'High' Expectations:

The Consumer Knowledge Structure of Hemp Food

Bachelor Thesis

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Abstract

Hemp food is gaining popularity in Canada and the United States because of its nutritional profile and health benefits, but Europe seems to fall behind. Research regarding the economic feasibility and nutritional properties of hemp food have been conducted, but there was no research in relation to the consumer yet. This study sheds a first light on the consumer knowledge structure of hemp food approached from a cognitive psychology perspective. An experimental study (2 x 2) was conducted where participants (N = 102) were manipulated with two stimuli: the absence/presence of THC and the absence/presence of food. Two convergent measurements were used to measure whether participants categorized the stimuli as drugs or food. Data was analyzed with help of a logistic regression and general linear model. Exposure to THC predicted that people mention more drugs-related inferences (η^2 = .072). Exposure to food, lead to more people choosing a food store (e^B = 6.810) as the designated place where they would look for a product. Exposure to food and THC cancelled this (e^B = .087) and people would no longer look in a food store for the product. Hemp and THC appear to be synonyms to one another and suggestions for further research are provided.

Acknowledgements

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Introduction

Brief history of hemp

Hemp was a much appreciated crop in the Old World for hundreds of years. In countries such as France, Spain, the Netherlands, Germany, and the UK, hemp was grown for its fibres which were used to produce sails, ropes, fabrics, and paper (Carus, Karst, Kauffmann, Hobson, & Bertucelli, 2013). In China hemp seeds have been consumed as food and as medicine for over more than 3000 years (Padua & Bunyapraphatsara, 1999). To this day, the Chinese still use the seeds - either raw, cooked, roasted or in hempseed oil - in their traditional cuisine and medicine. Even though hemp seed has played a significant role in multiple countries in the past and present, it still failed to enter mass markets in the west as an ingredient for human nutrition (Callaway, 2004).

Why hemp?

The seeds of hemp are a useful source of nutrition. The seeds contain high amounts of easily digestible protein (House et al., 2010), small traces of cannabidiol (CBD), omega-3/omega-6 fatty acids (Leizer, Ribnicky, Poulev, Slavik, & Raskin, 2015), and in addition vitamin E and minerals (Callaway, 2004). Modern human clinical trials proved that hemp seeds indeed do have health promoting properties, just like the Chinese already believed for over 3000 years and because of these health promoting properties, hempseed oil is actually identified as a functional food (Callaway, 2004).

Besides the nutritional and health benefits, there also are agricultural advantages: hemp grows fast, supresses weeds by itself, does not require agrochemicals, and functions well under an organic regime (Carus et al., 2013). But why did hemp seeds still fail to enter mass markets in the west?

Hemp food markets in North America and Europe

In the 1930s the commercial production of hemp was prohibited in Canada, the United States (U.S.), and Europe due to the presence of the psychoactive compound delta-9-tetrahydrocannabinol (THC) in the plant. As a result of the limited availability of hemp seeds, the seeds have not been subjected to farming, food processing, and marketing in the 20th century (Callaway, 2004), which could explain why the market for hemp seeds as food in the west is not at its full potential yet.

In 1998, the commercial production of hemp for food consumption and industrial applications was reintroduced in Canada, provided that the maximum concentration of THC in the crop is below 0.3%. Commercial hemp farming is still prohibited in most states of the U.S., but it is slowly changing. In the past four years, more than half of the states have legalized the growth of hemp for research and/or pilot programs. Merely a few states allow the commercial cultivation of the plant

("State Industrial Hemp Statutes", 2018). Nonetheless, consumers in the U.S. are already allowed to consume hemp foods; making it the biggest market for commercially produced hemp from Canada.

Hemp foods are becoming increasingly popular in the U.S. In 2015, the total sales of hemp foods in the U.S. was worth roughly $91.7 million (Johnson, 2017). A year later the total sales of hemp food increased to $129.3 million, implying a growth of 41% (Hemp Business Journal, 2017).

A reason for the popularity in the U.S. is that Canadian farmers, processors, and manufacturers of hemp foods are able to produce high quality hemp seeds and tasty products. Also Whole Foods - the largest natural product chain in North America - adopted a wide variety of hemp products, which contributes to the popularity (Leson, 2006).

The hemp seeds are praised by American consumers for their desirable nutritional profile and health benefits, even though the characteristics of hemp were initially not scientifically well established and communicated (Leson, 2006). In the last two decades science finally started to catch up with the lack of research on hemp foods. Economical and feasibility studies (e.g. Cochran, Windham, & Moore, 2000; Ehrensing, 1998) were conducted in North America to provide stakeholders with information about the market prior and after the legalization. Furthermore, studies on the nutritional profile and health benefits provided consumers and nutritional scientists with reliable information.

While the hemp food market in the U.S. is growing substantially, the hemp seed market for human nutrition in Europe remains quite small and relatively unknown. In Europe, the total demand for hemp seed is approximately 12,000 metric tonnes every year and the seeds are mainly used for animal feed (70%) instead of human consumption (30%). The European market is still developing, but could grow hundredfold, provided that there is proper quality management and marketing (Carus et al., 2013).

Problem statement

While there have been multiple studies on the economic feasibility and the nutritional and compositional profile of commercially produced hemp, it seems that the consumer itself is overlooked. To my best knowledge, there is no research on what consumers associate hemp foods with. This is a missed opportunity, since consumer research does increase the odds of success of new products in a market (van Kleef, van Trijp & Luning, 2005). Also, the seeds from hemp could potentially play a role in the shift towards a more environmentally friendly diet for Western consumers, since hemp itself is a relatively sustainable plant (Carus et al., 2013), and overall because a plant-based diet is more sustainable than a meat-based diet (Pimentel & Pimentel, 2003). Therefore, the goal of this study is to gain more insight in the knowledge structure of consumers regarding hemp foods.

Given the illegal history of hemp - rather than it being a traditional ingredient for medicine and cuisine like in China - and the fact that marijuana is the most used drug in the Netherlands ("Nationale Drug Monitor", 2017), it would not be surprising that THC and its psychoactive effect quickly come to mind when hemp is mentioned instead of its potential nutritional/health benefits.

As mentioned before, the maximum amount of THC allowed in hemp is 0.3%, which is proven to be too little to cause any harm or to have psychoactive effects (Callaway, 2004). So, according to nutritional studies, consumers do not have to worry about THC in hemp foods.

Unfortunately, this does not tell us whether consumers do worry about THC and place hemp foods in the same category as marijuana. Neither does it tell us whether consumers classify hemp foods as drugs as a result of that categorization. If consumers do categorize hemp foods the same as marijuana and there are drugs-related associations, it is essential to know more about the strength of these associations, the affective tag people hang onto these associations, and whether it is possible to weaken drug-related associations, or strengthen other associations with hemp foods. This leads to the following main research question: what do consumers associate with hemp foods?

Theoretical framework

Human Associative Memory model

Multiple methods are developed and conceptualized to elicit consumer knowledge structures, with different ways to depict knowledge structures. Three types of depiction that are mainly used for problems are matrices, networks, and hierarchies (Novick & Hurley, 2001). Networks and hierarchies are especially useful to describe knowledge structures, because they are able to show specific linkages among nodes (Lawson, 2002).

To gain a better understanding of the consumer knowledge structure of hemp foods and their associations, this study is based on the Human Associative Memory (HAM) model. The model represents the human memory as an interactive network of interconnected nodes that trigger each other in different contexts (Anderson & Bower, 1973). This interactive network will first be explained by elaborating on nodes, schemata, and categories. Thereafter, a continuum of psychological processes will be discussed to explain how stimuli are categorized and evaluated with help of these nodes, schemata, and categories.

Nodes, schemata, and categories

A node is the basic element of a neural network that represents a piece of information stored in a person's mind. Different groups of nodes may be activated in different contexts and mental

domains through bridges and cut points (Teichert & Schöntag, 2010). Schemata are made up from these interconnected groups of nodes and operate in line with the spreading activation theory.

The spreading activation refers to the flow of thoughts where different nodes are activated from memory by source nodes (Collins & Loftus, 1975). The first nodes (source nodes) that are activated determine the context, and consequently activate connected nodes within that same context, thus forming a schema.

Schemata are seen as hierarchical structures, with general nodes (category labels) at the top of the hierarchy and specific nodes (category attributes) at the lower levels (Pavelchak, 1989). Cognitive categories are also seen as hierarchical structures; at the top are inclusive categories (e.g. hemp), in the middle less-inclusive categories (e.g. hemp food), and at the bottom specific objects (e.g. hulled hemp seeds).

Even though the hierachicity of knowledge structures is not yet proven (Scholderer & Grunert, 2005), many categorization models conceptualize that they are hierarchical, and so do Fiske and Pavelchak (1986) in their model to explain the categorization and evaluation of stimuli, which will be explained next.

Piecemeal and category-based evaluation

Fiske and Pavelchak (1986) developed a two-mode model that specifies the evaluation of different stimuli in two stages, namely categorization and evaluation. In the categorization stage there is an attempt to identify a stimulus object within an existing category of objects. Categorization can occur at any level of the hierarchy, which can lead to different evaluations. Consumers have schemata associated with categorized objects that will be applied to stimulus object after successful categorization (Pavelchak, 1989). Afterwards, in the evaluation stage, the categorized object will be judged in terms of its relative likeability (Pavelchak, 1989).

The model by Fiske and Pavelchak (1986) dictates that stimuli can be evaluated in two modes, depending on the success of the categorization stages. When an individual is confronted with an object stimulus and is able to retrieve a fitting schema from its memory, then the categorization is successful. Accordingly, the individual will process the stimulus in a category-based manner, which means that a category label (general nodes) will quickly come to mind along with its closely linked affective tag, which helps the perceiver to evaluate the stimulus.

A stimulus may have multiple category labels related to its features, but mainly the one with the largest number and strongest associations will be used to organize the remaining features. When an individual is motivated, or unable to retrieve a schema from memory, the stimulus will be processed through piecemeal evaluation.

Category attributes (specific nodes) will be used to form a judgment about the stimulus. The difference between the modes is that it generally is easier and quicker for people to judge a stimulus based on a category-based evaluation, because it only requires schema activation, whereas piecemeal evaluation takes more processing.

Fiske and Neuberg (1990) defined three more steps between straightforward categorization and piecemeal evaluation, namely; assimilation, accommodation, and re-categorization (figure 1.). The psychological processes are not necessarily viewed as a stepwise procedure, but more as a continuum, where the steps are not competitive, but complementary. Straightforward categorization is solely based on internal cues and when the perceiver moves more towards a piecemeal process, more external cues will be incorporated in the evaluation.
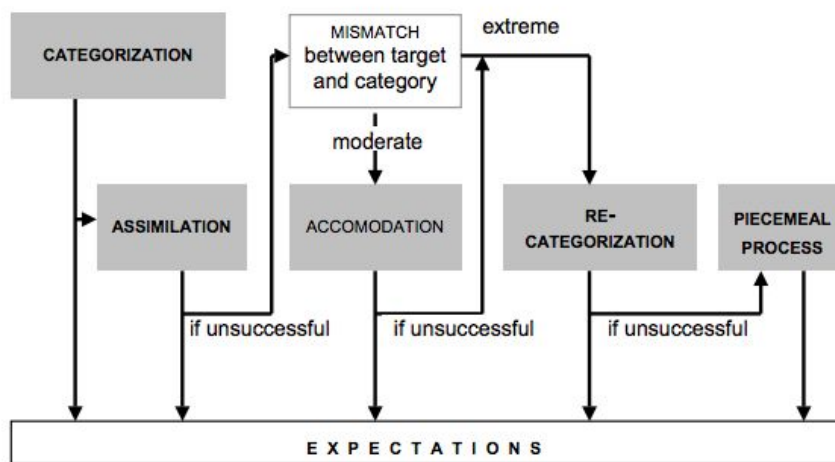
Figure 1. Psychological processes involved in categorization (Michaut, 2004)

Straightforward categorization

Michaut (2004) defined categorization as the rapid and unconscious classification of a stimulus object in a basic category because it fits within a schema related to that category. For example, when people are manipulated with hemp and THC, it is expected that the cognitive schema drugs will be activated in a rapid and unconscious manner. This is expected to happen, because it is assumed that THC is a category label with strong associations and affective tags, especially in combination with hemp. As a result, all other possible associations with hemp will be neglected or suppressed. Hemp is assumed to be on top of the hierarchy and hence to be the source node of multiple knowledge structures. Thus, when a consumer is only stimulated by hemp it is expected that multiple knowledge structures will be retrieved from memory.

H1: Mentioning THC will result in more straightforward categorization of the stimuli in drugs than when THC is not mentioned.

Sujan and Dekleva (1986) found that novice consumers who are not very knowledgeable about a category have incomplete schemata, whereas expert consumers who are more knowledgeable have more complete schemata. Therefore, subjective knowledge of the stimuli should be accounted for as a moderator. Expert consumers should be aware of the low THC-contents and lack of psychoactive effects in hemp and thus associate it less or not with drugs at all.

H1.1: The effect of mentioning THC will be smaller for people who are more knowledgeable about hemp, resulting in less categorization as drugs.

Assimilation

Assimilation happens when the perceiver is in a state of 'attention' (Michaut, 2004). In this state of 'attention' some category attributes are considered to test the object stimulus in relation to the first category label and schema that came to mind. If there is congruence, then there is assimilation (Mandler, 1982). The perceiver will continue to evaluate the stimulus in relation to the first category label. Michaut (2004) defined assimilation as the verification of the first category cued after taking some attributes of the stimuli into consideration and these attributes are congruent with the schema of the category.

Accomodation

Accomodation is what happens when there is a slight incongruence between the activated schema and the perceived category attributes, and the perceiver has to adjust or reorganize his/her schemata to fit in the stimuli object (Michaut, 2004). There is made a distinction between two types of accommodation; diversification and subcategorization (Fiske & Neuberg, 1990).

Diversification

Diversification is the adjustment or re-organization of the schema retrieved from memory after considering some attributes. The goal of this adjustment is to integrate more examples in the category related to that schema (Michaut 2004).

Subcategorization

Subcategorization or subtyping is the shift from the first category cued to a lower level, more specific category after considering some attributes (Michaut, 2004). So, the difference with

diversification is that a new small category (subtype) will be created rather than that the first category will be expanded.

Re-categorization

Re-categorization is the transition from the first category cued to a completely new category after considering attributes of the stimuli (Michaut, 2004). It occurs when there is a severe incongruence with the attributes and the claimed category (Meyers-Levy and Tybout, 1989). The mismatch between the attributes and the activated schema can be solved by major changes in the cognitive structure, i.e. finding a new schema where it does fit (Mandler, 1982; Fiske & Neuberg, 1990). Mentioning hemp next to food, will probably cause a mismatch as described above, resulting in the re-categorization of the stimuli from drugs into something that is edible.

H2: Mentioning food will result in the re-categorization of the stimuli into something edible, resulting in less categorization as drugs.

H2.1: The effect of mentioning food will be enhanced for people who are more knowledgeable about hemp, resulting in even less categorization as drugs.

People in the Netherlands can probably come up with some examples for hemp, food, and THC that fit in a (sub)category of the knowledge structure of drugs. It is expected that a participant is more familiar with an edible form of drugs (high in THC) rather than an example of hemp food (low in THC) that is not intended to have a psychoactive effect. Thus, the stimulus THC has more associations than food, making THC the stronger stimulus.

H3: When both food and THC are mentioned, THC will outweigh food and have a stronger effect on the categorization process, resulting in more categorization as drugs.

H3.1: When both food and THC are mentioned, THC will not outweigh food for people who are more knowledgeable about hemp, resulting in less categorization as drugs.

Piecemeal process

If the perceiver is unable to confirm the first category or to re-categorize the stimulus object, then the perceiver may analyse it attribute-by-attribute (Fiske & Neuberg, 1990). The initial category will be considered as an attribute among others and has minimal influence. The perceiver will directly asses the products, without using a previous meaning assignment (Michaut, 2004).

Method

Participants and design

The design of this study is an experimental 2 x 2 design (figure 2.). Data was collected with the help of an self-administrative online survey made in Qualtrics (annex 1.). In total 102 respondents (57 female, 45 male) filled in the survey. The sample as a whole was quite young ($M = 32.88$, $SD = 16.40$) and more than half of the respondents (60%) said to have experience with recreational drug-usage of marijuana/weed/hashish. The respondents consisted of students from Wageningen University and people within reach on social media. Convenience sampling was chosen, because of time and budget restrictions. It is a cheap sampling method which has the possibility of gathering many respondents in a short time-span (Etikan, 2016). Respondents were approached through different social media; e.g. WhatsApp, Facebook, LinkedIn, and Snapchat. Disadvantages of convenience sampling are the higher likelihood of selection bias and outliers (Etikan, 2016), but this was not necessarily a problem since this study was an experiment.
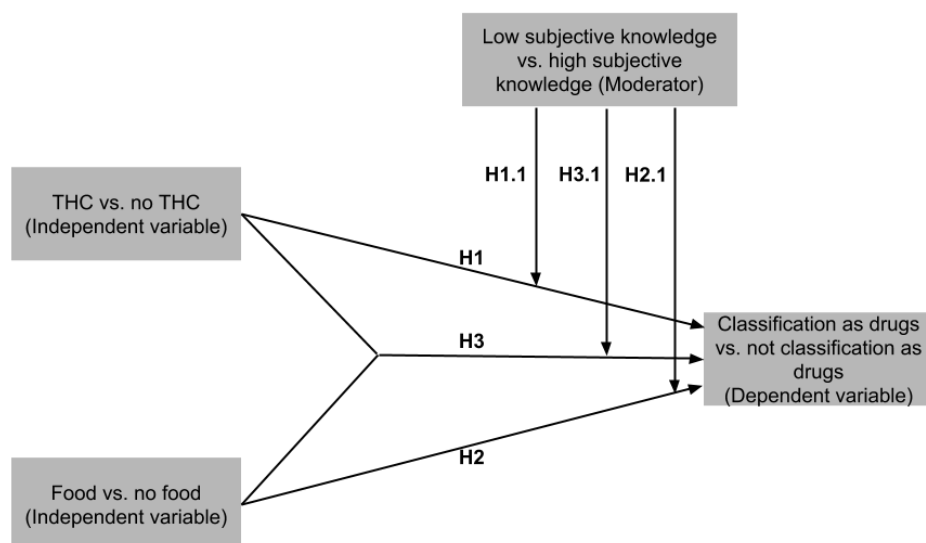
Figure 2. Experimental 2 x 2 design

The self-administered online survey started with a welcome text and participants were thanked in advance for their participation. Furthermore, there was a disclaimer that the participants will remain anonymous and that their answers are treated confidentially. The participant was also informed about the approximate duration of the survey. An e-mail address was provided for participants that had questions about the survey.

After the introduction, the participants had to comply with two conditions. They had to agree with the fact that their answers were recorded and understood that their data was treated confidentially. The minimum age for participants was at least eighteen years old, because of the drugs related topic. At the end of the survey, participants were thanked again for their participation in the study.

Procedures and measures

There were four different conditions in the survey, following a 2 x 2 design (table 1.). Participants were randomly assigned to one of these four conditions by Qualtrics. In order to do so, every participant first had to read an introductory story about hemp and could only continue if they ticked the box that said "I have read the introductory message". In total, there were four small stories, following the stimuli distribution in table 1, along with the corresponding combination of manipulation messages. The participants of the four conditions were bundled in two between-subjects factors (table 2.); THC (0 = no THC stimulus, 1 = THC stimulus) and food (0 = no food stimulus, 1 = food stimulus).

Table 1.

The distribution of the stimuli among the four conditions

Condition	Stimulus 1	Stimulus 2	Stimulus 3	Manipulation message
1	Hemp	-	-	1
2	Hemp	THC	-	1 & 2
3	Hemp	-	Food	1 & 3
4	Hemp	THC	Food	1, 2 & 3

Manipulation messages:
1. "Recently hemp is regaining popularity as a sustainable and versatile resource."
2. "Hemp is often associated with its THC-contents."
3. "The seeds from hemp are suitable to produce food for human consumption."

Table 2.

Between-subjects factors THC and Food

	N

THC	.00	52
	1.00	50
Food	.00	48
	1.00	54

After the manipulation, the participants had to answer two categorization questions while thinking of the information given in the introductory message. To operationalize the classification there was a combination of a direct and an indirect categorization measurement. The direct measurement was based on a study by Moreau, Markman & Lehmann (2001), where they asked the participant to choose from different places on a map to figure out where they would look for a certain product in a store. In this study the participant had to choose from a list of eight stores. When a participant chose coffeeshop as the right store, it was assumed that a drug-related knowledge structure was activated. When a participant chose supermarket and bakery, it was assumed that a food-related knowledge structure was activated.

The indirect measurement used predetermined inferences, where the participants could choose from, to determine the categories that came to mind. The fit of the inferences with the categories was tested with two pre-tests. The eight participants in the first pre-test (annex 2.) were asked to drag and drop inferences into the corresponding category. The pre-test showed that all the inferences except 'hulled hemp seeds' did fit the categories. A second pre-test (annex 3.), also with eight participants, was conducted where 'hulled hemp seeds' was replaced by 'granola with hemp seeds'. The second pre-test showed that the new inference was a better fit. New variables were created for food ($\alpha = .72$), and drugs ($\alpha = .91$), to show how many inferences from a certain category were selected by the respondent. This resulted in a score from 1 till 5, where a score of 1 represented that none of the drug-related inferences were mentioned and a score of 5 represented that all drug-related inferences were mentioned.

To measure subjective knowledge of participants regarding hemp, a scale by Flynn & Goldsmith (1999) was used. The scale consisted of five items:

1. I know pretty much about [hemp].
2. I do not feel very knowledgeable about [hemp]. (reverse scored)
3. Among my circle of friends, I'm one the "experts" on [hemp].
4. Compared to most other people, I know less about [hemp]. (reverse scored)
5. When it comes to [hemp], I really don't know a lot. (reverse scored)

All the items were judged on a 7 point Likert-scale, where a score of 1 represented 'strongly disagree', 4 was 'neither agree nor disagree' and 7 was 'strongly agree'. After reversing items 2, 4, and 5, Cronbach's Alpha was used to check the reliability of the scale and turned out to be reliable ($a = 0.87$). Afterwards, a new variable was made with the average of the scores on the 5 items, with scores varying from 1 till 7. A score of 1 shows little subjective knowledge and a score of 7 shows high subjective knowledge.

To check if the manipulation was successful, the participants were asked at the end of the survey to write down in one sentence what they could remember from the introductory (manipulation) message. After the manipulation check, the participant was asked to fill in a few socio-demographic questions, i.e. experience with recreational drug-use, gender, and age.

Before distributing the survey among the sample, a small pilot study was conducted to see if there are errors in the survey-flow and items. The pilot study ($N = 3$) did not show any flaws, except that two respondents indicated that the wording of the first item on the subjective knowledge scale felt unnatural or informal, but the item was not changed.

Results

Manipulation check

The randomized distribution of the participants among the four conditions was successful; all conditions were almost equally represented (table 3.). The goal of the manipulation check was to see how salient the elements were in the manipulation message. The success rate represents the percentage of people that were able to recall the condition specific element when asked.

Based on condition two, it seems that the presence of the THC element decreases the success rate of hemp. Furthermore, the elements hemp and food seem to be more salient than THC. This is clearly visible in condition four, where THC is barely mentioned by participants, in comparison to hemp and food.

Table 3.

Manipulation check: Success rates of mentioning elements per condition

Condition	Hemp	THC	Food	All elements mentioned	N
1	100%	-	-	100%	25
2	70%	39%	-	26%	23
3	93%	-	52%	48%	27
4	93%	11%	41%	11%	27

Drugs-related knowledge structure

Coffeeshop or not?

Table 4 shows for each condition how many times coffeeshop was chosen. Based on these descriptive statistics, it seems that the THC element increased the likelihood of choosing for coffeeshop, when compared to the conditions where the THC element was absent. When the food element is mentioned it appears that the number of times coffeeshop was chosen decreased, when compared to the conditions where food was absent, but when both THC and food were mentioned, this cancelled out. The descriptive statistics seem to be in line with the hypotheses. The hypotheses were analysed with help of a logistic regression and will be discussed in the next section.

Table 4.

Descriptive statistics: coffeeshop count and average score of drugs-inferences for each condition

		Coffeeshop		Score of drugs-inferences
Food	THC	Yes	No	M (SD)
.00	.00	9	16	2.60 (2.363)
	1.00	12	11	3.78 (1.783)
1.00	.00	5	22	2.44 (2.082)
	1.00	10	17	3.56 (2.082)

Hypothesis 1, 2, and 3

Even though table 4 suggests a positive relationship between the presence of THC and the times that coffeeshop was chosen, no evidence was found for this relationship (table 5.), so hypothesis 1 could not be confirmed. Exposure to THC does not predict that people will look for a product, as described in the introductory message, in a coffeeshop.

While table 4 suggests a negative relationship between the presence of food and the times that coffeeshop was chosen, no evidence was found for this relationship (table 5.), so hypothesis 2 could not be confirmed. Exposure to food does not predict that people will not look for this product in a coffeeshop.

Furthermore, no evidence was found for the interaction effect between the presence of THC and food next to each other, and the times that coffeeshop was chosen, so hypothesis 3 could not be confirmed. So, simultaneous exposure does not mean that THC will outweigh food and people will look for the product in a coffeeshop.

Hypothesis 1.1, 2.1, and 3.1

No evidence was found for the moderating effect of subjective knowledge in the THC condition (table 5.), thus hypothesis 1.1 could not be confirmed. Which means that people who are exposed to THC and see themselves as less knowledgeable on the subject do not go to a coffeeshop more often than people who see themselves as more knowledgeable.

No evidence was found for the moderating effect of subjective knowledge in the food condition (table 5.), thus hypothesis 2.1 could not be confirmed. Thus, it could not be predicted that people who are exposed to food and see themselves as less knowledgeable on the subject will look for the product in a coffeeshop more often than people who see themselves as more knowledgeable.

No evidence was found for the moderating effect of subjective knowledge in both the food and THC condition (table 5.), thus hypothesis 3.1 could not be confirmed. High subjective knowledge could not predict that people who are exposed to both THC and food will more often go to other stores than the coffeeshop when compared to people who said to have low subjective knowledge.

Table 5.

Logistic regression: categorization as drugs predicted by THC, Food, and Food by THC

Predictors (a.)	B	S.E.	Wald	df	Sig.	e^B
THC	.662	.590	1.261	1	.261	1.939
FOOD	-.906	.647	1.960	1	.162	.404
FOOD by THC	.289	.867	.111	1	.739	1.335

Predictors (b.)	B	S.E.	Wald	df	Sig.	e^B
THC by Subjective knowledge	-.514	.468	1.203	1	.273	.598
Food by Subjective knowledge	-.217	.690	.099	1	.753	.805
THC by Food by Subjective knowledge	.549	.814	.455	1	.500	1.732

a. Variable(s) entered on step 1: THC, FOOD, FOOD * THC .
Model marginally significant X^2 (3, $N = 102$) = 6.465, $p = .091$
Prediction accuracy 65.7%

b. Variable(s) entered on step 2: THC * Subjective knowledge, Food * Subjective knowledge, THC *
Food * Subjective knowledge .

Model non-significant X^2 (7, N = 102) = 9.482, p = .220

Prediction accuracy 62.7%

Score of drugs-related inferences mentioned

In table 4 the means of the score of drugs-related inferences mentioned can be seen for each condition. The means in the conditions where THC is present are clearly higher than the means in the conditions where food is absent, suggesting that there is a positive relationship between THC and the score of drugs-related inferences mentioned. The means for the conditions where food is present seem to be slightly lower than the means of the conditions where food is not mentioned, perhaps suggesting a negative relationship between food and the score of drugs-related inferences mentioned. When THC is mentioned next food, it seems that people categorize is more than drugs, compared to when only food was mentioned. To test these relationships, a general linear model (univariate analysis of variance) is made.

Hypothesis 1, 2, and 3

Levene's Test came out significant (p = .05), suggesting that that the error variance of the dependent variable is unequal across groups. Still, a positive relationship, F (1, 98) = 7.624, p = .007[1], between participants that were exposed to the THC stimulus and the average score of drugs-related inferences (M = 3.66, SD = 1.93) was found. The effect of the THC stimulus on score of drugs-related inferences could be described as a weak relationship, η^2 = .072, accounting for 7.2% of the variance in the model. Thus, H1 could be confirmed; exposure to the THC stimulus indeed does lead to more drug-related associations.

Exposure to the food stimulus alone (p = .646) did not predict a lower score of drug-related inferences, and even though the means suggest that THC outweighs food, simultaneous exposure to THC and food (p = .932) did not predict such a relationship. There was not enough evidence found to confirm H2 and H3.

Hypotheses 1.1, 2.1, and 3.1

No evidence was found for the moderating effect of subjective knowledge in the THC condition (p = .511), thus hypothesis 1.1 could not be confirmed. More subjective knowledge does not predict a deduction in drugs-related inferences mentioned when exposed to THC, when compared to people who have low subjective knowledge.

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[1] Also tested for the covariates age, gender, and experience with recreational drug-usage. They had little to no influence in the model and H1 remained significant (p = .011). Covariates will not be discussed further.

No evidence was found for the moderating effect of subjective knowledge in the food condition ($p = .682$), thus hypothesis 2.1 could not be confirmed. People who said to have high subjective knowledge do not necessarily mention less drugs-related inferences when exposed to food when compared to people who said to be low in subjective knowledge on the subject.

No evidence was found for the moderating effect of subjective knowledge in both the food and THC condition ($p = .754$), thus hypothesis 3.1 could not be confirmed. People that scored high on subjective knowledge and were exposed to both food and THC did not necessarily mention less drugs-related inferences than people with low subjective knowledge.

Convergent validity drugs measurements

A Spearman's rank-order correlation was run to determine the relationship between the two measurements for drugs categorization. There was a moderate, positive correlation between the choice for coffeeshop and the amount of drugs-related inferences mentioned ($r_s(100) = .569$, $p < .000$), thus both measurements contributed to the categorization as drugs.

Food-related knowledge structure

Food store or not?

The choice for a food store was analysed with help of a logistic regression. Table 6 shows the frequency of the choice for food store per condition. The presence of the THC element seems to have no influence on the selection of food store when compared to the condition where the THC and food element were absent. The presence of the food element seems to increase the number of times food store was chosen when compared to the condition where food and THC were absent. When both THC and food were mentioned, food seems to no longer increase the number of times food store was chosen.

Table 6.

Descriptive statistics: food store and score of food-inferences per condition

		Food store		Score of food-inferences
Food	THC	Yes	No	M (SD)
.00	.00	3	22	2.32 (1.574)
	1.00	4	19	2.09 (1.676)
1.00	.00	13	14	2.56 (1.625)
	1.00	3	24	2.30 (1.636)

The THC stimulus was non-significant (p = .599), but the food stimulus was positively related towards the categorization as food (p = .008) and the interaction effect food by THC was negatively related towards the categorization as food (p = .026).

The odds that a participant, that was manipulated with the food stimulus, activated a food-related knowledge structure and chose for a food store were 6.810 (= $e^{1.918}$; table 7.) times greater than the odds of a participant that was not manipulated with the food stimulus. So, exposure to food, does predict that people will look for a product in either a supermarket or bakery.

The odds that a participant, manipulated with both food and THC, categorized it as food were 0.087 (= $e^{-2.440}$, table 7.), which means that the odds were 11.494 greater to not categorize it as food when exposed to both stimuli, thus exposure to THC definitely cancels out the effect of food.

Subjective knowledge was non-significant as a moderator for all conditions in the model and will not be reported.

Table 7.

Logistic regression: categorization as food predicted by THC, Food, and Food by THC

Predictors	B	S.E.	Wald	df	Sig.	e^B
THC	.434	.825	.277	1	.599	1.544
FOOD	1.918	.726	6.981	1	.008	6.810
FOOD by THC	-2.440	1.098	4.940	1	.026	.087

a. Variable(s) entered on step 1: THC, FOOD, FOOD * THC .
Model significant X^2 (3, N = 102) = 13.059, p = .005
Prediction accuracy 77.5%

Food-categorization indirect measurement

Levene's test came out non-significant (p = .992), indicating that the error variance of the score of food-related inferences is equal across groups. Exposure to the THC stimulus did not have a negative significant relationship (p = .448) with the amount of food-related inferences mentioned.

Neither did the exposure to the food stimulus show a significant positive relation (p = .493) with the amount of inferences mentioned.

Finally, the combination of both stimuli, THC and food, did not have a significant influence (p = .968) on the amount of food-related inferences mentioned. It did not matter for the amount of food-related inferences if they were exposed to both food and THC.

Convergent validity food measurements

A Spearman's rank-order correlation was run to determine the relationship between the two measurements for drugs categorization. There was a weak, positive correlation between the choice for a food store and the amount of food-related inferences mentioned ($r_s(100) = .298$, $p = .002$), thus both measurements contributed to the categorization as food.

Discussion

Contributions

It was essential to know how hemp is represented in the mind of the consumer, before engaging in marketing activities. Therefore, this study has shed a first light on the consumer knowledge structure regarding hemp food.

It seems that hemp and THC are inseparably interlinked in the mind of the consumer (table 3.), almost to the point where they could be synonyms to each other. When asked what people could remember from the introductory message, most people failed to mention THC and only mentioned hemp. This could mean that the source node, hemp, and its association with THC, is that strong that the nodes tend to fuse together in a way that only mentioning hemp suffices to mention the association with THC. This could be explained through stereotypes and prejudices. Hemp is probably a salient stereotype for drugs, and it is hard to not think of a prejudice, e.g. *"hemp makes you high"*, when hemp is mentioned. Which hard to ignore, because the straightforward categorization presumably happens in a rapid and unconscious manner (spreading activation), like Michaut (2004) described.

Although THC and hemp seem to be synonyms to one another, explicit exposure to THC in combination with hemp, did result in more activation of the drugs-related schema, but it did not predict that consumers would look for the product in a coffeeshop. That the model did not predict that people would look for the product in a coffeeshop, could be due to the robustness of the logistic regression, because of the dichotomous variable.

Food was easier to recall for people, perhaps because it did not really fit in the knowledge structure yet and was therefore more distinguishable. Exposure to the information that hemp could be used to produce food did lead to more people choosing the supermarket or bakery, but it did not show an increase in food-related inferences mentioned. Perhaps the inferences were incongruent with their schema for hemp food (or they did not have a schema at all), but through analogical reasoning chose for supermarkets and bakeries.

When THC and food were mentioned together THC did not outweigh food in the categorization as drugs according to both measurements. But it definitely did suppress the food-related knowledge network (table 7.), people most likely assume that there is no such thing as

THC in products from a supermarket or bakery. That the manipulation did not have an effect on the amount of food-related inferences mentioned could be, once again, due to the lack of knowledge regarding the subject, resulting in an incomplete schema.

Subjective knowledge did not act as a moderator for any of the conditions. Subjective knowledge probably does not predict the relationship as described by Sujan and Dekleva (1986) very well, because high subjective knowledge could still mean that everybody has little absolute knowledge on a subject and therefore incomplete schemata.

Concluding, to answer the main research question: what associations do people have with hemp food? Hemp food is not necessarily seen as drugs when hemp is mentioned in combination with food, but when THC is also mentioned next to food people will no longer look for the product in a food store. Furthermore, when hemp is mentioned in combination with THC, this will lead to an increase in associations with drug-related inferences.

Practical relevance

When marketers start to engage into marketing activities for hemp food, is it good to realize that hemp and THC are correlated to one another in the mind of the consumer. It would be in their best interest to make the consumer aware of how THC really behaves in hemp food. The association between the two nodes could possibly be weakened through careful repeated messaging (Cacioppo & Petty, 1979), training in the negation of stereotypes (Kawakami, Dovidio, Moll, Hermsen & Russin, 2000), or reversed association (Dunn & Kirsner, 1988).

Limitations

The dependent variable 'score of drugs-related inferences mentioned' was heteroscedastic according to Levene's test. The results of this research could therefore be prone to Type I errors, i.e. falsely rejecting the null-hypothesis. It appears that the dependent variable has hit its ceiling. The ceiling effect could decrease the likelihood that the testing instrument has accurately measured what is supposed to measure. Therefore, for reliability, a study where other drugs-related inferences are used, is recommended, before we can say something about the strength of the associations.

There are some concerns regarding the external validity of the research. The stimuli are given in a controlled setting and may differ from less controlled, real-life settings. Maybe companies elaborate more on the THC-contents in their external communications, resulting in less categorization as drugs. A study where THC-contents and its (psychoactive) effects are manipulated in relation to categorization as drugs could give more insight in how the consumer perceives it.

Due to the decision for a self-administered online survey there can only be speculated about the psychological processes behind the outcome of the categorization.

The choice for a predetermined set of inferences does mean that haphazard, natural associations of the participants have not been measured. A qualitative study could be conducted to elicit the participants true associations and absolute knowledge instead of its associations with a predetermined set of inferences, for which Teichert and Schöntag (2010) have developed a method.

Future research

What affective tags are associated with the schemata of hemp in the mind of the consumer have not been researched. It would be interesting to know how people feel about a product made with hemp, even though the association with drugs is quite strong, and its effect on purchase intention.

Also, the interconnected nodes that make up schemata can be strengthened or updated by learning (Wickelgren, 1981; van Reijmersdal, Neijens, & Smit, 2007), which suggests that existing category labels with their linked affective tags can be manipulated by either an internal or external source. A study where learning is used to weaken the association with THC or associations with benefits of hemp food are strengthened, could be relevant for marketers and researchers in the field of cognitive psychology.

Lastly, this study has shed a first light on one of the main actors in the upcoming market for hemp food in Europe; the consumer. The success of hemp food is highly dependable on the acceptance of the consumer and it is recommended to research the subject even more.

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Appendix

"Q1 Welcome

First of all, thank you for participating in my survey for my bachelor thesis. Your time and effort is extremely appreciated!

Your answers will be recorded and treated confidentially. You will stay anonymous and data will not be shared with any third parties.

Completing the survey will take around 5 minutes. If you happen to have any questions regarding the survey, feel free to e-mail me at jiri.kaan@wur.nl

 With kind regards,
 Jiri Kaan

When you click 'I AGREE', you confirm that:
I understand that my answers are recorded and will be treated confidentially
I am at least 18 years old

○ I agree

○ I disagree

Q2
Please take some time to read the introductory message very carefully:

Recently hemp (hennep) is regaining popularity as a sustainable and versatile resource.

○ I have read the introductory message

Q3
Please take some time to read the introductory message very carefully:

Recently hemp (hennep) is regaining popularity as a sustainable and versatile resource.
Hemp is often associated with its THC-contents.

○ I have read the introductory message

Q4
Please take some time to read the introductory message very carefully:

Recently hemp (hennep) is regaining popularity as a sustainable and versatile resource.
The seeds from hemp are suitable to produce food for human consumption.

○ I have read the introductory message

Q5
Please take some time to read the introductory message very carefully:

Recently hemp (hennep) is regaining popularity as a sustainable and versatile resource.
Hemp is often associated with its THC-contents.
The seeds from hemp are suitable to produce food for human consumption.

○ I have read the introductory message

Q6 Select a store where you think you can find a product that fits the description in the introductory message.

○ Pharmacy

○ Supermarket

○ Home-depot (bouwmarkt)

○ Pet store

○ Coffeeshop

○ Bakery

○ Clothes shop

○ Cosmetics store

Q7 Do you associate the following applications of hemp with the information outlined in the introductory message?

	Yes	No
Stoned	○	○
Joint	○	○
Spacecake	○	○

Salad oil	○	○
Nutricious	○	○
Paper	○	○
Textile	○	○
Rope	○	○
Feelings get intensified	○	○
Happy, relaxed mood	○	○
Paint	○	○
Building material	○	○
Omega 3/Omega 6	○	○
Food supplements	○	○
Granola with hemp seeds	○	○

Q8 Please rate the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
I know pretty much about hemp	○	○	○	○	○	○	○

I do not feel very knowledgeable about hemp	○	○	○	○	○	○	○
Among my circle of friends, I'm one of the "experts" on hemp	○	○	○	○	○	○	○
Compared to most other people, I know less about hemp	○	○	○	○	○	○	○
When it comes to hemp, I really don't know a lot	○	○	○	○	○	○	○

Q9 Please try to summarize in one sentence what you remember from the introductory message.

_____

Q10 What is your gender?

○ Male

○ Female

Q11 What is your age?

○ Age in years (0-99) _____

Q12 Do you have experience with recreational drug-usage? (marijuana/weed/hasj)
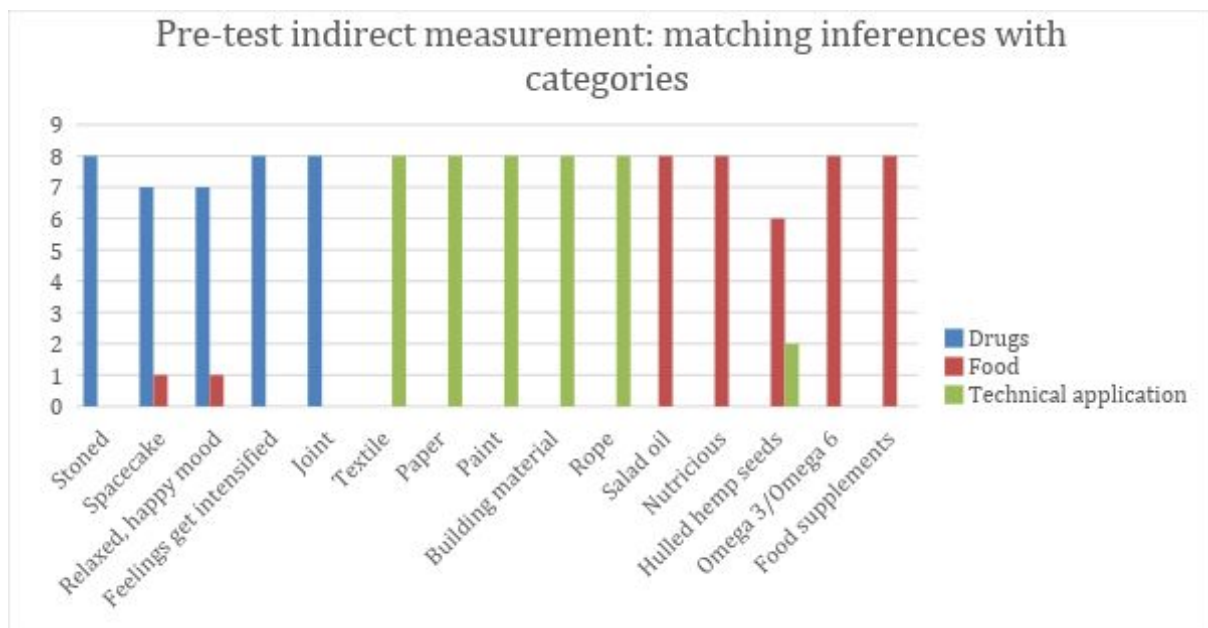
○ Yes

○ No

o   I prefer not to answer

Q13

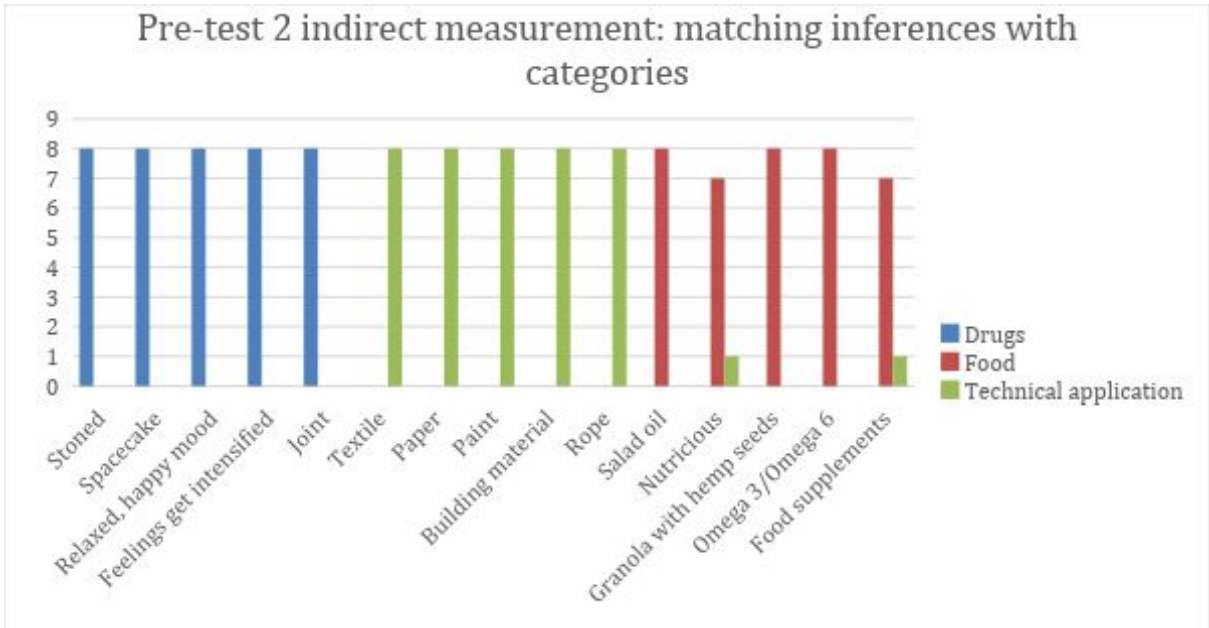You have filled in all the questions. Thank you so much for participating!
If you have any questions or remarks regarding the survey, feel free to e-mail me at jiri.kaan@wur.nl
Please press continue to submit your survey answers."

Appendix 1 Qualtrics survey

Appendix 2 Pre-test 1: indirect measurement

Appendix 3 Pre-test 2: indirect measurement