, creating an avoidance of the food when a decision cannot be easily and immediately reached. This increase in concern and higher theorised complexity of decision making, however, is also exhibited by laggards who were not expected in the current study to yet have considered the attributes of hemp food and made a decision. It appears, however, that laggards may have been captured within the hemp group, having already made their judgement on whether the benefits outweighed the costs in consuming the food. This is consistent with the approach-avoidance conflict of decision making and development of preferences where it has been experimentally demonstrated that the highest stimulus available at the time of decision making will dominate the decision making process (O'Hora et al., 2013). To be more explicit, it is suggested that the approach factors outweighed the avoidance factors in the decision to consume for the hemp group members (who we theorise now to comprise members from across the adopter groups). For the non-hemp group, it is suggested that the lower importance placed on the factors measured by the FCQ result in the food *not* being consumed when the decision is not immediate, and is also consistent with the approach-avoidance conflict.

Familiarity is also consistently reported as having a positive relationship with acceptance of novel foods (Aqueveque, 2015; Hwang and Lin, 2010; Sidali et al., 2019; Verbeke, 2015; Wilkinson et al., 2018), even when only a single positive experience was associated with the novel food (Hartmann and Siegrist, 2016). While familiarity only held a minor degree of importance in motivation considerations for the hemp group, it is important that the significance of familiarity is recognised for its role in the acceptance of novel foods, having implications for the way that hemp foods might be produced and marketed. It is suggested that incorporating hemp into easily recognisable foods may provide positive benefits for hemp food producers, as has been demonstrated for increasing acceptance of other foods (Hartmann and Siegrist, 2016; Hwang and Lin, 2010).

One final factor where there was expected to be a difference detected between the hemp group and non-hemp group was in the degree of importance placed on price. A lack of difference between the groups reinforces the notion of homogeneity across the sample groups and provides further evidence that the process of diffusion of hemp food may have progressed in the Australian population. As mentioned previously, less importance is placed on price by all groups as diffusion proceeds, particularly for laggards for whom price is a major consideration. It was expected at the outset of the study that the non-hemp group would include laggards who might at some time in the future make a decision to consume hemp food, and for who price would be a major consideration. It was hypothesised that a greater importance would be placed on price as measured by the FCQ for this group. The homogeneity of the groups, however, is indicative that at least some of the hemp group are laggards, which was not an expected outcome of the study. In keeping with the diffusion model this suggests price is no longer a major consideration, as would be expected after early and late majority adopters exert social influence over laggards to become consumers.

### 5.0. Limitations and future research

Many individual, situational, and social factors influence novel food acceptance and the process of diffusion of a novel food throughout a population (Ajzen, 2007; Pliner and Salvy, 2006; Rogers, 2003) and this study considers only a small number of traits and motivations involved in this process. It does, however, provide valuable data on the factors considered important in food choice for the adopters of hemp food, not only identifying those factors but making a determination on the status of the diffusion process. While the cross sectional design of the study limits somewhat the conclusions that can be drawn regarding the timeline for diffusion of hemp food in the Australian population, it has provided some evidence that diffusion may have already occurred to a greater degree than was expected by the authors. Although diffusion occurs along a continuum (Rogers, 2003) without absolute delineation between groups, a time sequence analysis in future novel food research might more accurately describe the timeline of diffusion within a population for that product. Future researchers of hemp food might use the current data as a baseline measure against which future trends can be measured. The best that can be achieved from cross sectional data is an indication of the current status of the diffusion process.

Despite the small number of factors considered in the current study the findings suggest that there is an increased burden on empirically supported models of food choice and diffusion throughout a population to explain these processes. As complexity continues to increase with increasing innovation and use of technology in novel food production, new models which can better account for the complexity may need to be investigated. Future research might attempt to develop models with greater evaluative capacity to account for the effects of highly salient aspects on novel food acceptance.

The suggestion that diffusion of hemp food has progressed substantially in the Australian population may indicate that additional steps need to be taken if acceptance of hemp food is to be realised to a greater degree. The large number of respondents who were unaware of hemp food's availability, or had no knowledge of where hemp food could be sourced, has reduced the potential market considerably. Capturing additional potential consumers may require a re-evaluation of marketing strategies. This might include targeting a more widespread consumer market but also a *re-invention* of the products within the market. In keeping with Rogers' (1976) model of diffusion of a novel product within a population, *re-invention* is a consumer initiated phenomenon which can be stimulated when an innovative product is marketed in such a way that allows the end user to adopt or modify its use to suit their own needs, rather than accept mainstream use of the product. This involves in the first instance understanding how the existing product is perceived by the consumer, and devising ways to alter that perception to encourage uptake of the *re-invented product* (the same product presented in a differ-

ent way) in a fashion that better accommodates the consumers' needs. This provides scope for future research into perceptions of hemp food.

Despite lack of a difference between the hemp group and non-hemp group in their degree of concern expressed over testing positive at a roadside drug test, the high degree of uncertainty reported across all consumers in the study indicates a need for further exploration of the THC factor. The apparent indecision might suggest that the relationship between hemp food and THC has either only been considered by a few participants prior to undertaking the survey, or has been considered by most with no conclusion reached on the potential implications of THC in hemp food. It would be concerning if assurances made by hemp food industry stakeholders that THC concentrations in hemp food are below detectable levels were not being taken at face value by consumers.

### 6.0. Conclusion

To date, novel foods have been largely treated as a broad category and empirical evidence has supported similarities in the attitudes of consumers toward their acceptance. There has, however, not been a novel food introduced in the Australian consumer market that exemplifies as broad a range of attributes as hemp food. From positive associations of health benefits and centuries old uses in medicine, textiles, and building, to negative associations pertaining to the illicit uses of hemp, hemp food presents as a unique novel food group. Hemp food's prior illegal status in Australia may have a role in the indecision of consumers' attitude toward THC in hemp food. Associations such as this may contribute to a previously unidentified phenomenon where a positive or negative net attitude toward hemp food will develop according to the association given the greatest degree of salience by that individual consumer. This phenomenon may behave similarly for other complex novel foods and is worthy of further investigation.

Similarly, existing models of food choice and diffusion of new foods throughout a population may prove inadequate where novel foods have associations with highly salient negative factors, or where there is a complex interaction of positive and negative attributes to the food. As innovation in food production increases, there may be an urgent need for the development of predictive models which account for these complex aspects with greater precision than those currently accepted as adequate.

It was expected that the current study would reveal differences between individuals who reported having consumed hemp and those who had not consumed hemp in what was thought to be an early stage of the product diffusion process, providing the Australian hemp food industry with an insight into early adopter attributes and motivations. While there has been some valuable insight provided into what factors are important to food choice motivations for those who have adopted hemp food, there has also been a realisation that diffusion of hemp food may already have substantially occurred and may not reach greater levels of diffusion than current without a re-evaluation of how hemp foods are presented in the market and how to reach those within the population who remain ignorant of hemp food's availability. This is an important finding for the Australian hemp food industry who may need to employ greater innovation in marketing strategies if they wish to increase the market share for hemp food, increasing marketing reach and adopting *re-invention* strategies which can lead to "a faster rate of adoption of an innovation and a greater degree of sustainability of an innovation" (Rogers, 2003, p. 190).

Ethics approval for the project was granted by the Charles Sturt University Human Research Ethics Committee (#H18273).

### Declaration of Competing Interest

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

## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.fufo.2021.100031](https://doi.org/10.1016/j.fufo.2021.100031).

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