Article Title**: Cognitive Dissonance in Food and Nutrition – A Conceptual Framework**

Journal Name**: Trends in Food Science and Technology**

Corresponding Author

Name**: ANDY S. J. ONG**

Address**:** School of Agriculture, Food and Rural Development, Newcastle University (Singapore Campus); School of Health Sciences, Nanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore 569830.

Email: a.s.j.ong@newcastle.ac.uk; andy_ong@nyp.edu.sg

Co-Author(s)

1. Name: **LYNN J. FREWER**

Address: Food and Society Group, School of Agriculture, Food and Rural Development, Newcastle University, Agriculture Building, Newcastle upon Tyne NE1 7RU

Email: Lynn.Frewer@newcastle.ac.uk

2. Name: **MEI-YEN CHAN**

Address: Human Nutrition Research Centre, School of Agriculture, Food and Rural Development, Newcastle University (Singapore Campus), Nanyang Polytechnic, 180 Ang Mo Kio Avenue 8, Singapore 569830.

Email: mei-yen.chan@newcastle.ac.uk

Abstract (Structured)

Background

This paper describes the development of a theoretical framework for the study of cognitive dissonance in food and nutrition.

Scope and Approach

The Food Cognition Dissonance (FCD) conceptual framework integrates relevant principles of cognitive dissonance and attitude, in the context of food and nutrition, to provide a novel perspective of structural food-related cognitive dissonance in relation to the examination of food-related attitudes. The elements and mechanisms within the FCD framework are elaborated, and considerations in the use of the framework are discussed.

Key Findings and Conclusion

The FCD framework can be applied to predicting how dissonance-based, food-related attitude change occurs. The approach may stimulate research that will ultimately lead to the development of effective nutrition programmes and/or communications to promote healthy eating.

Keywords: Cognitive consistency, Cognitive dissonance, Attitude change, Dietary behaviour

Running head: Food-related cognitive dissonance

Introduction

It has been generally recognized by researchers concerned with optimising healthy food choices that changes in dietary behaviours might occur through influencing and/or altering food related attitudes (Aikman, Crites & Fabrigar, 2006; Contento, 2012; Nestle, Wing, Birch, DiSogra, Drewnowski, Middleton, Sigman-Grant, Sobal, Winston & Economos, 1998; Worsley, 2002). A theory frequently implicated in the study of attitude change is the theory of cognitive dissonance (Festinger, 1957; Harmon-Jones & Harmon Jones, 2007). Its main tenet states that individuals experience a psychological state of discomfort (i.e., cognitive dissonance) when faced with inconsistencies between two or more held cognitions. They then seek to reduce the dissonance experienced by altering one or more of the inconsistent cognitions, typically those least resistant to change (Harmon-Jones, 2002). Cognition may be broadly defined as any belief, opinion, attitude, perception, or knowledge about persons, objects, issues, and so forth (Aronson, 2004; Littlejohn & Foss, 2005; O'Keefe, 2002).

Despite the recognition given to the potential application of cognitive dissonance in influencing healthy dietary choices (e.g., Hamilton-Ekeke & Thomas, 2011; Hjelmar, 2011; Worsley, 2002), the closest the construct has been specifically applied to modifying some semblance of food-related behaviour hitherto would be with respect to the *clinical* behaviours of alcohol consumption (e.g., Hammons, 2010) and disordered eating (e.g., Rohde, Auslander, Shaw, Raineri, Gau & Stice, 2014). To date, the theory has generally not been applied to modifying *non-clinical* dietary health behaviour (Freijy & Kothe, 2013). In a review of cognitive dissonance research in food and nutrition, Ong, Frewer and Chan (in press)[1]

[1] The review was conducted from 1st Mar 2014 to 1st Oct 2014 and thus, covers all related published work up to 1st Oct 2014. From that time to 18th Aug 2016, four more relevant food-related cognitive dissonance studies were found by the authors – two related to food risk/safety (Cao, Just, Turvey & Wansink, 2015; Gaspar, Luis, Seibt, Lima, Marcu, Rutsaert, Flectcher, Verbeke & Barnett, 2016) and two related to meat consumption (Onwezen & ven der Weele, 2016; Tian, Hilton & Becker, 2016). These four new studies were perused and

described in detail, and critically evaluated, 14 diverse food-related studies that had examined cognitive dissonance as a focal construct; they found that the 14 reviewed studies rarely pertained to examining the utility of cognitive dissonance in influencing or altering food and/or food-related attitudes, with the exception of perhaps one study that had simply investigated the effects of cognitive dissonance on the combined health behaviours of physical exercise and dietary intentions (Stellefson, Wang & Klein, 2006). Furthermore, across those studies, the authors found (1) disparities in how cognitive dissonance was used in research conceptualization, (2) variations in how cognitive dissonance arousal was experimentally evoked without clear adherence to established cognitive dissonance paradigms, and (3) the general lack of explicit measurement of cognitive dissonance itself (subsequent to its arousal). The authors suggested that the unsystematic and disconnected approach taken in the examination of cognitive dissonance in food-related studies could have resulted in inconsistent findings vis-à-vis the effects of cognitive dissonance across those studies. It was concluded that a conceptual framework integrating the basic principles of cognitive dissonance theory with the relevant attitude and context-specific theorizations associated with food and nutrition was required to facilitate systematic research in this area as a precursor to application. The purpose of this paper is to propose such an integrated theoretical framework.

Developing an Integrated Conceptual Framework for the Study of Cognitive Dissonance in Food and Nutrition – Insights from Cognitive Dissonance, Attitude and Food-related Research

The primary core of the proposed conceptual framework for the study of cognitive dissonance in food and nutrition should rightly be founded on the construct of cognitive

found not to affect the conclusions that were drawn from our earlier review upon which the current paper is based.

dissonance and its conceptualization. In this instance, the proposed framework adopts the basic principle underlying cognitive dissonance theory *as a consistency theory of attitude change* in assuming the importance of cognitive consistency maintenance[2]. The proposed framework primarily seeks to expound on the dissonance arousal process that is potentially invoked when individuals experience conflicting food-related cognitions. In the current context of the proposed framework, a more precise definition of cognition as *attitude*[3] is taken as its secondary core, given the proposed framework's ultimate application as a tool to inform and guide efforts in influencing attitude change via cognitive dissonance. The focus of the framework on the dissonance arousal process is predicated on the premise that its understanding will provide the context for a more precise prediction of the dissonance resolution process that follows (Ong et al., in press), which includes attitude change. The constructs and workings of the proposed framework will be elaborated and developed based on insights drawn from relevant research and literature related to cognitive dissonance, attitude, and food choice.

The cognitive dissonance construct and the basic cognitive dissonance process

Although "Festinger's early explanation of dissonance did not clearly identify whether *dissonance* is cognitive or emotional" (Sweeney, Hausknecht & Soutar, 2000, p. 373), dissonance theorists generally agree that *both* cognitive as well as affective aspects to cognitive dissonance exist. In the original version of cognitive dissonance theory, Festinger (1957) emphasized the importance of, and need for, cognitive consistency by individuals, stating that "*x* and *y* are dissonant if not-*x* follows from *y*" (p. 13), with *x* and *y* being "any

[2] Although there were attempted reformulations of the precise mechanisms underlying cognitive dissonance effects, particularly that which related to ego-defence (e.g., Aronson, 1968; Steele & Liu, 1983; Cooper & Fazio, 1984; Stone & Cooper, 2001), purist dissonance theorists maintain that Festinger's (1957) original version focusing on cognitive consistency maintenance continues to be viable, and can explain the evidence generated by the revisions (Gawronski, 2012; Harmon-Jones, 2002; Harmon-Jones & Mills, 1999).

[3] Food-related attitude in the proposed framework includes attitude towards food (e.g., attitude towards pasta, broccoli, etc.) and attitude towards food activity/event (e.g., attitude towards dieting, sensory eating, etc.).

knowledge, opinion, or belief about the environment, about oneself, or about one's behaviour" (p. 3). This essentially specifies a cognitive dimension to the cognitive dissonance construct. Cognitive consistency is defined by the logical links between cognitive elements, and the explicit nature of bringing specific cognitive elements into conscious evaluation "implies that these elements have to be understood as propositions about states of affairs that are regarded as true or false by the individual" (Gawronski, 2012, p. 653, citing Gawronski & Strack, 2004). Thus, an individual who holds, and is simultaneously aware of, the propositions "Margarine is healthier than butter" and "Margarine has been found to contain harmful trans fat" is facing a situation of cognitive inconsistency. A situation of cognitive inconsistency would evoke a psychological state of tension or discomfort (Carlsmith & Aronson, 1963; Elliot & Devine, 1994) within the individual, and it is this psychological discomfort that motivates individuals to change attitudes (Metin & Metin-Camgoz, 2011) as a means of resolving cognitive inconsistency. This psychological state of tension or discomfort represents the affective dimension of the cognitive dissonance construct, and has been referred to as an aversive motivational state (Harmon-Jones, 2002).

Thus, a conceptualization of cognitive dissonance must take into account both its cognitive and affective aspects (Sweeney et al., 2000; Harmon-Jones, 2002). Harmon-Jones (2002) provided a taxonomy to distinguish the affective motivational state (i.e., *dissonance*) from the cognitive inconsistency that produces it (i.e., *cognitive discrepancy*), and the cognitive and behavioural changes that result from the affective motivational state of dissonance (i.e., *cognitive discrepancy reduction*). Based partially on such taxonomy, a figure to clarify the basic cognitive dissonance process is presented in Figure 1.

Insert Figure 1 here

From Figure 1, it may be seen that dissonance arousal is a crucial phase in the cognitive dissonance process, as it forms the basis of the dissonance resolution phase that follows. From Festinger's (1957) seminal introduction of the theory of cognitive dissonance to subsequent research conducted to test the theory (e.g., Brehm, 1956; Festinger & Carlsmith, 1959; Festinger, Riecken & Schachter, 1956; Aronson, Fried & Stone, 1991; Aronson & Mills, 1959), various experimental paradigms dictating the conditions under which cognitive inconsistency would lead to cognitive dissonance have been derived. These are known as cognitive dissonance paradigms (Harmon-Jones & Harmon-Jones, 2002; 2007), of which the major ones include:

- *Free choice paradigm*: When a decision is freely made by an individual, especially one that involves cognitive inconsistency, dissonance may be aroused.

- *Induced compliance paradigm*: When an individual does or says something that contradicts a prior belief or attitude, dissonance is aroused.

- *Belief disconfirmation paradigm*: When an individual is exposed to information inconsistent with his/her beliefs, dissonance is aroused.

- *Hypocrisy paradigm*: Whenever an individual is induced to publicly make statements consistent with some normative standards and thereafter, reminded of times when he/she did not act in accordance with such standards as depicted in the statements made, dissonance is aroused.

- *Effort justification paradigm*: Whenever an individual voluntarily engages (i.e., put in effort) in an unpleasant activity to achieve some goal, therein implying the occurrence of cognitive inconsistency, dissonance is aroused.

Having evolved from studies with varied contexts, the different paradigms reflect different conditions under which dissonance arousal would occur. It may be inferred, therefore, that the paradigms are amenable to differential applications, depending on the context of a study – for example, the induced compliance paradigm has been used as the basis for a dissonance-based intervention for the prevention of eating disorder (e.g., Stice, Rohde, Durant & Shaw, 2012) and the hypocrisy paradigm has been employed to influence various health behaviours (e.g., Freijy & Kothe, 2013). Although the paradigms are typically applied independently, it is not uncommon for the paradigms to be used in combination with one another where appropriate – for instance, Cao, Just and Wansink (2014) employed a mix of the free choice and belief disconfirmation paradigms in their experimental research looking into cognitive dissonance and confirmatory bias in relation to food risk/safety. Regardless of whether they are applied independently or in combination, however, cognitive dissonance paradigms should constitute an indispensable part of any cognitive dissonance centric study.

In summary, any study that looks at cognitive dissonance would need to consider the use of specific cognitive dissonance paradigm(s) to elicit cognitive dissonance arousal. The actual arousal itself needs to be assessed in terms of its cognitive discrepancy and dissonance make-up before any subsequent motivated efforts at cognitive discrepancy reduction may be accurately attributed to the dissonance (Elliot & Devine, 1994). Current food-related studies that have examined cognitive dissonance as a focal construct, have largely neglected the cognitive dissonance arousal process such that neither the exact cognitive dissonance paradigm(s) used (if any) to elicit cognitive dissonance arousal was accurately specified nor the actual cognitive dissonance arousal explicitly measured thereafter (Ong et al. in press). The latter, in particular, has been quantitatively and qualitatively limited in cognitive dissonance research generally across domains (Sweeney et al., 2000).

Correspondingly, in additional recognition of the importance of assessing actual cognitive dissonance arousal after it has been triggered, the cognitive and affective distinctions underlying the conceptualization of the cognitive dissonance construct will be reflected within the proposed framework as *food-related cognitive discrepancy* (i.e., inconsistency between two or more food-related attitudes) and *food-related dissonance* (i.e., psychological tension/discomfort experienced as a result of food-related cognitive discrepancy) respectively. These two together define *food-related cognitive dissonance*.

Attitude, attitudinal structures and cognitive dissonance

An attitude may be defined as a psychological, evaluative response towards a particular person, place, thing, event, etc. (*attitude object*) in positive and/or negative terms based on affective, behavioural and cognitive information (Eagly & Chaiken, 1995; Minami, 2009; Schwartz, 2012; Schwarz & Bohner, 2001). This definition of attitude adopted by the proposed framework is founded on a contemporary view of the tripartite model of attitude (Breckler, 1984; see Figure 2).

Insert Figure 2 here

In this model, attitude is seen as a response to an antecedent stimulus or attitude object alongside affective, behavioural and cognitive tendencies toward the attitude object. In this instance, affect essentially refers to an emotional response to an attitude object, which may be measured physiologically (e.g., heart rate, galvanic skin response) or through self-reports of feelings or mood. Behaviour includes overt actions and behavioural intentions, which may be similarly gauged via verbal, self-statements regarding behaviour. Lastly, beliefs, knowledge structures, perceptual responses, and thoughts make up the cognitive component that likewise could be assessed through verbal self-reports. In the traditional view of the model, all three

components are seen as constituents of the "anatomy" of an attitude (Smith, 1947, p.508). In the contemporary view of the model, however, the three components are seen as bases of an attitude (Fabrigar, MacDonald & Wegener, 2005). Whilst all three components, varying on a common evaluative continuum, may be sufficiently distinct from each other to preclude high inter-componential correlation, there is normally some degree of positive correlation amongst the three components that establishes a situation of triadic consistency. This is particularly so when attitude measurement may be derived from cognitive representations of each component, a provision allowed for in the tripartite model. This fits in well with the focus of cognitive dissonance theory on cognitive consistency, and its propositional-thoughts-based analysis. Thus, although the moderate inter-correlation amongst the components means that it is plausible for them to operate in partial, or even complete independence (Breckler, 1984; Greenwald, 1982, and Zajonc, 1980), the proposed framework will appeal to the tripartite model's allowance for an assumption of tendency towards triadic consistency amongst the attitudinal components in alignment with the assumptions underlying its central cognitive dissonance core.

The definition of attitude premised on the tripartite model essentially captures what has been termed as the internal structure of attitude, i.e., *intra-attitudinal structure*, which comprises attitude, with its tri-componential cognitive, affective, and behavioural dimensions, towards an attitude object (Fabrigar & Wegener, 2010). Attitude objects may be delineated in terms of relative concreteness or abstraction (Eagly & Chaiken, 1998), in which a less concrete (and thus, more abstract) object may be termed a *superordinate* attitude object, and a more concrete (and thus, less abstract) object termed a *subordinate* attitude object. In this case, it is possible for attitudes toward superordinate attitude objects to subsume attitudes toward subordinate attitude objects in a way that is generally consistent with each other. For example, an individual who holds a positive attitude towards environmentalism is also likely

to possess a positive attitude towards organic food (e.g., Nordvall, 2014) and a negative attitude towards meat consumption (e.g., Hjelmar, 2011). Such linkages or associations between attitudes constitute what has been termed as the external structure of attitude, i.e., *inter-attitudinal structure* (Fabrigar & Wegener, 2010; Dreezens, Martijin, Tenbuilt, Kok & de Vries, 2005a; 2005b; Eagly & Chaiken, 1998), which may also include attitudinal links between subordinate-subordinate and superordinate-superordinate attitude object pairings.

Evidence from food and/or food-related research suggests that instances of food-related cognitive dissonance may occur within and/or across attitude structures. In terms of the internal attitude structure, for instance, in a food risk/safety study, Cao, Just and Wansink (2014) reported that individuals who had committed to, and placed purchase bids for, a specific type of chocolate, demonstrated a willingness to increase their bids for the chocolate despite being given food risk information about the chocolate after they had placed their initial bids. The authors reasoned that confirmatory bias via selective information processing was engaged to narrow the discrepancy between what the individuals knew about the chocolate from the new food risk information given, and their prior behaviour of having placed purchase bids for the chocolate. Evidence for a similar occurrence of cognitive discrepancy amongst the evaluative tri-components of an attitude (typically between the behavioural and cognitive components) have been found in expectancy-disconfirmation studies in food-related consumer research (e.g., Olson & Dover, 1979), and nutrition communication research (e.g., Albarracín, Cohen & Kumkale, 2003). Separately, food-related research in attitudinal ambivalence, which may be defined as the simultaneous possession of both positive and negative evaluations of an object (Riketta, 2000; Thompson, Zanna & Griffin, 1995), provide further evidence for incongruity at the intra-attitudinal level (e.g., Berndsen & van der Pligt, 2004; Cong, Olsen & Tuu, 2013; Povey, Wellens & Conner, 2001).

In the analysis of the external attitude structure, it is important to first understand the potential link between attitude and value, particularly since individuals are hypothesized to appeal to values in a personal food system when making food choice decisions (Connors, Bisogni, Sobal & Devine, 2001; Falk, Bisogni & Sobal, 1996; Furst, Connors, Bisogni & Falk, 1996), *ceteris paribus*. It has been postulated that attitudes derive from values (Dreezens et al., 2005a; 2005b; Eagly & Chaiken, 1995; Verplanken & Holland, 2002), which (1) often comprise central/core, affect-laden beliefs embodying abstract ideals/principles that provide general orientation and organization for life (Austin & Vancouver, 1996; Maio, Olson, Bernard & Luke, 2003; Rohan, 2000; Rokeach, 1968; 1973; Schwartz, 2012), (2) may be global or domain-specific, and (3) are measured in terms of perceived importance to the individual (Schwartz, 1992; 2012). Values may be considered part of an extended intra-attitudinal structure where they place hierarchically above attitude, such that causality runs from values through attitudes to behaviour (Dreezens et al., 2005a; Bernard, Maio, & Olson, 2003; Homer & Kahle, 1988; Luzar & Cosse, 1998; Maio & Olson, 1994; Stienstra, Ruelle, & Bartels, 2002; Thøgersen & Ölander, 2002). By serving as standards or archetypes for attitude development (Homer & Kahle, 1988; Luzar & Cosse, 1998; Rokeach, 1973), values have implications for attitudinal consistency insofar as qualitative similarities and differences amongst the values exist.

To elaborate, linkages between attitudes may be formed on diverse bases but typically involve links between attitudes toward different entities[4] (Eagly & Chaiken, 1995; 1998). In the context of an extended intra-attitudinal structure, these may be conceptualized in terms of associations between attitudes toward different but related attitude objects stemming from (a) the same value(s), and/or (b) different values. All things being equal, it is in the latter

[4] Some researchers consider multiple attitudes toward the same object (that stem from different values) as inter-attitudinal structure since these are evaluations based on many specific (and different) attributes or emotions associated with the attitude object – each evaluation technically considered as an attitude based on a specific attribute and/or emotion (Fabrigar & Wegener, 2010; Fabrigar et al., 2005).

instance that inconsistencies in food-related attitudes are likely, and indeed, have been found, to occur[5]. For example, researchers have found that in making food choices, consumers are frequently caught in a trade-off of opposing values such as cost *versus* quality, or taste *versus* health considerations (Connors et al., 2001; Hauser, Jonas & Riemann, 2011; Shepherd, 1999). The corresponding affect-based belief(s) underlying values also become conflicted, as illustrated, for example, in studies related to meat consumption and/or vegetarianism where beliefs pertaining to the values of health, taste/hedonism and universalism clash. This often translates to cognitive incongruence at the attitude level either between same- (i.e., superordinate-superordinate or subordinate-subordinate) or different-level (i.e., superordinate-subordinate) attitude object pairings (e.g., Berndsen & van der Pligt, 2004; Lea & Worsley, 2002; Rothgerber, 2014).

To summarise, evidence from food-related research indicates that food-related cognitive dissonance may occur intra-attitudinally and inter-attitudinally. The evidence suggests that an alternative perspective to analysing cognitive dissonance, not yet formally recognized in cognitive dissonance research generally, much less its study in the domain of food and nutrition, is needed. The proposed framework will ensure that this evidence-based, alternative structural view of food-related cognitive dissonance is addressed.

The Food Cognition Dissonance (FCD) Conceptual Framework

Integrating the insights gathered from cognitive dissonance and attitude studies both generally as well as specifically in a food-related context, the proposed theoretical framework for the study of cognitive dissonance in food and nutrition – the food cognition dissonance (FCD) conceptual framework – is presented and illustrated in Figure 3.

[5] This pertains particularly to instances of disparate and incompatible/incongruent values and excludes instances of different but compatible/congruent values.

Insert Figure 3 here

Formally, the FCD conceptual framework is proposed as an integrated theoretical framework that could serve to guide systematic cognitive dissonance research in the food and nutrition domain, particularly with regards to investigating cognitive dissonance effects on food-related attitudes. In acknowledgement of the basic course through which cognitive dissonance progresses, the FCD framework focuses on the cognitive dissonance arousal process predicated on the logic that its understanding would facilitate a better gauge of the cognitive dissonance resolution process that follows, which includes attitude change. In this regard, through proper application of cognitive dissonance paradigm(s), the FCD framework stipulates that food-related cognitive discrepancy in food-related attitude(s) would lead to a psychological state of tension or discomfort, i.e., food-related dissonance. The latter serves as an aversive motivational state that would then set in motion efforts to reduce the food-related cognitive discrepancy to restore cognitive consistency. Within the FCD framework, recognition is given to the fact that food-related cognitive dissonance may occur within and/or across food-related attitudinal structures. Any cognitive discrepancy amongst the evaluative tri-components within the internal structure of a food-related attitude is termed *intra-attitudinal, food-related cognitive discrepancy* (*Intra-FCDp*). The aversive state of tension or psychological discomfort that results from *Intra-FCDp* is correspondingly *intra-attitudinal, food-related dissonance* (*Intra-FD*). These two terms collectively define *intra-attitudinal, food-related cognitive dissonance* (*Intra-FCD*). Any cognitive discrepancy that occurs in the external linkages between food-related attitudes of different attitude objects is termed *inter-attitudinal, food-related cognitive discrepancy* (*Inter-FCDp*). The aversive state of tension or psychological discomfort that results from *Inter-FCDp* is correspondingly *inter-*

attitudinal, food-related dissonance (*Inter-FD*). These two terms collectively define *inter-attitudinal, food-related cognitive dissonance* (*Inter-FCD*).

Based on the illustration of the FCD framework presented in Figure 3, some hypotheses may be drawn about the framework mechanism concerning the direction and mobility of cognitive dissonance effects within and across attitude structures. Within an extended intra-attitudinal structure, a change in attitude towards an attitude object may occur due to dissonance-based alterations in (a) the tri-componential bases of the attitude (bottom-up) or (b) the value from which the attitude derives (top-down). The overall change in the intra-attitudinal structure of that attitude could likely then cause inter-attitudinal cognitive dissonance to emerge in terms of its external attitudinal link with another (related) attitude object (assuming consistency between the attitudinal structures of both attitude objects prior to the former's intra-attitudinal structure change). If these are strong enough, corresponding cognitive dissonance effects will bear on the intra-attitudinal structure of the second related attitude object to ultimately change it and bring it in line with the altered intra-attitudinal structure of the first attitude object, *ceteris paribus*. The hypothesis that a change in attitude towards an attitude object would correspondingly influence a change in attitude towards another related attitude object has been (1) supported by research on inter-attitudinal structure and attitude change, which showed the spreading activation effect to apply across various attitude object level pairings (i.e., superordinate-superordinate, superordinate-subordinate, subordinate-superordinate, subordinate-subordinate), regardless of the initial attitude object level from which the attitude change began (Dinauer & Fink, 2005), and (2) suggested by specific food research examining associations between food-related attitudes such as Bergmann, von der Heidt and Maller's (2010) study, which advocated influencing meat consumption via leveraging on consumers' ethical concerns about the impact of factory farming on the environment, including animal welfare. However, the hypothesized cognitive

dissonance mechanism underlying such attitude alterations amongst linked attitude objects, as postulated in the FCD framework, are yet to be empirically tested. Additionally, whilst the basis of the on-going discussion is predicated on intra- and inter-attitudinal cognitive dissonance occurring sequentially in that order, it is theoretically possible for the sequence to occur in reverse order, or for the interaction to occur simultaneously. The actual effects of these latter two theoretical possibilities would likewise require empirical testing. It is, however, suspected that the effects might be lesser if the sequence is reversed but strongest when both types of attitudinal cognitive dissonance are activated simultaneously (particularly if both of these complement each other and work in unison to drive linked attitudes in the same direction).

Use of the FCD framework for food and nutrition research

The FCD framework may be generally used in any food and nutrition study that is interested in understanding how cognitive dissonance can influence food-related attitudes, whether positively or negatively. The ultimate goal is to harness that understanding to guide and inform efforts in influencing positive dietary attitudes and behaviours. In this regard, the framework provides an alternative, unique and novel perspective in studying the effects of food-related cognitive dissonance on food-related attitudes via the latter's structural pathways and/or properties. Some considerations in the use of the FCD framework are discussed herewith.

1. Cognitive dissonance arousal – triggering it and measuring it

As discussed, the cognitive dissonance process entails cognitive dissonance arousal and cognitive dissonance resolution. For food-related research that are interested in examining cognitive dissonance as a focal construct, with regards to cognitive dissonance arousal, it is important to pay careful attention to (1) referencing established protocols in the arousal of cognitive dissonance (i.e., cognitive paradigms), and (2) ensuring that the actual

cognitive dissonance aroused thereafter is formally and explicitly assessed. Whilst mainstream cognitive dissonance research has generally been adept at the former, with a few having attempted the latter, *cognitive dissonance research in the food-related domain have been relatively inadequate in both* (Ong et al., in press).

In focusing and elaborating on the arousal portion of the cognitive dissonance process, the proposed FCD framework not only serves to distinguish the use of cognitive dissonance paradigms to arouse cognitive dissonance (i.e., cognitive paradigms) from the explicit measurement of actual cognitive dissonance aroused itself, but it also particularly provides a blueprint for the latter in terms of what should be assessed. Indeed, assessing both intra- and inter-attitudinal cognitive dissonance, along with the sub-components of cognitive discrepancy and dissonance within each, allows for potential interaction effects between the two to be explored and discovered. For example, at a superordinate attitude object level, by reminding an individual that he/she has not been eating healthily despite his/her belief in doing so (*Intra-FCD*) and highlighting that he/she has compromised health for something less consequential such as convenience (*Inter-FCD*; e.g., Connors et al., 2001; Dave, An, Jeffery, & Ahluwalia, 2009; Sijtsema, Jesionkowska, Symoneaux, Konopacka & Snoek, 2012), we could examine if the intra- and inter-attitudinal dimensions of food-related cognitive dissonance would work in unison to direct change towards health and away from convenience. The potential of cumulative benefits would be tested in this instance. Intra- and inter-attitudinal cognitive discrepancies can also realistically occur in opposite directions simultaneously. For example, at a subordinate attitude objective level, individuals who place a premium on taste but nonetheless opt for a less tasty food choice based on its health benefits (*Inter-FCD*), only to be told subsequently that the food is not as healthy as they had been led to believe (*Intra-FCD*; e.g., Goldberg & Sliwa, 2011; Patterson, Satia, Kristal, Neuhouser & Drewnowski, 2001). Determining which attitude is least resistant to change

under such circumstances, and hence, the net result(s) of opposing structural food-related cognitive dissonance, have important implications, particularly for the design and implementation of effective dietary attitude change interventions (e.g., food and/or food-related health/nutrition communication). Hitherto attempts at direct measurement of cognitive dissonance (or a proxy thereof) have largely been in terms of self-rating reports (e.g., Festinger, 1957; Elliot & Devine, 1994; Sweeney et al., 2000; Rothgerber, 2014; Onwezen & van der Weele, 2016) although a neural mode of assessment has recently been suggested (Izuma, Matsumoto, Murayama, Samejima, Sadato & Matsumoto, 2010); both of these present possible direct means of measuring the novel cognitive dissonance constructs within the FCD framework.

Additionally, it should be noted that the differential application of distinct cognitive dissonance paradigms (see Table 1) could have different consequences, *ceteris paribus*.

Insert Table 1 here

Although almost all of the food-related studies reviewed by Ong et al. (in press) did not explicitly cite the specific cognitive dissonance paradigm(s) used in their manipulation of cognitive dissonance arousal[6], some semblance of what these might be could be inferred from, and for, at least some of the studies. In food-related consumer behaviour research, cognitive dissonance appeared to be almost always aroused *via* the *belief disconfirmation* paradigm, particularly in expectancy-disconfirmation studies (e.g., Behrens, Villanueva, & da Silva, 2007; Schifferstein, Kole & Mojet, 1999) where individuals had been generally shown to react to discrepant food or food-related (characteristics) information by assimilating these into prior knowledge as a means of dissonance resolution. Albarracín et al. (2003) seemed to

[6] With the exception of Cao et al. (2014) – see Ong et al. (in press) for details.

418 have used the *induced compliance* paradigm in nutrition communication to a somewhat
419 similar effect. Specifically, participants in the study who were exposed to an abstinence
420 message regarding an alcohol-like beverage, expressed higher intentions to use the product
421 after consuming the drink compared to those who were exposed to a moderate-use message.
422 In contrast, Stellefson et al. (2006) used the *hypocrisy* paradigm to highlight the discrepancy
423 between individuals' statements about the importance of physical exercise and good dietary
424 habits to maintaining physical health or appearance, and knowledge of their actual health
425 behaviours in these two areas (amongst other variables); however, they found no cognitive
426 dissonance effects on influencing intentions to engage in either health behaviours. In all these
427 studies, the arousal of cognitive dissonance occurred intra-attitudinally. Of the 14 food-
428 related studies reviewed by Ong et al. (in press), inter-attitudinal cognitive dissonance arousal
429 was clearly evident primarily in a meat consumption study by Rothgerber (2014) who found a
430 tendency amongst meat eaters to sustain their meat consumption behaviour through selective
431 cognitive modification after being exposed to vignettes depicting various types of vegetarians.
432 The method of cognitive dissonance arousal was, however, indiscernible within the
433 parameters of any of the established cognitive dissonance paradigms, coming marginally
434 close only to an atypical version of belief disconfirmation at best.

435 Given thus, it would be instructive to systematically explore the application of the
436 various cognitive dissonance paradigms in terms of their precise effects on the arousal of
437 food-related cognitive dissonance, particularly in relation to the latter's distinct structural
438 dimensions as proposed in the FCD framework. A systematic study as such, along with
439 noting the precise circumstances under which food-related cognitive dissonance emerge,
440 might possibly facilitate efforts to appropriately match paradigms to intra- and/or inter-
441 attitudinal dimensions of food-related cognitive dissonance to attain optimal food-related
442 attitude change outcomes. For example, even though Albarracín et al.'s (2003) study implies

that the induced compliance paradigm would lead to the maintenance of an existing negative dietary behaviour, the same paradigm has been used as the premise of a clinical, dissonance-based intervention to help individuals with body-image concerns keep potential dysfunctional eating at bay (e.g., Stice, Mazotti, Weibel & Agras, 2000; Stice, Rohde, Durant & Shaw, 2012). This example serves to reiterate the fact that careful thought must be given to how cognitive dissonance is created or aroused, as this might influence the mode of dissonance resolution undertaken subsequently.

2. Attitude strength

It is important to identify and select attitudes that are powerful drivers of behaviours and cognition rather than those that are "minimally consequential" (Bizer & Krosnick, 2001, p. 566). The former are, however, often strong attitudes that are hard to change, while the latter are often weak attitudes that are relatively easy to change. This is what has come to be known as *attitude strength* which, in its multi-dimensional form, is determined by the dimensions of extremity, intensity, certainty, importance, knowledge, accessibility, direct experience, latitudes of rejection and non-commitment, and evaluative-cognitive consistency (Krosnick & Smith, 1994); in its simpler, (higher order) bi-dimensional form, it is determined by the dimensions of centrality and commitment (Holland, 2003; Pomerantz, Chaiken & Tordesillas, 1995).

Attitude accessibility, one of the dimensions underlying attitude strength, is an intra-attitudinal structure property that denotes the strength of association between attitude object and its attitudinal evaluation (Fabrigar et al. 2005). Highly accessible attitudes are usually those that have been used or activated frequently, such that "repeated expressions strengthen the associations between objects and evaluations, thereby increasing the ease of retrieval of the evaluation from memory" (Fabrigar et al., 2005, p. 81, citing Fazio, Chen, McDonel & Sherman, 1982, and Powell & Fazio, 1984). Highly accessible attitudes typically, therefore,

engender fast responses to situations that appropriately elicit them, and have been found to be relatively stable over time, and good predictors of behaviour (Schwarz, 2001, citing Fazio, 1995). Such fast computational responses occur particularly when all information that comes to mind is evaluatively consistent (Schwarz & Bohner 2001). Given thus, assuming that an individual has a positive and highly accessible attitude towards consuming fried chicken nuggets, then hypothetically, an appropriately created and channelled intra-attitudinal cognitive discrepancy could be used to disrupt attitude accessibility through the generation of evaluative inconsistency, which in turn, would slow the computational responses (Schwarz & Bohner, 2001) for a more deliberated evaluation (Fabrigar et al., 2005). The subsequent intra-attitudinal dissonance aroused may impact on the latter in terms of driving it in a healthier direction. Such a hypothesis about the underlying cognitive dissonance mechanism may be derived from the FCD framework for empirical testing.

Given that attitude represents an overall evaluative summary of information deriving from affective, behavioural and cognitive bases, attitudes have also been postulated to be acutely accessible when based on information considered as highly diagnostic (i.e., credible evaluative information) by an individual. These commonly include classes of information from across the three bases, such as sensory information about the object, emotional reactions engendered by the object, past behaviour towards the object, and direct experience with the object (Fabrigar et al., 2005; Fazio, 1995). According to researchers (e.g., Fabrigar et al., 2005), some attitudes may be primarily affective-based (i.e., attitude formed mainly from emotional experiences with, or responses to, an attitude object), some primarily behavioural-based (i.e., attitude formed mainly from behavioural experiences with, or responses to, an attitude object) and some primarily cognitive-based (i.e., attitude formed mainly from cognitive experiences with, or responses to, an attitude object). When intra-attitudinal cognitive discrepancy occurs due to cognitive inconsistency between at least two

componential bases (e.g., affective-cognitive – liking junk food despite knowing its unhealthy properties), in which one is the primary basis for the attitude (e.g., affect), cognitive discrepancy reduction in response to intra-attitudinal dissonance might possibly occur through changing one or both of the other two secondary bases (e.g., cognition and/or behaviour) to be in line with the primary base, owing to the cognitive dissonance resolution principle of effecting change via the route of least resistance. The challenge then is to see how cognitive dissonance may be manoeuvred using the FCD framework to target and change the more resistant, negative (and affective-based in the on-going example) food-related attitudes.

Whilst attitude accessibility is an intra-attitudinal structure property, recent research has begun to examine the impact of attitude accessibility across attitude structures (i.e., inter-attitudinal effects of attitude accessibility on two different (but related) attitude objects). It has generally been found that increasing the accessibility of one attitude leads to greater strength and resistance of the related attitude to counter-attitudinal responses in a consistent direction, *ceteris paribus* (Blankenship, Wegener & Murray, 2015). This makes the introduction of the FCD framework timely as it allows for analysis of how intra- and inter-attitudinal cognitive dissonance might be utilized to overcome strong, negative food-related attitudes linked to one another.

Finally, it is important to note that attitude strength generally follows the life stages hypothesis, such that susceptibility to change is highest in the early and late part of an individual's life, which Visser and Krosnick (1998) attributed to factors such as role transitions, changes over time in the meaning linked to particular attitude objects, etc. Thus, an additional challenge for a dissonance-based strategy of attitude change is to effect alteration of unhealthy food attitudes held by individuals in the middle stage of their lives (i.e., young to middle adulthood) when attitude strength is strongest.

3. Explicit vs. implicit attitude

Amongst the many typologies of attitude that researchers have considered in the study of the concept, one that has gained increased, though, comparatively limited, traction in food-related research pertains to the explicit-implicit classification (e.g., Czyzewska, Graham & Ceballos, 2011; Panzone, Hilton, Sale & Cohen, in press). Typically, explicit attitudes have been referred to as evaluations that may be consciously expressed, controlled and thus, directly measureable, and implicit attitudes as evaluations "for which people may not initially have conscious access and for which activation cannot be controlled" (Rydell, McConnell & Mackie, 2008, p. 1526), and thus, only indirectly measurable. With the use of consciousness as distinguishing criterion being in contention (Gawronski, Hofmann & Wilbur 2006), an alternative take on the explicit-implicit distinction, which focuses on underlying principles of information processing, has been suggested. In this instance, explicit attitudes may be seen as declarative, propositional evaluations, which entail deliberate, evaluative judgements on assertions about evaluative properties of specific attitude objects, particularly in terms of truth values (i.e., as being true or false). Implicit attitudes, on the other hand, may be seen as associative evaluations, which entail spontaneous (with little cognitive resources expended), affective reactions to specific attitude objects, independent of the assignment of truth values (Gawronski & Strack, 2004; Gawronski et al., 2006).

Hence, as the cognitive dissonance arousal and resolution processes are inherently propositional, only explicit, but not implicit, attitudes would be subjected to cognitive dissonance effects, including dissonance-based attitude changes, if any (Gawronski & Strack, 2004). Correspondingly, the current proposed FCD framework applies only to explicit attitudinal judgements (i.e., explicit attitudes), but not for implicit evaluative associations (i.e., implicit attitudes). Nonetheless, researchers have studied the idea of *implicit ambivalence*, which is described as the discrepancy between implicit and explicit evaluations of the same

object (Gawronski & Strack, 2012), and found dissonance to result from such a discrepancy. The resultant dissonance induced greater cognitive processing of attitude object relevant information (Rydell et al., 2008) apparently as an explicit discrepancy reduction strategy. How this phenomenon works its way into the current proposed FCD framework remains a work-in-progress, particularly since there is ambiguity surrounding the notion of ambivalence. Typically, attitudinal ambivalence is said to have occurred "when there is evaluative tension associated with one's attitude because the summary includes both positive and negative evaluations" (Fabrigar et al., 2005, p. 84, citing Kaplan, 1972, Scott, 1969, and Thompson, Zanna & Griffin, 1995). Explicit attitude forms the base of such a typical definition of attitudinal ambivalence, which has also been referred to as explicit ambivalence (Gawronski & Strack, 2012), and noted to be an intra-attitudinal phenomenon (Fabrigar et al., 2005). The involvement of implicit and explicit attitudes in implicit ambivalence, however, seem to suggest that this latter ambivalence is inter-attitudinal in nature, as akin to the notion of dual attitude structures (Wilson, Lindsey & Schooler, 2000).

Future Directions and Conclusion

The proposed FCD conceptual framework presented in this paper represents an initial basic step towards facilitating a systematic approach to the study of cognitive dissonance in food and nutrition, particularly in terms of how food-related cognitive dissonance might impact on food-related attitudes. It specifically focuses on understanding the dissonance arousal process, which has hitherto been inadequately studied (Ong et al., in press), in order to facilitate an understanding of the subsequent dissonance resolution process that includes attitude change. Through integrating insights from the literature on cognitive dissonance and attitude, in the context of food and nutrition, the FCD framework presents a novel, structural perspective of food-related cognitive dissonance that would, hopefully, contribute to, and enhance, both of these understandings. With a view to eventually utilize the proposed FCD

conceptual framework to guide the development of dissonance-based strategies to influence positive dietary attitudes (and thus behaviours), future research work in this area should focus on testing, and fine-tuning, some of the basic assumptions and features of the proposed framework, as discussed here. As the FCD framework focuses on the arousal portion of the cognitive dissonance process, deriving the resolution portion of the process based on the basics of the framework could be part of such efforts to complete and close the loop. Ultimately, the establishment of a systematic explanation of cognitive dissonance effects in food-related attitudes would, in turn, improve the construct's application precision in changing dietary patterns towards health and aid in the development of effective nutrition programmes in public health promotion.

References

Aikman, S.N., Crites, S.L., Jr., & Fabrigar, L.R. (2006). Beyond affect and cognition: Identification of the informational bases of food attitudes. *Journal of Applied Social Psychology*, *36*(2), 340-382.

Albarracín, D., Cohen, J. B., & Kumkale, G. T. (2003). When communications collide with recipients' actions: Effects of post-message behaviour on intentions to follow the message recommendation. *Personality and Social Psychology Bulletin*, 29: 1-12.

Aronson, E. (1968). Dissonance theory: Progress and problems. In R. P. Abelson, E. Aronson, W. J. McGuire, T. M. Newcomb, M. J. Rosenberg, & P. H. Tannenbaum (Eds.), *Theories of cognitive dissonance: A sourcebook* (pp. 5-27). Chicago: Rand McNally.

Aronson, E., Fried, C., & Stone, J. (1991). Overcoming denial and increasing the intention to use condoms through the induction of hypocrisy. *American Journal of Public Health*, *81*, 1636–1638.

Aronson, E., & Mills, J. (1959). The effect of severity of initiation on liking for a group. *Journal of Abnormal and Social Psychology*, *59*, 177–181.

Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological Bulletin*, *120*(3), 338–375.

Behrens, J. H., Villanueva, N. D. M., & da Silva, M. A. A. P. (2007). Effect of nutrition and health claims on the acceptability of soyamilk beverages. *International Journal of Food Science and Technology*, 42: 50-56.

Bergmann, I., von der Heidt, T, & Maller, C. (2010). Cognitive dissonance and individuals' response strategies as a basis for audience segmentation to reduce factory farmed meat consumption. In R. Russell-Bennett, and S. Rundle-Thiele, (Eds.) *Connecting Thought*

603 *and Action: Proceedings of the 2010 International Nonprofit & Social Marketing (INSM)*
604 *Conference, Brisbane, Australia* (pp. 32-35). Lismore, NSW: ePublications@SCU.
605 Bernard, M. M., Maio, G. R., & Olson, J. M. (2003). The vulnerability of values to attack:
606 Inoculation of values and value-relevant attitudes. *Personality and Social Psychology*
607 *Bulletin*, *29*(1), 63–75.
608 Berndsen, M., & van der Pligt, J. (2004). Ambivalence towards meat. *Appetite*, *42*(1), 71-78.
609 Bizer, G. Y., & Krosnick, J. A. (2001). Exploring the structure of strength-related attitude
610 features: The relation between attitude importance and attitude accessibility. *Journal of*
611 *Personality and Social Psychology*, *81*(4), 566-586.
612 Blankenship, K. L., Wegener, D. T., & Murray, R. A. (2015). Values, inter-attitudinal
613 structure, and attitude change: Value accessibility can increase as a related attitude's
614 resistance to change. *Personality and Social Psychology Bulletin*, *41*(12), 1739-1750.
615 Breckler, S. J. (1984). Empirical validation of affect, behaviour and cognition as distinct
616 components of attitude. *Journal of Personality and Social Psychology*, *47*(6), 1191-1205.
617 Brehm, J.W. (1956). Postdecision changes in the desirability of alternatives. *Journal of*
618 *Abnormal and Social Psychology*, *52*, 384–389.
619 Cao, Y., Just, D. R., & Wansink, B. (2014). Cognitive dissonance, confirmatory bias and
620 inadequate information processing: evidence from experimental auctions. Paper presented
621 at the Agricultural & Applied Economic Association's AAEA/EAAE/CAES Joint
622 Symposium: Social Networks, Social Media and the Economics of Food 2014, Montreal,
623 Canada.
624 Cao, Y., Just, D. R., Turvey, C., & Wansink, B. (2015). Existing food habits and recent
625 choices lead to disregard of food safety announcements. *Canadian Journal of Agricultural*
626 *Economics*, *63*, 491-511.

627 Carlsmith, J. M., & Aronson, E. (1963). Some hedonic consequences of the confirmation and
628 disconfirmation of expectations. *Journal of Abnormal and Social Psychology*, *66*(2), 151-
629 156.
630 Cong, L. C., Olsen, S. O., & Tuu, H. H. (2013). The roles of ambivalence, preference conflict
631 and family identity: A study of food choice among Vietnamese consumers. *Food Quality*
632 *and Preference*, 28(1), 92-100.
633 Connors, M. Bisogni, C. A., Sobal, J., & Devine, C. M. (2001). Managing values in personal
634 food systems. *Appetite*, *36*(3), 189-200.
635 Contento, I. R. (2012). Nutrition Education: Linking Research, Theory, and Practice (2nd ed.).
636 Sudbury, MA: Jones & Bartlett Publishers.
637 Cooper, J., & Fazio, R. H. (1984). A new look at dissonance theory. In L. Berkowitz (Ed.),
638 *Advances in experimental social psychology* (pp. 229–266). Orlando, FL: Academic Press.
639 Czyzewska, M., Graham, R., & Ceballos, N. A. (2011). Explicit and implicit attitudes to food.
640 In V. R. Preedy, R. R. Watson, & C. R. Martin (Eds.), International handbook of
641 behaviour, diet and nutrition. New York, NY: Springer Publishing.
642 Dave, J. M., An, L. C., Jeffery, R. W., & Ahluwalia, J. S. (2009). Relationship of attitudes
643 toward fast food and frequency of fast-food intake in adults. *Obesity*, *17*(6), 1164-1170.
644 Dinauer, L. D., & Fink, E. L. (2005). Interattitude structure and attitude dynamics: A
645 comparison of the hierarchical and Galileo spatial-linkage models. *Human*
646 *Communication Research*, *31*(1), 1-32.
647 Dreezens, E., Martijn, C., Tenbult, P., Kok, G., & de Vries, N. K. (2005a). Food and values:
648 An examination of values underlying attitudes toward genetically modified- and
649 organically grown food products. *Appetite*, *44*(1), 115–122.
650 Dreezens, E., Martijn, C., Tenbult, P., Kok, G., & de Vries, N. K. (2005b). Food and the
651 relation between values and attitude characteristics. *Appetite*, *45*(1), 40–46.

652 Eagly, A. H., & Chaiken, S. (1995). Attitude strength, attitude structure and resistance to
653 change. In R.E. Petty, and J.A. Krosnick, *Attitude strength: Antecedents and consequences.*
654 *Ohio State University series on attitudes and persuasion* (Vol. 4). Hillsdale, NJ: Lawrence
655 Erlbaum Associates, Inc.
656 Eagly, A. H., & Chaiken, S. (1998). Attitude structure and function. In D.T. Gilbert, S.T.
657 Fiske, and G. Lindzey, *The Handbook of Social Psychology* (4th ed., pp. 269-322).
658 McGraw-Hill: New York.
659 Elliot, A. J., & Devine, P. G. (1994). On the motivational nature of cognitive dissonance:
660 Dissonance as psychological discomfort. *Journal of Personality and Social Psychology*,
661 *67*(3), 382-394.
662 Fabrigar, L. R., MacDonald, T. K., & Wegener, D. T. (2005). The structure of attitudes. In D
663 Albarracín, B. T., Johnson, & M. P. Zanna (Eds.), *The Handbook of Attitudes* (pp. 79-124).
664 Abingdon, UK: Routledge.
665 Fabrigar, L. R., & Wegener, D. T. (2010). Attitude structure. In R. F. Baumeister, & E. J.
666 Finkel, (Eds.). *Advanced social psychology: The state of the science* (pp. 177-216). New
667 York: Oxford University Press.
668 Falk, L., Bisognit, C., & Sobal, J. (1996). Food choice processes of older adults: A qualitative
669 investigation. *Journal of Nutrition Education*, *28*(5), 257-265.
670 Fazio, R.H. (1995). Attitudes as object-evaluation associations: Determinants, consequences,
671 and correlates of attitude accessibility. In R.E. Petty & J.A. Krosnick (Eds.), *Attitude*
672 *strength: Antecedents and consequences* (pp. 247–282). Hillsdale, NJ: Erlbaum.
673 Fazio, R. H., Chen, J., McDonel, E. C., & Sherman, S. J. (1982). Attitude accessibility,
674 attitude behavior consistency, and the strength of the object-evaluation association.
675 *Journal of Experimental Social Psychology*, *18*(4), 339-357.

676 Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford, CA: Stanford University
677 Press.
678 Festinger, L., & Carlsmith, J.M. (1959). Cognitive consequences of forced compliance.
679 *Journal of Abnormal and Social Psychology*, 58, 203–210.
680 Festinger, L., Riecken, H. W., & Schachter, S. (1956). *When prophecy fails*. Minneapolis:
681 University of Minnesota Press.
682 Freijy, T., & Kothe, E. J. (2013). Dissonance-based interventions for health behaviour change:
683 A systematic review. *British Journal of Health Psychology*, *18*(2), 310-337.
684 Furst, T., Connors, M., Bisogni, C., Sobal, J., & Falk, L. (1996). Food choice: A conceptual
685 model of the process. *Appetite*, *26*(3), 247-265.
686 Gaspar, R., Luís, S., Seibt, B., Lima, M. L., Marcu, A., Rutsaert, P., Fletcher, D., Verbeke,
687 W., & Barnett, J. (2016). Consumers' avoidance of information on red meat risks:
688 Information exposure effects on attitudes and perceived knowledge. *Journal of Risk*
689 *Research*, *19*(4), 533-549.
690 Gawronski, B. (2012). Back to the future of dissonance theory: Cognitive consistency as a
691 core motive. *Social Cognition*, *30*(6), 652-668.
692 Gawronski, B., Hofmann, W., & Wilbur, C. J. (2006). Are "implicit" attitudes unconscious?
693 *Consciousness and Cognition*, *15*(3), 485-499.
694 Gawronski, B., & Strack, F. (2004). On the propositional nature of cognitive consistency:
695 Dissonance changes explicit, but not implicit attitudes. *Journal of Experimental*
696 *Psychology*, *40*(4), 535-542.
697 Gawronski, B., & Strack, F. (2012). Cognitive consistency as a basic principle of social
698 information processing. In B. Gawronski, & F. Strack (Eds.), *Cognitive consistency: A*
699 *fundamental principle in social cognition* (pp. 1-16). New York, NY: Guilford
700 Publications.

Goldberg, J. P., & Sliwa, S. A. (2011). Getting balanced nutrition messages across communicating actionable nutrition messages: Challenges and opportunities. Symposium on Nutrition: Getting the balance right in 2010. Proceedings of the Nutrition Society, 70, 26-37. A meeting of the Nutrition Society hosted by the Irish Section was held at the University of Ulster, Coleraine, 16-18 June 2010.

Greenwald, A. G. (1982). Is anyone in charge? Personalysis versus the principle of personal unity. In J. Suls (Ed.), *Psychological perspectives on the self*: Vol. 1 (pp. 151-181). Hillsdale, NJ: Erlbaum.

Hamilton-Ekeke, J. T., & Thomas, M. (2011). Teaching/learning methods and students' classification of food items. *Health Education*, *111*(1), 66-85.

Hammons, M. E. (2010). Examining the hypocrisy paradigm as an intervention for modifying high-risk alcohol use behaviours among college students. Doctoral Dissertation. Retrieved from http://etd.fcla.edu/CF/CFE0003237/Hammons_Mary_E_201008_PhD.pdf

Harmon-Jones, E. (2002). A cognitive dissonance theory perspective on persuasion. In J. P. Dillard, and M. W. Pfau (Eds.), *The Persuasion Handbook: Developments in Theory and Practice* (pp. 99-116). Thousand Oaks, CA: Sage Publications Inc.

Harmon-Jones, E., & Harmon-Jones, C. (2007). Cognitive dissonance theory after 50 years of development. *Zeitschrift für Sozialpsychologie*, *38*(1), 7-16.

Harmon-Jones, E.,& Mills, J. (1999). *Cognitive dissonance: Progress on a pivotal theory in social psychology*. Washington, DC: American Psychological Association.

Hauser, M., Jonas, K., & Riemann, R. (2011). Measuring salient food attitudes and food-related values. An elaborated, conflicting and interdependent system. *Appetite*, *57*(2), 329-38.

Hjelmar, U. (2011). Consumers' purchase of organic food products. A matter of convenience and reflexive practices. *Appetite*, 56: 336-344.

726 Holland, R. (2003). *On the structure and consequences of attitude strength.* Unpublished
727 doctoral dissertation, University of Nijmegen, the Netherlands.
728 Homer, P. M., & Kahle, L. R. (1988). A structural equation test of the value-attitude-
729 behaviour hierarchy. *Journal of Personality and Social Psychology*, *54*(4), 638-646.
730 Izuma, K., Matsumoto, M., Murayama, K., Samejima, K., Sadato, N., & Matsumoto, K.
731 (2010). Neural correlates of cognitive dissonance and choice-induced preference change.
732 Proceedings of the National Academy of Sciences of the United States of America,
733 *107*(51), 22014-22019.
734 Kaplan, K. J. (1972). On the ambivalence-indifference problem in attitude theory and
735 measurement: A suggested modification of the semantic differential technique.
736 *Psychological Bulletin*, *77*(5), 361-372.
737 Krosnick, J. A., & Smith, W. R. (1994). Attitude strength. In V. S. Ramachandran (Ed.),
738 *Encyclopedia of Human Behaviour* (pp. 279-289). San Diego, CA: Academic Press.
739 Lea, E., & Worsley, A. (2002). The cognitive contexts of beliefs about the healthiness of
740 meat. *Public Health Nutrition*, *5*(1), 37-45.
741 Littlejohn, S. W., & Foss, K. A. (2005). Theories of human communication (8th ed.).
742 Thomson/Wadsworth, Belmont, CA.
743 Luzar, E. J., & Cosse, K. J. (1998). Willingness to pay or intention to pay: The attitude-
744 behaviour relationship in contingent valuation. *Journal of Socio-Economics*, *27*(3), 427-
745 444.
746 Maio, G. R., & Olson, J. M. (1994). Value-attitude-behavior relations: The moderation role
747 of attitude functions. *British Journal of Social Psychology*, *33*(3), 301–312.
748 Maio, G. R., Olson, J. M., Bernard, M. M., & Luke, M. A. (2003). Ideologies, values,
749 attitudes, and behavior. In J. Delamater (Ed.), Handbook of social psychology (pp. 283–
750 308). New York: Kluwer Academic/Plenum Publishers.

751 Metin, I., & Metin-Camgoz, S. (2011). The advances in the history of cognitive dissonance
752 theory. *International Journal of Humanities & Social Science*, *1*(6), 131-137.
753 Minami, M. (2009). Role of attitude in multicultural counselling competency. *World Cultural*
754 *Psychiatry Research Review*, *4*(1), 39-46.
755 Nestle, M., Wing, R., Birch, L., DiSogra, L., Drewnowski, A., Middleton, S., Sigman-Grant,
756 M., Sobal, J., Winston, M., and Economos, C. (1998). Behavioural and social influences
757 on food choice. *Nutrition Reviews*, 56: S50-S74.
758 Nordvall, A. C. (2014). Consumer cognitive dissonance behaviour in grocery shopping.
759 *International Journal of Psychology and Behavioural Sciences*, *4*(4), 128-135.
760 O'Keefe, D. J. (2002). Persuasion: Theory and research (2nd ed.). Thousand Oaks, CA: Sage.
761 Olson, J. C., & Dover, O. A. (1979). Disconfirmation of consumer expectations through
762 product trial. *Journal of Applied Psychology*, 64: 179-189.
763 Ong., A. S. J., Frewer, L. J., & Chan, M. Y. (in press). Cognitive dissonance in food and
764 nutrition: A Review. *Critical Reviews in Food Science and Nutrition*. DOI:
765 10.1080/10408398.2015.1013622.
766 Onwezen, M. C., & van der Weele, C. N. (2016). When indifference is ambivalence:
767 Strategic ignorance about meat consumption. *Food Quality & Preference*, *52*, 96-105.
768 Panzone, L., Hilton, D., Sale, L., & Cohen, D. (in press). Socio-demographics, implicit
769 attitudes, explicit attitudes, and sustainable consumption in supermarket shopping. *Journal*
770 *of Economic Psychology*. DOI: 10.1016/j.joep.2016.02.004
771 Patterson, R. E., Satia, J. A., Kristal, A. R., Neuhouser, M. L., & Drewnowski, A. (2001). Is
772 there a consumer backlash against the diet and health message? *Journal of the American*
773 *Dietetic Association*, *101*(1), 37-41.
774 Pomerantz, E. M., Chaiken, S., and Tordesillas, R. S. (1995). Attitude strength and resistance
775 processes. *Journal of Personality and Social Psychology*, *69*(3), 408-419.

776 Povey, R., Wellens, B., & Conner, M. (2001). Attitudes towards following meat, vegetarian
777 and vegan diets: An examination of the role of ambivalence. *Appetite*, *37*(1), 15-26.
778 Powell, M. C., & Fazio, R. H. (1984). Attitude accessibility as a function of repeated
779 attitudinal expression. *Personality and Social Psychology Bulletin*, *10*(1), 139-148.
780 Riketta, M. (2000). Discriminative validation of numerical indices of attitudes ambivalence.
781 *Current Research in Social Psychology*, *5*(5), 63-83.
782 Rohan, M. J. (2000). A rose by any name? The value construct. Personality and Social
783 Psychology Review, 4(3), 255–277.
784 Rohde, P., Auslander, B. A., Shaw, H., Raineri, K. M., Gau, J. M., & Stice, E. (2014).
785 Dissonance-based prevention of eating disorder risk factors in middle school girls: Results
786 from two pilot trials. *International Journal of Eating Disorders*, 47: 483-494.
787 Rokeach, M. (1968). *Beliefs, attitudes, and values: A theory of organization and change.* San
788 Francisco: Jossey-Bass.
789 Rokeach, M. (1973). *The nature of human values*. New York: Free Press.
790 Rothgerber, H. (2014). Efforts to overcome vegetarian-induced dissonance among meat
791 eaters. *Appetite*, 79: 32-41.
792 Rydell, R. J., McConnell, A. R., & Mackie, D. M. (2008). Consequences of discrepant
793 explicit and implicit attitudes: Cognitive dissonance and increased information processing.
794 *Journal of Experimental Social Psychology*, *44*(6), 1526-1532.
795 Schifferstein, H. N. J., Kole, A. P. W., & Mojet, J. (1999). Asymmetry in the disconfirmation
796 of expectations for natural yogurt. *Appetite*, 32: 307-239.
797 Schwartz, S. H. (1992). Universals in the content and structure of values: Theoretical
798 advances and empirical tests in 20 countries. In M. P. Zanna, Advances in experimental
799 social psychology (Vol. 25) (pp. 1–65). Waterloo: Academic Press, Inc.

Schwartz, S. H. (2012). An overview of the Schwartz theory of basic values. *Online Readings in Psychology and Culture*, *2*(1). http://dx.doi.org/10.9707/2307-0919.1116

Schwarz, N., & Bohner, G. (2001). The construction of attitudes. In A. Tesser, and N. Schwarz (Eds.), *Blackwell handbook for social psychology: Intraindividual processes* (pp. 436-457). Blackwell Publishers Inc., Malden, MA.

Scott, W. A. (1969). Structure of natural cognitions. *Journal of Personality and Social Psychology*, *17*(4), 261-278.

Shepherd, R. (1999). Social determinants of food choice. *Proceedings of the Nutrition Society*, *58*(4), 807–812.

Sijtsema, S. J., Jesionkowska, K., Symoneaux, R., Konopacka, D., & Snoek, H. (2012). Perceptions of the health and convenience characteristics of fresh and dried fruits. *LWT – Food Science & Technology*, *49*(2), 275-281.

Smith, M. B. (1947). The personal setting of public opinions: A study of attitudes toward Russia. *Public Opinion Quarterly*, *11*(4), 507-523.

Steele, C. M., & Liu, T. J. (1983). Dissonance processes as self-affirmation. *Journal of Personality and Social Psychology*, *45*(1), 5-19.

Stellefson, M., Wang, Z-M., & Klein, W. (2006). Effects of cognitive dissonance on intentions to change diet and physical activity among college students. *American Journal of Health Studies*, 21: 219-227.

Stice, E., Mazotti, L., Weibel, D., & Agras, W. S. (2000). Dissonance prevention program decreases thin-ideal internalization, body dissatisfaction, dieting, negative affect, and bulimic symptoms: A preliminary experiment. *Journal of Eating Disorders*, 27: 206-217.

Stice, E., Rohde, P., Durant, S., & Shaw, H. (2012). A preliminary trial of a prototype internet dissonance-based eating disorder prevention program for young women with body image concerns. *Journal of Consulting and Clinical Psychology*, 80: 907-916.

825 Stienstra, J., Ruelle, H., & Bartels, G. (2002). A closer look at eleven years of environment
826 perception through laddering. In G. Bartels, and W. Nelissen (Eds.), *Marketing for*
827 *sustainability: Towards transactional policy-making*. Amsterdam: IOS Press.
828 Sweeney, J. C., Hausknecht, D., & Soutar, G. N. (2000), Cognitive dissonance after purchase:
829 A multidimensional scale. *Psychology & Marketing*, *17*(5), 369-385.
830 Thøgersen, J., & Ölander, F. (2002). Human values and the emergence of a sustainable
831 consumption pattern: A panel study. *Journal of Economic Psychology*, *23*(5), 605–630.
832 Thompson, M. M., Zanna, M. P., & Griffin, D. W. (1995). Let's not be indifferent about
833 (attitudinal) ambivalence. In R. E. Petty, & J. A. Krosnick (Eds.), *Attitude strength:*
834 *Antecedents and consequences* (pp. 361-386). Mahwah, NJ: Erlbaum.
835 Tian, Q., Hilton, D., & Becker, M. (2016). Confronting the meat paradox in different cultural
836 contexts: Reactions among Chinese and French participants. *Appetite*, *96*, 187-194.
837 Verplanken, B., & Holland, R. W. (2002). Motivated decision making: Effects of activation
838 and self-centrality of values on choices and behaviour. *Journal of Personality and Social*
839 *Psychology*, *82*(3), 434-447.
840 Visser, P. S., & Krosnick, J. A. (1998). Development of attitude strength over the life cycle:
841 Surge and decline. *Journal of Personality and Social Psychology*, *75*(6), 1389-1410.
842 Wilson, T. D., Lindsey, S., & Schooler, T. Y. (2000). A model of dual attitudes.
843 *Psychological Review*, *107*(1), 101-126.
844 Worsley, A. (2002). Nutrition knowledge and food consumption: Can nutrition knowledge
845 change food behaviour? *Asia Pacific Journal of Clinical Nutrition*, 11(Suppl): S579-S585.
846 Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences. *American*
847 *Psychologist*, *35*(2), 151-175.