DEAKIN UNIVERSITY

CASS CENTRE FOR ADVANCED SENSORY SCIENCE

NEWSLETTER

Centre for Advanced Sensory Science (CASS) Newsletter #4 August 2018

Latest news

Welcome to the mid-year CASS newsletter.

With Dr Gie Liem, Dr Sara Cicerale, Dr Georgie Russell and Professor Russell Keast are maintaining our strength in sensory, consumer, nutrition interface while starting to grow our chemistry and safety areas. In the safety area, we welcome back Dr Snehal Jadhav from maternity leave. Dr Shirani Gamlath will be developing up the food product development program.

But in big news for CASS, Associate Professor Robert Shellie started in August and will head up our flavour and separation science area. Rob has a very strong publication record in separation and flavour science and over the next few months will develop a research program in CASS. We have also just commissioned our new GC-MS-O (see page 7) to help us identify key flavours in foods.

Rob, Snehal and Shirani will all be working closely together on flavour, safety and product development. We will update developments in the next newsletter, but if you have questions please contact cass@deakin.edu.au.

In This Issue

The significant problems we face cannot be solved at the same level of thinking we were at when we created them."

- Albert Einstein (1879-1955)

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CASS CENTRE FOR ADVANCED SENSORY SCIENCE

What's in this issue

CASS 2018: Meet our team

Centre for Advanced Sensory Science Team 2018

9
Academic staff

6
PhD students

7
Honours Students

4
PhD completions between June 2017– March 2018

2
Research Assistants

4
CASS-Academy Students

CASS IN THE MEDIA

CASS recently gained media attention after a recent publication in the *American Journal of Clinical Nutrition*, looking at the influence of diet and genes in fat taste. Below are some highlights!

Study participants, twins Jennie Luke and Susan Cheney. Photo: Justin McManus

Source: Age, Melbourne, 12th April 2018.

CASS Researcher, Andrew Costanzo with participants.

- The coverage reached a cumulative audience of **1,726,41** people.
- Media types of the coverage include: TV, AM Radio, FM Radio and newspaper.
- Total advertising space rate: $134,405.

CASS IN THE MEDIA Continued

During the first half of 2018, CASS filmed a segment to be featured on *Catalyst*. The segment focuses on the link between individual fat taste sensitivity and food intake.

The segment goes to air August 14th 2018 and will be available to watch online at a later day.

A CASS Researcher preparing solutions.

Solutions to be presented to participants.

Prof. Russell Keast discussing the intricacies of fat taste.

WHAT YOU EAT, NOT YOUR GENES, DETERMINES SENSITIVITY FOR FAT

A taste for fat is not driven by genetics, rather it's all-down to diet, a new Deakin University study of Australian twins has found.

The NHMRC-funded research, published in the *American Journal of Clinical Nutrition*, found that a high-fat diet decreased a person's sensitivity to the 'taste' of fat, irrespective of their body weight or genetics.

"There's this idea that maybe some people are just not as good at sensing high levels of fat, and that they're born that way," lead researcher Professor Keast, Director of Deakin's Centre for Advanced Sensory Science, said.

"But what we found is that genetics does not provide any protection against the dietary influence of fat. If we eat a high fat diet, we lose our ability to sense fat."

The study conducted an eight-week dietary intervention with 44 sets of twin adults, recruited from Twins Research Australia.

Twins within each pair were randomly allocated to a low-fat diet (getting less than 20 per cent of their energy from fat) or high-fat diet (getting more than 35 per cent of their energy from fat).

Those on the high-fat diet were encouraged to eat more dairy, meat and oil. But each consumed the same number of overall kilojoules and were monitored to keep within their normal weight range.

Their taste for fat was tested at the start, middle and end of the trial.

At each test, each twin was given three small unmarked cups of liquid, and had to identify which of the cups contained a fatty acid. If they were unable to do so, the concentration of fatty acid was increased.

At four and eight weeks, the twins on the low-fat diets were able to identify the fatty acid at a lower concentrations than their twin on a high-fat diet.

Professor Keast said this was significant because of the strong link between taste sensitivity and satiety, the feeling of fullness.

"If you are eating too many high fat foods, fat becomes an invisible nutrient," he said.

"The satiety response becomes very important because consumers have to be satisfied to stop eating.

"People who have a lower sensitivity to the fat taste, end up eating far more kilojoules from fat because they need more to feel satiated.

"That's why it's vitally important we're careful with what we're eating, otherwise we will get in a bad cycle of our bodies becoming accustomed to high levels of fat and requiring higher levels of fat to become satisfied. That can then lead to obesity."

Deakin School of Exercise and Nutrition Sciences PhD candidate Andrew Costanzo, a co-author on the twins study, said on average Australians took in about 31 per cent of their energy from fat, which is within the recommended 20 to 35 per cent range. The issue begins with individuals who consume quantities of fat above this range.

"A moderate amount of fat is good for our health, but excess fat becomes a problem," Mr Costanzo said.

"What this study shows is that if you want to lose weight, choosing lower fat foods is good because it will gradually increase your sensitivity to the taste of fat. This won't change how much you like the taste of fatty foods, but instead, the small amount of fat that you do eat will make you feel fuller, quicker.

"In the longer term we can build an increased sense of satisfaction for foods with a lower fat content, we've just got to battle those hard initial weeks."

Written by
Elise Snashall-Woodhams
Senior Media Coordinator,
Deakin University

CASS RESEARCH

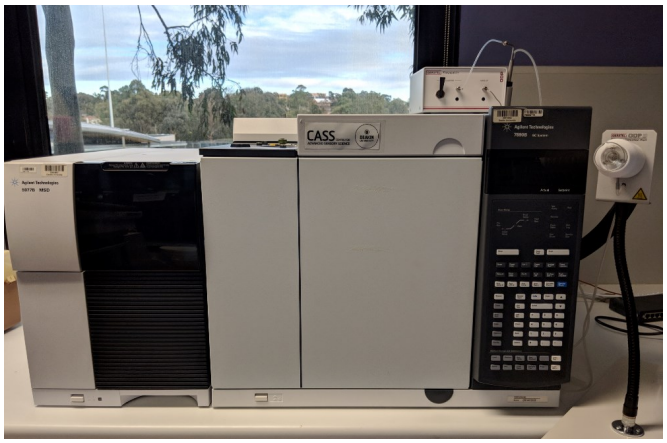
Various research projects were undertaken at CASS in 2018 and will continue into 2019. These are a few of our highlights to-date...

What's new in flavour analysis at CASS

Flavour is one of the most important attributes that informs whether to accept or consume a particular product or not. To illustrate, coffee with an unpleasant blue cheese aroma would be refused by the consumer, but reducing the blue cheese note to below threshold level a perfectly acceptable beverage. The first step in solving this problem is identification of the compound or compounds responsible.

The CASS flavour lab have spent the past three months training a panel of 'sniffers' for projects we are working on. Our trained panel are able to recognise hundreds of aroma compounds, and provide descriptive and intensity magnitude for aroma compounds eluting from our Gas Chromatography Olfactometry (GC-O) system. In addition, CASS has invested in a Mass Spectrometer to enhance our analytic capability in concert with NIST 2017 MS library which contains mass spectra information for 267,000 compounds, which help us to identify an unknown and key compounds from complex matrices. CASS now has a Gas Chromatography Olfactometry Mass Spectrometry (GC-O-MS) capabilities, along with the skills and knowledge to identify the key aromas and off-flavour from any food products, beverages and packaging materials. Last but not least, the combination of sensory and instrumental analysis gives us the ability to construct preference maps to better understanding and information related to consumer liking of a product. If you are interested in visiting CASS Flavour lab and discussing potential partnerships or research, please email cass@deakin.edu.au.

Aroma and flavour analysis CASS PhD and honour students in the lab.



Our new GC-O-MS

CASS RESEARCH Continued

Sensory science, tasting the future.

The days of pac-man are long over. Not only have the video games progressed graphically, the essence of gaming has changed. Teenagers now sit with digital 360 degrees headset on the couch while being digitally immersed in their surroundings. They can look around in the virtual world, which makes the game more realistic. The interesting thing is that we can do the same with sensory science. For a long time we have known that our liking of food is a function of the context in which we taste the food. A cold drink simply tastes better on the beach than in a bathroom, despite the difference in temperature of the room. The problem has always been that testing in a real life environment is not only expensive and time consuming, but also hard to control. We can not control if all of the sudden kids are screaming in the room in which food is evaluated. In sensory science we often want to control the context and vary the products.

Digital immersive environments might just be the solution. With this technology we can immerse consumers in different contexts such as a restaurant, beach or busy street with relative ease and a high degree of control. As researchers we first make a 360 video recording with a high definition 360 degree camera. Such camera looks like a small box with different cameras pointing into different directions. We then project this recording onto 360 degree goggles. The move tracking sensors in the goggles correspond with the recording in such way that when you look left, you see the recording of the left part of the room. When you look up you can see the part of the room which you would naturally see when you look up. Recently CASS researcher Kathryn Colla started her PhD project investigating the opportunities of digital immersive environment in sensory research. This is an exciting new field and hopefully we will soon be able to provide this new way of sensory testing to our partners.

For more information, contact Gie Liem: gie.liem@deakin.edu.au

CASS RESEARCH Continued

The link between food liking and sample quality

Australian population dietary intakes are characterised by inadequate fruit, vegetables and whole grains intake and excessive intake of discretionary foods (with minimal nutritional value and high levels of fat, sugar and salt). Dietary patterns which are associated with inadequate fruit and vegetable intake are linked with overweight, obesity and chronic disease development. Further, discretionary foods high in the palatable fat, sugar and salt are associated with elevated daily energy intakes, overweight and obesity.

In a limited number of studies, survey reports of food liking have shown promise of being a good proxy for laboratory measures of preference as well as habitual dietary intake. The novel method of assessing dietary intake via food preference survey-reports are based on the assumption that individuals tend to eat foods they like and refrain from eating those they dislike. Food liking measures have the potential of minimising the impact of underreporting and social desirable biases, when trying to establish the relationship between diet and health indices.

A current honours research project is investigating variations in food liking amongst a sample of young adults and its association with diet quality (as a measure of overall dietary intake) and body mass index (BMI). Watch this space for a summary of what we find…

For more information, contact Sara Cicerale: sara.cicerale@deakin.edu.au

CASS RESEARCH Continued

Why are some people more likely than others to become overweight?

There are many ways in which researchers, businesses and government organisations are trying to tackle the obesity epidemic and help individuals to have healthier diets and healthier weights. One piece of this complex puzzle relates to how individuals approach and think about food and eating – their appetitive traits. Appetitive traits are inherited differences in eating behaviours that make some people more susceptible than others to overeating and making poorer food choices. For instance, being particularly responsive to food cues, being less responsive to feelings of fullness or eating more in response to negative emotions can have effects on food intakes and weight in childhood and beyond. Individuals differ in the extent to which they exhibit these appetitive traits.

CASS research explored how and why appetitive traits develop in early childhood by taking a close look at the literature on the development of appetitive traits and comparing and contrasting this to what is known in the broader field of developmental science about how children develop in other areas. Key findings were that appetitive traits probably develop due to ongoing and reciprocal interactions between children's biological characteristics (such as their temperament or genetics), their parents' feeding practices, parents' beliefs and other cognitions (e.g. about their child's current weight), and the children's food intakes and weight. However, the review identified that there is much scope to further explore the development of appetitive traits in childhood with longitudinal research designs. This type of research is important if we are to understand how and why particular individuals are more susceptible to obesity than others, and therefore identify opportunities for new interventions.

For more information, please contact Georgie Russell: georgie.russell@deakin.edu.au

Rapid methods as an innovative replacement for Descriptive Analysis. Is it really possible?

The food industry is constantly evolving, with consumers increasingly dictating the products available on the market. With the evolution of the food industry, there has been a recent shift within sensory research to the use of rapid tools as a replacement for the traditional Descriptive Analysis approach. In a series of five papers, Oliver et al from the Centre for Advanced Sensory Science at Deakin University compares Check All That Apply (CATA), Napping with Flash Profile , and Temporal Dominance of Sensation (TDS) with Traditional Descriptive Analysis using a highly trained panel. In addition, Oliver also applied preference mapping to see how rapid method compared to descriptive analysis. Preference Mapping techniques are commonly applied to consumer research to assist in linking consumer preferences to the sensory profiles of products, thus ensuring an accurate depiction of the characteristics linked to consumer liking. This multivariate statistical approach accounts for differences between individual consumers by either relating sensory profile information to consumer data, or relating consumer data to product sensory profiles.

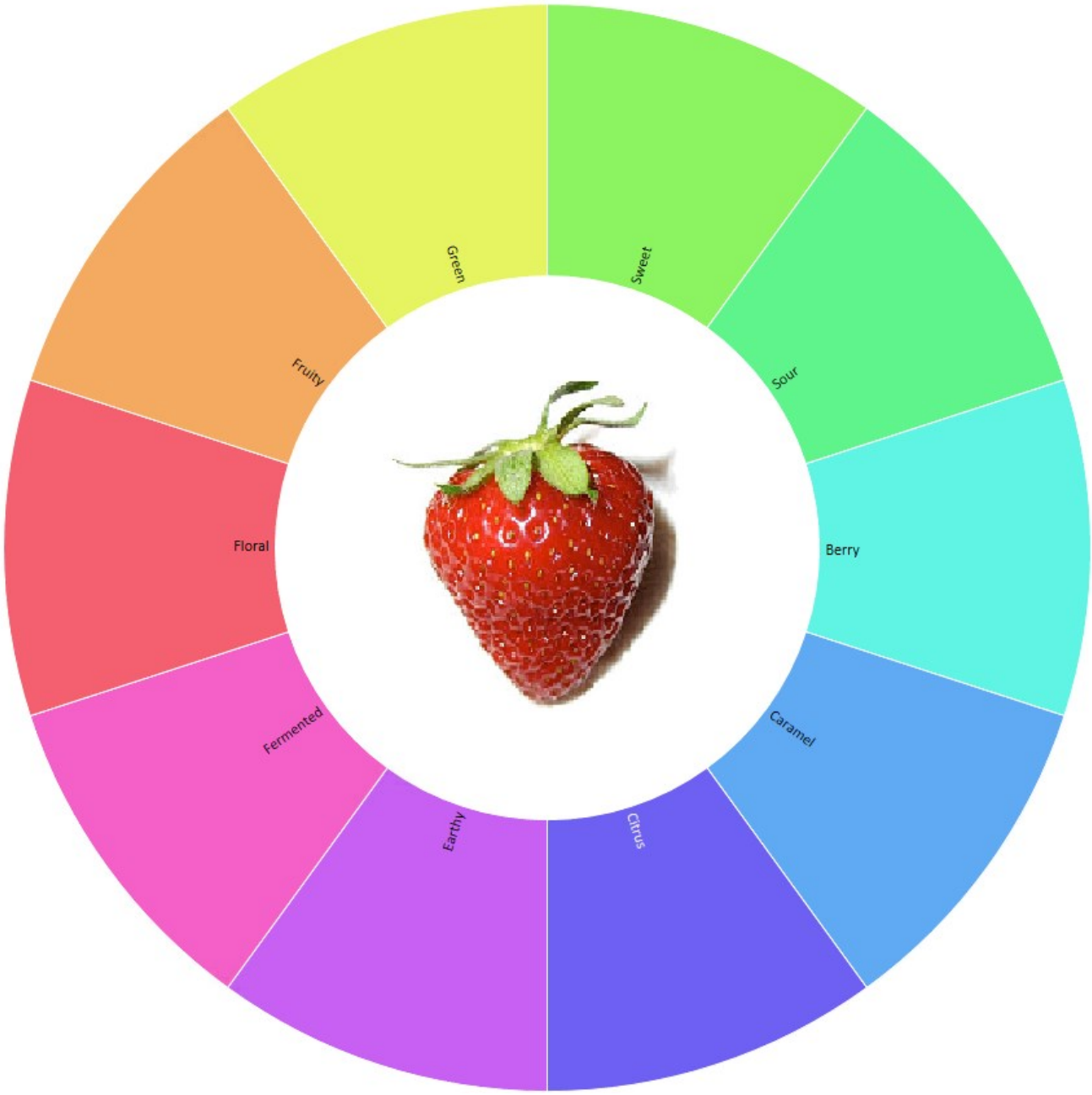
The first method compared was CATA, with an untrained consumer panel (n=131) using a list of verbal descriptors to describe the flavour of food, and checking the box for each attribute experienced when consuming the food. The trained panel (n=12) applied QDA techniques to profile each food. A second untrained consumer panel (n=139) rated their liking of the same sample set. Results revealed CATA produced moderately comparable product configurations to QDA (r=0.760), with similarities in descriptors associated with liking. This research has established CATA as a time and cost efficient alternative for the QDA methodology. The authors concluded that when precise definitions and quantification of the sensory attributes of products are required, QDA is a more robust and reliable evaluation tool.

The second method compared was Napping, a specialized form of the marketing tool named projective mapping. This methodology requires assessors to produce a map illustrating product differences and similarities on a two-dimensional space – if two products are viewed similary they will be placed closer together than products that are viewed as less similar. This allows products to be assessed simultaneously rather than by the monadic approach of conventional profiling. Assessors are not trained in the use of a common descriptive language, rather they devise their own criteria for evaluating and separating products. Untrained consumers (n=131) used Napping to separate the foods based on their similarities and differences. Trained panelists (n=12) applied both QDA and Napping methods. Results revealed Napping using consumers to produce product configurations comparable to the trained QDA panel (R= 0.936 and 0.898 between QDA and Napping via a trained panel, and a consumer panel respectively), with similar descriptive terms to describe products. The authors concluded that you need at least n=120 consumers to complete the Napping technique and any reduction in numbers reduced the quality of the data. If there are enough consumers, Napping provides reasonable comparison with Descriptive Analysis, although like the CATA outcome, QDA is a more robust and reliable evaluation tool.

The third method compared was TDS, a multidimensionality approach assessing changes in the dominant sensory attributes over time, without being limited to singular attributes. Due to the time-intensity nature of TDS, it may provide a different magnitude of information to traditional descriptive methodologies regarding the sensory profile of foods. The QDA trained panelists (n=12) were provided with food samples and applied QDA techniques to profile each food. Untrained consumers (n=103) were provided with the same foods and required to use TDS methodology. Results revealed moderately comparable product configurations produced via TDS in comparison to QDA (R = 0.684), as well as similar application of the sweet and sour attributes (R= 0.714 and 0.829 respectively). The TDS method did not agree with the QDA methodology regarding more complex flavor terms. For TDS, consumers lack training on complex flavours, mean that it yields information not that well matched to the QDA methodology.

In summary, Descriptive Analysis provide valuable in depth objective perceived flavour profile of a food. The new rapid methods provide some descriptive data, however it is not as detailed as the data generated from Descriptive Analysis. Understanding what the new rapid methods can provide will be important when food producers need some descriptive data, but do not have access to Descriptive Analysis panels.

The descriptive language of strawberries



Strawberry flavour wheel.

Descriptive analysis is a powerful tool, allowing researchers and the food industry to obtain a complete sensory profile of a product of concern. The above is an example of specific aroma and flavour attributes found in strawberries, as published in a recent CASS paper (Oliver et al. 2018).

Understanding the sensory characteristics of a product can assist with understanding process and ingredient variables, shelf-life testing and when linked with consumer data, can provide powerful insights into the drivers of liking.

For more information on Descriptive Analysis, contact Russell Keast: russell.keast@deakin.edu.au

Latest publications and presentations

- Appleton J, Laws R, Russell CG, Fowler C, Campbell KJ, Denney-Wilson E. Infant formula feeding practices and the role of advice and support: an exploratory qualitative study. BMC Pediatrics. 2018;18(1):12.

- Appleton J, Russell Catherine G, Laws R, Fowler C, Campbell K, Denney Wilson E. Infant formula feeding practices associated with rapid weight gain: A systematic review. Maternal & Child Nutrition. 2018;0(0):e12602.

- Costanzo A, Nowson C, Orellana, Bolhuis D, Duesing K, Keast R. (2018). Effect of dietary fat intake on fat taste sensitivity: a co-twin randomised control trial. *American Journal of Clinical Nutrition*. 107(5) pp683-694

- Hartley I, Keast R, Liem D. (2018). Physical activity-equivilent label reduces consumption of discretionary snack foods. *Public Health Nutrition*. 21(8) pp1435-1443

- Hutchings S, Low J, Keast R. (2018). Sugar reduction without compromising sensory perception. An impossible dream? *Critical Reviews Food Science and Nutrition*. 21 pp1-21 doi: 10.1080/10408398.2018.1450214

- Laws RA, Denney-Wilson EA, Taki S, Russell CG, Zheng M, Litterbach E -K, et al. Key Lessons and Impact of the Growing Healthy mHealth Program on Milk Feeding, Timing of Introduction of Solids, and Infant Growth: Quasi-Experimental Study. JMIR mHealth and uHealth. 2018;6 (4):e78.

- Liem DG, Turchini GM, Wanich U, Keast R. (2018) Sustainability Descriptive Labels on Farmed Salmon: Do Young Educated Consumers Like it More? *Sustainability.* 10, 2397 doi:10.3390/su10072397

- Liu D, Costanzo A, Evans MDM, Archer NS, Nowson C, Duesing K, Keast R. (2018) Expression of the candidate fat taste receptors in human fungiform papillae and the association with fat taste function. *British Journal of Nutrition*. 120(1) pp.64-73. doi: 10.1017/S0007114518001265.

- Low JYQ, LACY KE, McBride RL, Keast RSJ. (2018) The Associations Between Oral Complex Carbohydrate Sensitivity, BMI, Liking, and Consumption of Complex Carbohydrate Based Foods. *Journal of Food Science*. doi: 10.1111/1750-3841.14276.

- *Oliver P, Cicerale S, Pang E, Keast R. (2018) Check-All-That-Applies (CATA) as an Alternative for Quantitative Descriptive Analysis (QDA™) to Establish Flavors Driving Liking in Strawberries. Journal of Sensory Studies. doi.org/10.1111/joss.12316*

- *Oliver P, Cicerale S, Pang E, Keast R. (2018) A comparison of Temporal Dominance of Sensation (TDS) and Quantitative Descriptive Analysis (QDA) to identify in strawberries. Journal of Food Science doi.org/10.1111/1750-3841.14096.*

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Blog: Deakin-CASS.wordpress.com

Photos: JadietPhotography/ Deakin University

Latest publications and presentations cont.

- *Oliver P, Cicerale S, Pang E, Keast R. (2018) Comparison of Quantitative Descriptive Analysis (QDA™) to the Napping methodology with and without product training. Journal of Sensory Studies. doi.org/10.1111/joss.12331*

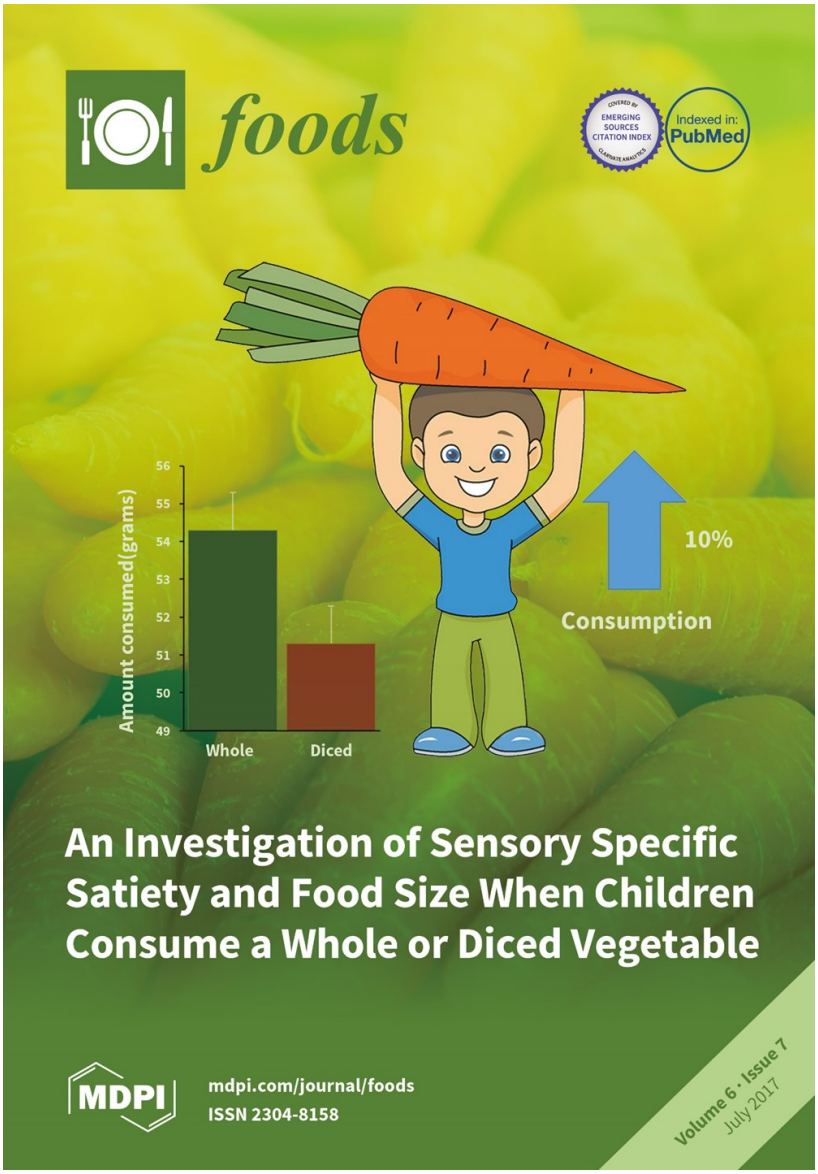
- *Oliver P, Cicerale S, Pang E, Keast R. (2018) Developing a Strawberry Lexicon to Describe Cultivars at Two Maturation Stages. Journal of Sensory Studies. doi.org/10.1111/joss.12312*

- *Oliver P, Cicerale S, Pang E, Keast R. (2018) Identifying Key Flavors in Strawberries Driving Liking via Internal and External Preference Mapping. Journal of Food Science doi.org/10.1111/1750-3841.14109*

- Russell CG, Russell A. Biological and Psychosocial Processes in the Development of Children's Appetitive Traits: Insights from Developmental Theory and Research. Nutrients [Internet]. 2018 2018/05//; 10(6).

- Russell CG, Haszard JJ, Taylor RW, Heath A-LM, Taylor B, Campbell KJ. Parental feeding practices associated with children's eating and weight: What are parents of toddlers and preschool children doing? Appetite. 2018;128:120-8.

- Russell CG, Denney-Wilson E, Laws RA, Abbott G, Zheng M, Lymer SJ, et al. Impact of the Growing Healthy mHealth Program on Maternal Feeding Practices, Infant Food Preferences, and Satiety Responsiveness: Quasi-Experimental Study. JMIR mHealth and uHealth. 2018;6(4):e77.



A CASS publication on the front cover of *Foods* journal.

- Skrzypczyk V, Hermon K, Norambuena F, Turchini G, Keast R, Bellgrove A. (2018) Is Australian seaweed worth eating? Nutritional and sensorial properties of wild harvested Australian versus commercially available seaweeds. *Journal of Applied Phycology*. doi.org/10.1007/s10811-018-1530-2.

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