

**‘Dealing’ with Complexity:
Construction and Analysis of a Card Based
Communication Tool for Patients with Obesity**

by

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ABSTRACT

Clinical communication tools have been used as aids in the treatment of diseases such as diabetes and cancer but not obesity. The objective of this project was to create and test a card based communication tool for use between patients with obesity and health care practitioners.

A total of 64 cards were developed based on summaries of the complex set of factors associated with obesity and various survey tools. Subjects participated in either semi-structured interviews or a focus group where they sorted through the deck and selected statements they identified with, followed by a recorded discussion of the activity.

Age was negatively associated with the number of cards selected. Qualitative analysis revealed several patterns in participant preference for using the tool (e.g. communication with a healthcare practitioner or monitoring progress). These results will aid in refining the tool and provide some practical information to healthcare practitioners on communication around obesity.

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1: INTRODUCTION

1.1 Overview of obesity treatment

Obesity rates have been increasing across all age groups worldwide and has reached epidemic proportions ^{1,2}. The direct economic cost of overweight and obesity in Canada was estimated at \$6.0 billion in 2006 and is projected to rise to \$8 billion in the near future due to increased risk of many associated psychological and physiological health concerns ^{3,4}.

Obesity has emerged from a complex set of biological, social, and environmental variables. The Foresight obesity system map illustrates this complexity with 109 variables and 304 connections between them ⁵. These variables represent the multiple levels of factors associated with obesity, from population to individual level variables. To successfully combat obesity, solutions will likely need to target all of these levels. At the population level, for example, government policy on food production or transportation can influence the population's eating or physical activity behaviour ^{6,7}. Similarly, at the individual level, counselling by healthcare practitioners can lead to increased physical activity and quality of life ⁸, better eating habits ⁹, and prevention of further weight gain ¹⁰.

For any individual, only a subset of these many individual level variables are relevant. Effectively understanding and addressing this subset has proven

difficult, with clinicians often reporting obesity treatment as being “doomed to failure”¹¹, frustrating, and ineffective¹². There is a lot of potential in exploring solutions to obesity at the level of patient-practitioner interactions as so many occur on a regular basis.

1.2 Complexity of behavioural and cognitive treatment

The Canadian Clinical Practice Guidelines on the Management and Prevention of Obesity provide some guidance to clinicians by addressing pharmaceutical, surgical, cognitive, and behavioural treatment or prevention strategies¹³. Many different drugs have been developed and tested as treatment for obesity¹⁴, as well as various forms of bariatric surgery¹⁵. The behavioural and cognitive treatment of obesity is important as it is the least invasive, and at least one study has shown that it may be more successful than pharmacotherapy, especially in maintaining long term weight loss after the treatment has stopped¹⁶. Behavioural treatment can exist on its own, or as an important component of these other treatments¹⁷.

1.2.1 Behavioural treatment

Addressing obesity at the level of the individual through behavioural interventions has been successful even though it is inherently complex due in part to the wide range of possible variables affecting behaviour. Behavioural treatment of obesity helps individuals learn healthy behaviours that will have a positive influence on their eating or physical activity habits. Studies that investigated clinical behavioural treatment of obesity generally involve a

treatment program lasting several months to several years and have found that behavioural therapy can produce significant weight loss that persists after treatment stops. One study had participants' discuss situational control of overeating, the development of diet plans, and exercise management with a therapist ¹⁶. Participants lost a significant amount of weight (9.6 kg on average), and at 1 year follow-up had maintained roughly half of this weight loss. At 3 years follow up, participants still maintained some weight loss, although this was no longer significant ¹⁸. Similarly, another study involving a behavioural intervention lasting 2 years provided participants with "every day" strategies to control their eating behaviour" (e.g. eating at the same place, avoiding TV or shopping while hungry) ¹⁹. Some participants completed an additional 2 years of behavioural counselling and only they maintained their weight loss 8 years later ²⁰. This suggests that the longer the treatment lasts, the longer individuals maintain their weight loss.

The American Clinical Guidelines for the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults reviewed 22 randomized controlled trials incorporating behaviour therapy into obesity treatment ²¹. They concluded that behaviour therapy can produce 10% weight reduction over 4 to 12 months. Interestingly, they also found that no specific behaviour therapy was superior. Rather, behaviour therapies that were "multimodal" worked best.

Various studies and organizations have identified a range of important target variables. Core features of behaviour modification for obesity based on recommendations from the World Health Organization include ²²⁻²⁵:

- self-monitoring
- social skills
- cognitive re-programming (e.g. "abandon undesirable thoughts")
- control of stimuli
- goal setting
- relapse prevention
- changes in eating habits
- positive reinforcement
- dietetics
- changing the environment
- education about physiology
- physical activity

This large range of behaviour related variables suggests that treatment needs to be comprehensive if it is to address a complex problem like obesity.

Interestingly, of all these variables, self-monitoring may be the most important component ^{25, 26} as it raises awareness of behaviours on a regular basis. Through self-monitoring, people establish their own feedback loops, and its significance in treatment illustrates the importance of solutions which respect the complexity of the problem.

1.2.2 Cognitive treatment

Cognitive variables are centred around the idea that the way an individual thinks about themselves and their behaviour, or an event in their life, affects how they respond to it ²⁵. They are another potential target of obesity treatment ²⁴. Similar to behavioural strategies, there is a wide range of possible target variables. In relation to health, negative cognitive elements (or thought patterns) include "magnifying negative aspects", "failing to recognize or minimizing positives", and "dichotomous thinking" ²⁵. Van Dorsten and Lindley discuss several studies involving cognitive therapy for obesity ²⁵. One study evaluating the effectiveness of a short term (10 week) cognitive treatment program for obesity addressed issues such as self-control, stress, emotional eating, and the effect of thoughts on eating ²⁷. Participants in the treatment group lost an average of 8.5 kg over the 10 weeks, and at 18 months post treatment the treatment group had lost an average of 10.4 kg. A follow up study comparing cognitive therapy to behaviour therapy for obesity found that participants in the cognitive therapy group lost a mean of 5.5 kg 18 months after treatment was terminated, while the group receiving behaviour therapy had gained 0.3 kg ²⁸. Although the long term effects of cognitive therapy on weight loss maintenance remain unclear, it is likely an important component to achieving weight loss. Until more research is conducted comparing cognitive and behaviour therapy in the treatment of obesity, both approaches should be used in obesity treatment ²⁴.

This evidence from behavioural and cognitive interventions also supports a chronic disease model of obesity where the disease relapses if and when

treatment stops ¹¹. Most evidence suggests that weight regain does occur when treatment stops, with nearly half of many participants regaining the weight within 5 years ²⁵. Unless behavioural support is continued after the treatment phase, weight regain is likely ¹⁹.

Cognitive therapy has also been explored as a tool to aid in the maintenance of weight loss since the ability to alter an individual's cognition may have an effect which lasts after treatment stops ^{27, 29}. One study investigated this in obese adults. Both a control and treatment group received dietetic behavioural support. The control group received additional physical activity support while the experimental group received cognitive treatment meant to "identify, challenge, and change dysfunctional cognitions concerning eating, control, weight, and shape" ³⁰. Both groups lost similar amounts of weight during treatment, but at 1 year follow up, the control group had gained back 25% of the initial weight loss, while the treatment group that received cognitive therapy maintained their weight loss. More research is needed to fully understand the long term implications of cognitive therapy in obesity treatment, but the results thus far suggest that changing the way patients with obesity think about their condition and their behaviour has the potential to positively influence treatment and long term results beyond what behavioural treatment alone can.

1.2.3 Patient involvement

To maximize the benefit from behavioural and cognitive therapies in obesity treatment, patients should be actively involved in the treatment process. Patients

vary in their preferences to being involved in making decisions about their own treatment, and for a variety of reasons many patients do not want to be involved in making treatment decisions ³¹. Specifically, younger patients, and those with more education and qualifications were more likely to want to participate in treatment oriented discussion surrounding their condition, while those who were older or had less education were more likely to prefer the clinician take a paternalistic role in making these decisions ³¹. The authors suggest that this may be due to poor understanding on the part of the patient as to the value in having them actively participate. Likewise, another study identified some essential elements of patient participation in medical decision making, one of which is making sure that patients understand that there is a degree of "uncertainty" in medical decisions, and that their input is valued ³². Ensuring patients know that their input is important in deciding on treatment is thus an important element to active patient participation.

Healthcare practitioner communication is an important element to successful patient participation in treatment decisions. One study evaluated clinician communication style, participatory decision-making style, and patient understanding in a sample of patients living with diabetes and concluded that patient understanding was the best predictor of self-management ³³. Another study investigated the effect of different patient communication styles on how their physician communicates with them ³⁴. The study found that physicians' communication styles were dependant on how the patient communicated, and that physicians were more likely to use patient centred communication when

patients actively participated. Finally, a study by Matthews *et al.* identified aspects of patient-provider communication that affected adherence to treatment among diabetes patients. Communication with a clinician, knowledge of diabetes, and consequences of poor glycemic control were identified as major factors affecting patient adherence to treatment. The study also found that patients who reported poor communication with their physicians also tended to have poorer adherence to treatment.

It is clear that patient-clinician communication around behavioural and cognitive variables is complex with many different factors playing a role. As many of these elements are relevant to the treatment of obesity, practitioners must be properly equipped if they are to successfully treat obesity. Their capacity, and the capacity of patients, must match the complexity inherent in the management of obesity. Here, and throughout this paper, capacity is defined generally as the ability of an individual to respond to a complex task, whether through cognitive or behavioural mechanisms or external supports.

In general, the evidence suggests that communication and decision making tools which act to increase patient participation and understanding of their disease and treatment will yield positive outcomes. As clinicians may be poor at assessing their patients' preferences³¹ and patient centred communication has been found to be beneficial regarding patient outcomes^{34, 35}, tools which facilitate better communication around the patient's barriers and preferences for treatment will likely yield benefits for both patients and clinicians. Such tools may increase

the capacity of both practitioners and patients to better match the complexity of their disease and treatment. Their capacity may be increased by narrowing in on the most meaningful elements from a broad range of complex target variables. Without such tools, trying to focus on a complex treatment may lead to feelings of “despair” or “retreat”³⁶.

1.3 Decision aids and clinical communication tools

A variety of tools have been developed to facilitate patient participation and improve conversations between patients and practitioners. These tools are beneficial because patients are more likely to adhere to treatment when clinicians and educators openly communicate with patients about their disease³⁵. This is especially true for diseases where the patient is responsible for a large part of the treatment or prevention, such as diseases that require lifestyle modifications. Many forms of treatment are quite simple; a patient may simply have to take a pill once a day. However, when there are many different elements that make up a treatment or prevention strategy, the responsibility on the part of the patient becomes inherently more complex. Increased complexity of diseases and treatment requires higher quality decisions³⁷, and the ability of the clinician to obtain appropriate information from the patient and effectively communicate with the patient becomes even more important and challenging. Patient preferences for specific treatments are not correlated with age, gender, education, or income making it difficult for physicians to make the best decision for a given patient³⁷. In these situations, patient feedback is necessary to make the highest quality decision³⁷. Often this is difficult given the limited time that clinicians spend with

patients, the skill level of the clinician in obtaining this information, and the willingness of the patient to participate.

Clinical decision-making support tools have been developed and used in oncology³⁷ as well as many other fields³⁸. These take a variety of forms, including video³⁹, CD-ROM⁴⁰, as well as a package containing an audio tape, written information, and a list of questions that patients may ask their doctor⁴¹. Davison *et al.* also utilized a card sort exercise to “elicit patients’ preferences for control over treatment decision-making” in men with a recent diagnosis of prostate cancer⁴¹.

In general, decision aids have focused on providing the patient with information on different treatments for a given disease, as well as, their potential outcomes and have mainly been utilized for diseases where treatments are somewhat less complex (e.g. prenatal testing, breast cancer gene screening)³⁸. Often a set number of useful treatments are known, for which there is relatively clear evidence about their effectiveness and outcomes. Although many of these tools exist, they are not widely utilized by clinicians³⁷.

Clinical communication tools differ from decision aids. Both make visits more efficient by providing the clinician with appropriate information they can use to direct the conversation. Communication tools as opposed to decision aids are used when diseases and treatments are more complex and involve a larger lifestyle component and where specific treatment strategies are less well defined. One of these is the Patient-Centred Assessment and Counselling for Exercise

tool ⁴². Here, patients are presented with a series of statements and asked to select those that describe them the best. Using this information, clinicians can talk with patients about their selections and provide an appropriate physical activity program. Another communication and self-management tool was developed for use by patients with diabetes ⁴³. Individuals living with diabetes must deal with many different factors that affect their disease, including many emotional variables that may remain hidden. The Diabetes Cards were developed as part of a design project to address the difficulty some patients with diabetes may have in articulating their specific and individual challenges in managing their disease. They consist of statements constructed from written descriptions of the problems and needs of diabetes patients. In this way, patients are able to develop their own "diabetes care agenda" ⁴³.

An important difference in the reasons for developing decision aids and the reasons for developing communication tools is the complexity of the treatment. Some aspects of disease management have fairly well defined potential outcomes where information about the specific treatments could be beneficial to patients. Other aspects, such as those that incorporate lifestyle elements, are inherently more complex as there are a seemingly infinite number of possible solutions. As such, it is difficult to describe specific treatments to the patient as there is no "one size fits all" approach. In these instances, communication tools which facilitate discussion around the patient's own unique set of variables may be more beneficial.

One obesity focused card based communication tool is currently under development which aims to improve communication between parents of overweight children and clinicians ⁴⁴. Card statements were generated from themes based on several focus groups made up of either parents of overweight children or clinicians involved in obesity treatment. Parents may look through the cards prior to meeting with a healthcare professional and select relevant statements. These cards may then be used in a discussion with a clinician. No such tools have been developed for use with adults and from the patient's perspective.

1.3.1 Card sorts

A deck of cards outlining a range of challenges that individuals with obesity frequently encounter may act as a clinical communication tool and help patients identify variables they find most meaningful and would like to talk about with a healthcare practitioner. Card sorts have a variety of positive characteristics, and have been used successfully in other fields such as palliative medicine ⁴⁵, maternal well-being ⁴⁶, physical activity ⁴⁷, and family caregiving ⁴⁸ for a variety of purposes (e.g. assessing patient concerns or perceptions). When used, they often lead to positive results and when compared alongside other methods have proven more sensitive in obtaining information ⁴⁶.

In palliative care, a card sort tool was developed to assess perceptions of factors associated with the "erosion of dignity" prior to death, and how perceptions of these factors differ for care providers and patients ⁴⁵. Patients and

families filled out an open ended survey, and upon transcription and coding, 18 subthemes were identified which became the cards which subjects would order (stack) from most important to least important. The researchers randomized the deck with each use because participants were more likely to rank the earlier cards higher. Principal components analysis was employed, and the researchers found that six cards explained the majority of the variance. These six cards were administered to clinicians and patients, and again ordered from most important to least important. Interestingly, the two groups had opposing views as to the importance of factors associated with the loss of dignity near death.

Another project developed a card sort to investigate postpartum concerns of women ⁴⁹. A total of 61 cards were created from a literature review and personal experience. Participants sorted the cards into three piles (“interests”, “worries, and “not of concern”). To ensure reliability, several cards essentially had the same statements with different wording (e.g. “feeling on edge” and “feeling nervous and tense”). The degree to which these cards were sorted into the same piles yielded a measure of reliability. Lugina *et al.* used this same tool and compared it to semi-structured interviews ⁴⁶. They found that the card sort tool was more sensitive (defined as “the extent to which outcomes were affected by changes in methods of assessment or input parameters”), although this may have led mothers to have concerns that they did not previously have. Furthermore, the authors noted that the card tool was easier to administer, and required less time than a semi-structured interview.

Finally, the activity card sort tool was developed to assess activity levels in individuals with some cognitive loss, but has since been modified and used with several different populations⁴⁷. One version, the Activity Card Sort – Australia, was developed and validated for use by older Australians⁵⁰. A total of 114 photographic cards were generated from diaries of activities done for a minimum of 30 minutes. This was reduced to 82 after participants rated all activities on a Likert scale according to how often they perceive Australians 65 and older performed that activity and the lowest scoring cards were dropped. This tool has since been validated for use in measuring participation in older Australians.

Neufeld *et al.* described practical considerations to using card sorts in a study on family caregiving and non-support⁴⁸. Several interesting notes they described about developing and using a card sort tool are listed below:

- General statements (i.e. without references to specific people or places) enable more participants to understand and relate to the cards
- Participants were asked to describe their thinking out loud while sorting the cards
- Giving participants an “unclear” pile will aid in eliminating or improving specific cards
- Participants were sometimes confused about where to sort a card if only part of the statement applied to them

- Some participants experienced test anxiety as they felt they were being “tested” and had to be reassured that there were no right or wrong selections
- Some participants became very emotional (crying, anger, hurt, disappointment, sadness) and needed time to recover or talk about certain issues
- Multiple different card sorts using the same deck can be effective in allowing “self-exploration” by participants and an opportunity to improve in their self-knowledge

As a card sort activity can help individuals organize and prioritize variables, it may help increase the capacity of individuals to manage obesity. The process of selecting cards may help individuals sort through the complexity of the problem and identify meaningful variables they wish to address and discuss.

1.4 Variables implicated in patient centred obesity treatment

To engage in meaningful patient centred obesity treatment that targets cognitive and behavioural variables, health practitioners must decide which variables to address. Self-efficacy, binge eating disorder, flexible cognitive restraint of eating, disinhibition, and hunger have been shown in the literature to be appropriate targets in obesity treatment. Addressing them in a clinical setting may help produce lasting health related behaviour change. Additionally, they have widely utilized tools designed to assess them.

1.4.1 Self-efficacy

Many different measures have been explored that relate to health behaviour change in an attempt to provide cognitive or behavioural support to individuals. These include self-efficacy, self-motivation, outcome expectancies, locus of control, social support ⁵¹, self-esteem ⁵², beliefs about the health value, and perceived benefits and barriers ⁵³. Varying results have been obtained for all of these measures, but self-efficacy has been widely utilized and may be the best predictor of weight loss in the realm of eating behaviours ⁵¹. One study also identified self-efficacy as the most significant factor associated with an increase in physical activity ⁵³.

Self-efficacy is defined as an individual's belief in their ability to "master specific activities, situations, or aspects of his or her own psychological and social functioning" ⁵². More generally, self-efficacy is a person's belief in their ability to accomplish something. This definition, taken from Bandura suggests that self-efficacy is behaviour specific ⁵². As such, many different tools have been developed to measure self-efficacy in different contexts. In relation to obesity, self-efficacy tools have been developed for both eating behaviour and physical activity.

Two self-efficacy scales have been developed, validated, and used for eating behaviour: the Eating Self-Efficacy Scale and the Weight Efficacy Lifestyle Questionnaire (WEL) ⁵¹. The Eating Self-Efficacy Lifestyle Questionnaire is a 25 item questionnaire that asks respondents to rate the likelihood that they would

have difficulty in controlling overeating in the 25 different situations that make up the questionnaire ⁵⁴. Participants answer each item from 1 (no difficulty controlling eating) to 7 (most difficulty controlling eating). Some examples of the 25 items include "Overeating after work or school", "Overeating with friends", "Overeating after an argument", and "Overeating while hungry". In the analysis of the tool, the authors found that it assessed two factors, "eating when experiencing negative effect" and "eating during socially acceptable circumstances". In testing, the self-efficacy scores were significantly related to weight loss in participants taking part in a weight loss program.

The WEL ⁵⁵ is another tool used to measure self-efficacy in regards to eating behaviour. It consists of 20 items and asks respondents to rate their "confidence about being able to successfully resist the desire to eat" from 0 (not confident) to 9 (very confident) for each item. Unlike the Eating Self-Efficacy Scale, the WEL assesses 5 factors: negative emotions (e.g. "I can resist eating when I am anxious (nervous)"), availability (e.g. "I can control my eating on the weekends"), social pressure (e.g. "I can resist eating even when I have to say "no" to others"), physical discomfort (e.g. "I can resist eating when I feel physically run down"), and positive activities (e.g. "I can resist eating when I am watching TV"). The initial tool had 40 items and was tested on a sample of patients with obesity enrolled in a 14-session weight loss program. Principal components analysis revealed that 5 components existed, and the 20 item revised version reflects this (having 4 items per component). The tool can be scored globally by combining all 5 components, or each component can be

scored individually. Testing of the WEL was done alongside the Eating Self-Efficacy Scale, and both were found to be significantly correlated in regards to global scores, and scores of similar components ⁵⁵.

The ability of baseline WEL scores to predict subsequent weight loss is questionable ⁵¹. Bas and Donmez found that initial WEL scores were associated with high weight loss in a commercial 20 week weight loss program ⁵². Another study found no association between WEL scores and subsequent weight loss in adult men and women ⁵⁶. Interestingly, a study on African-American women found that higher WEL scores (i.e. greater self-efficacy) before treatment was associated with less weight loss after 6 months of personalized monthly sessions ⁵⁷.

Although the predictive capabilities of the WEL remain unclear, there is good evidence that changes in WEL scores mirror success in weight loss programs. One study found a significant improvement in all 5 components of the WEL in a 26 week very low calorie diet intervention program ⁵⁸. Similarly, another study on a population of adults found that WEL scores significantly increased over the duration of the 18 month behavioural intervention study, and were significantly associated with weight loss ⁵⁹. A study on a sample of female smokers concerned about their weight who underwent 12 1-hour cognitive-behavioural weight control sessions significantly improved their WEL score, which was also associated with improved diet quality, weight loss, improved self-efficacy for quitting smoking, and a reduction in the number of cigarettes smoked

⁶⁰. Finally, Palmeira *et al.* concluded in a study on 142 overweight obese women who participated in a 16-week weight control program that weight management self-efficacy (as measured by the WEL) was the single best correlate to weight reduction ⁶¹. Increasing eating self-efficacy is thus a well established target for treatment ⁶².

There are also a range of tools that exist for measuring self-efficacy as it relates to physical activity, although their use in obesity treatment research is scarce ⁵¹. In general, these all have a similar form, and consist of statements asking the respondent to rate their confidence in their ability to exercise under a number of different situations. These situations, represented by different items in the questionnaire, relate to feelings, time, and both the physical and social environments, among others. A very short exercise self-efficacy measure was developed by Armstrong *et al.* ⁶³. Using a 5 point likert scale, it asks the respondent to rate their confidence in their ability to exercise when feeling sad or highly stressed, when family or social demands are great, and their ability to set aside time to exercise. Another relatively short exercise self-efficacy tool was developed by Marcus *et al.* ⁶⁴. It contains 5 items, and asks participants to rate their confidence in participating in regular exercise when tired, in a bad mood, on vacation, raining or snowing, and when the respondent feels they don't have the time. Finally, a longer exercise self-efficacy questionnaire was developed by Bandura ⁶⁵. It consists of 18 items, many of which are quite similar to the other scales mentioned. Respondents rate each item according to their degree of confidence in performing regular exercise by writing a number from 0 to 100. This

tool was employed and validated in a sample of Korean adults where exercise self-efficacy was negatively correlated with having a chronic disease⁶⁶ and in a population of older adults in a cardiac rehabilitation setting where exercise self-efficacy was correlated with distance in a six minute walk test⁶⁷.

It appears that exercise self-efficacy is quite different from eating self-efficacy, both as a predictive tool and method of assessing success in exercise programs. One study using the 3 item exercise self-efficacy tool developed by Armstrong *et al.* found that baseline exercise self-efficacy was associated with baseline levels of physical activity and with increased physical activity at 4 months post intervention⁵³. However, at 12 months, self-efficacy was no longer associated with increased physical activity. Another study found that exercise self-efficacy was not related to adherence to a physical activity program⁶⁸. Several studies have shown that high exercise self-efficacy may actually have negative effects on exercise adherence. One study⁶⁹ found that self-efficacy decreased as the program was ending, and the authors suggest that this may be because participants knew they would have to exercise on their own⁷⁰. Another study found that past performance was associated with increased self-efficacy, however, self-efficacy may be negatively associated with future performance (i.e. an individual's past success with exercise may increase self-efficacy, but having high self-efficacy to exercise may be detrimental)⁷¹. This has been debated by Bandura and Locke⁷² who argue against the way Vancouver *et al.*⁷¹ interpret their findings, and suggest instead that there is an interaction between self-efficacy and goal setting, and that the negative association between self-efficacy

and performance may have been confounded by participants setting high goals. It is generally accepted that improving exercise self-efficacy over the course of an intervention is beneficial, and can play a role in obesity treatment⁵¹ and health behaviour research^{62, 67}.

1.4.2 Binge eating disorder

Binge eating disorder is prevalent amongst obese persons, and greatly impacts an individual's health and psychological well-being^{73, 74}. As with self-efficacy, baseline binge eating scores are not predictive of weight loss in intervention studies⁵¹. However, there is value in assessing baseline binge eating status. In one study on obese adolescents, binge eating status was related to level of anxiety, depression, and overall psychopathologic distress⁷⁴. In studies on adults, baseline binge eating status was related to depression, weight cycling, perceived barriers to losing weight, psychopathology, higher impulsiveness ratings, depression, food cravings, and greater body dissatisfaction⁷⁵⁻⁷⁷. Although assessing binge eating disorder does not necessarily help predict success in weight loss treatment programs, it is clearly related to many psychopathologic conditions. Many of these conditions impact an individual's ability to make healthy, sustainable behaviour change, making binge eating an important component to assess in obese persons. The presence or absence of binge eating disorder will help determine the type and priorities of treatment.

There are several different methods for measuring the level of binge eating disorder in an individual. Clinical interviews have been used with criteria based off the *Diagnostic and statistical manual of mental disorders*^{77, 78}. The 3 page Questionnaire on Eating and Weight Patterns (QEWP), or elements from it, have also been utilized^{79, 80}. It includes questions about demographics, current and highest historical weight, weight cycling, and specific questions about binges (e.g. frequency, calories consumed, duration). It also includes several questions that assess cognitive elements such as loss of control and feelings of distress about overeating. The Binge Eating Scale (BES)⁸¹ is made up of 16 items consisting of 3 or 4 statements each and asks the respondent to circle the one that best describes “the way you feel about the problems you have controlling your eating behaviour”. It differs from the QEWP as it focuses almost entirely on the cognitive elements associated with binge eating disorder. Each answer has an associated number of points, and the total points correspond to that person’s level of binge eating severity. The scale was validated against interview judged levels of binge eating severity (none, moderate, severe). Mean BES scores for an all female sample were 14.9, 19.6, and 28.9 for each interview judged category. Scores for males in the other sample were similar. All items in the scale showed good internal consistency. The BES is the most popular scale for assessing binge eating disorder⁵¹, and has been used successfully in assessing male and female adolescents and adults^{74, 76, 82}.

1.4.3 Cognitive restraint, disinhibition, and hunger

The 51 question Three Factor Eating Questionnaire (TFEQ), also known as the Eating Inventory, assesses three variables found to be important to the study of individual obesity: cognitive restraint of eating, disinhibition (the loss of inhibition around eating in response to certain stimuli), and hunger⁸³. In reviewing psychological predictors of weight gain, Teixeira states that flexible cognitive restraint, low disinhibition / emotional eating, and less hunger are the most consistent predictors of poor eating behaviour. The TFEQ has been used extensively in behavioural research⁸⁴ and in obesity^{62, 85, 86}.

Cognitive restraint of eating describes an individual's "conscious attempts to monitor and regulate food intake"⁶². In principle, high cognitive restraint should limit consumption, however, there is confusion in the literature regarding whether restraint of eating is something positive or negative⁶². In one study on women who enrolled in weight loss treatment, cognitive restraint was negatively associated with body weight at baseline⁸⁵. As subjects went through weight loss treatment, their restraint increased, indicating a benefit from having high cognitive dietary restraint. However, in another study, men with higher restraint had higher BMI ratings at baseline, with values varying according to gender, personal weight history (with formerly obese women having the highest restraint scores), and current adiposity status⁸⁶. Finally, another study found a significant association between cognitive restraint and BMI among non-obese women⁸⁴.

More recently, cognitive restraint has been divided into flexible cognitive restraint and rigid restraint⁸⁷. Rigid restraint describes an “all-or-nothing” approach to eating behaviour, with individuals often feeling guilty for eating foods they should not have^{84, 87}. Flexible cognitive restraint, on the other hand, is a graduated approach where an individual might minimize consumption of certain foods as opposed to cutting them out of their diet completely or feeling guilty for consuming them^{84, 87}. For example, the statement “When I have eaten my quota of calories, I am usually good about not eating any more” is an item that assesses flexible restraint, while the statement “I count calories as a conscious means of controlling my weight” assesses rigid restraint⁸⁷.

Interestingly, this division of cognitive restraint into flexible and rigid explains many of the observed discrepancies. Higher flexible cognitive restraint is associated with lower BMI, less disinhibition (described below), lower self-reported energy intake, and greater weight reduction over 1 year⁸⁷. Rigid dietary restraint was associated with greater disinhibition, higher BMI, and more frequent binge episodes⁸⁷. The positive effect of flexible cognitive restraint and more negative effects of rigid restraint have also been confirmed elsewhere^{62, 84, 88}. Fortunately, both rigid and flexible cognitive restraint can be assessed through the TFEQ using different items from its cognitive restraint of eating factor⁸⁷.

Disinhibition is a measure of uncontrolled eating in response to certain stimuli (i.e. a loss of eating inhibition)^{62, 86}. Several studies have found that obese individuals have significantly higher levels of disinhibition in both men and

women^{84, 86}. Several intervention studies have found that individuals improve (i.e. lower) their disinhibition with treatment, and this correlates to a reduction in BMI^{62, 85}. It has been suggested that disinhibition is one factor that should be targeted in weight loss interventions⁸⁴.

Level of hunger is the last variable that is assessed by the TFEQ⁸³. This item measures the level of hunger individuals experience in their lives⁶². This factor is especially important in wealthier societies where food is readily available⁸⁶. Several studies have found that obese individuals have a higher level of hunger, especially those who also have high disinhibition^{84, 86}. Counselling that helps individuals deal with high hunger, through behavioural or cognitive mechanisms, may help with the long term treatment of obesity⁸⁴.

1.5 Project rationale

As described, physicians often have difficulty dealing with obesity in a clinical setting. This is problematic as they are able to positively influence patients' health related behaviour by providing patients with some form of behavioural counselling, especially when patients actively participate^{8, 9}. To make conversations between patients and practitioners more specific and meaningful and promote patient participation in obesity treatment, this project created and pilot tested a card based clinical communication tool. By helping patients narrow in on the most meaningful variables, the tool may increase their capacity to address obesity. It was designed to help patients understand the broad range of variables implicated in obesity and to help patients and practitioners focus on a

manageable set of them. It was anticipated the tool might help direct the conversation between patient and healthcare provider to issues relevant to the individual, as opposed to a more generic “one size fits all” discussion of obesity. Tailoring the discussion to the patient’s own unique situation may facilitate better patient centred care ⁸⁹. Specifically, it is anticipated that after pilot testing and refinement, such a communication tool could:

- Make patients more aware of the complex social, biological, and environmental determinants of obesity
- Help patients identify those determinants of obesity that are meaningful to them
- Make clinical visits more efficient and relevant by tailoring discussion to individual patient needs
- Help patients identify modifiable factors to target through treatment or intervention

2: METHODS

This project involved several different methodological processes (Figure 1). As a large portion of the project was qualitative, an appropriate qualitative methodology (interpretive description) was required. Card statements were created using a variety of different sources and methods. Finally, a questionnaire was then developed along with an interview and focus group protocol.

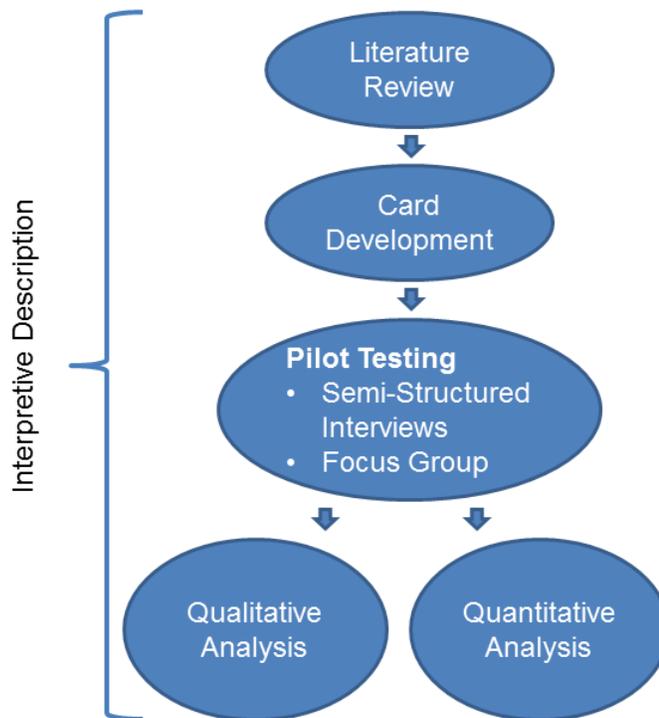


Figure 1 - Outline of Methods

2.1 Interpretive description

Interpretive description, which is a qualitative methodology developed to investigate clinical phenomena, was utilized^{90, 91}. It arose out of frustration from nurse practitioners who have struggled to use methodologies developed in other fields in clinical health research. The prevailing 3 qualitative methodologies include grounded theory (developed in sociology), phenomenology (developed in philosophy), and ethnography (developed in anthropology)⁹². When nurse practitioners attempted to use these methodologies for issues specific to nursing they often chose pieces of each to meet their specific research requirements. This was not encouraged and was viewed as poor research design⁹¹. Interpretive description arose as a result of this in an effort to provide healthcare practitioners with a qualitative methodology which has been developed specifically for the field to gain a better understanding of clinical phenomena^{90, 91}.

In developing an analytic framework for an interpretive description, the researcher must review what is previously known in the area so that it can be built upon⁹¹. This initial framework acts as a starting place and can be modified as needed as the analysis proceeds⁹¹. Theoretical sampling often plays a role in interpretive description and involves sampling from predictable variations in the population to better understand them as opposed to sampling from all variations⁹¹. Extensive interviewing and observation are generally not recommended in an interpretive description⁹¹. Rather, collateral data collection from a variety of available sources is encouraged.

Effective analysis in interpretive description is inductive and uses a coding scheme that is less intense which results from a preliminary review of the data ⁹¹. Deductive analysis, on the other hand, tends to use a pre-determined, detailed, and complex coding scheme ⁹¹. The focus in interpretive description should be on adding to the current knowledge in the area in a way that impacts clinical practice and understanding ^{90, 91}. Likewise, studies which have used interpretive description methodology report their results as a supplement to existing research in a way that tells a story as opposed to some other methodologies which are often more rigid in their coding and do not discuss their findings in the context of existing data ^{90, 91}.

One limitation to interpretive description surrounds the extensive literature review done at the start. This may have introduced bias into the project, especially at the interpretation and discussion stage. To account for this, two researchers reviewed the data and both confirmed coding patterns and interpretation. Additionally, we noted instances where our results confirmed or opposed other research. Finally, major findings of the literature review were presented to provide the reader with the context used to interpret the results.

As with all qualitative research, personal or professional bias is of concern. As it may be impossible to remove all bias, we provided our rationale and corresponding framework to provide readers with the perspective we used to interpret the data ⁹³. Direct quotations, major themes and deviations from them were presented in an attempt to provide an objective view of the data.

Interpretation was separated to ensure that the subjectivity of researchers did not contaminate other sections⁹³.

2.2 Construction of card statements

Card statements were chosen to represent the broad range of factors implicated in obesity at the level of the individual while including cognitive and behavioural variables found to be important in obesity treatment. The Foresight obesity system map was used to construct cards describing individual level variables because it was an excellent overview of many different areas implicated in obesity⁵. All 7 clusters on the map (food production, food consumption, individual physical activity, individual psychology, social psychology, physical activity environment, and physiology) were utilized.

Statements were developed for all 109 variables on the Foresight map. They were worded to describe a problem that an individual might face. For example, the variable “Food Variety” was converted to the statement “I do not try new foods often” while the variable “Cost of Physical Exercise” was converted to “Physical activity is too expensive”. Concurrently, statements which were very broad, did not describe an individual variable, or were out of the control of an individual were excluded. This included variables such as “Force of Dietary Habits” and “Female Employment”. In total, 26 variables (13 of which were from the Physiology Cluster) were not included.

Similar statements were then grouped together to keep the number of statements down to a manageable set. One way of grouping similar statements

together was by the addition of the actual phrasing of each of the individual statements using commas or the word “or”. For example, the variables “Portion Size” and “Rate of Eating” were converted to the statements “I generally put too much food on my plate” and “I generally consume my food quickly”, respectively. These statements were combined to “I often put too much food on my plate or eat quite quickly”. The second method of combining statements was the construction of a new statement that did not utilize the exact wording of the first set of statements, but which still captured the variables. For example, the variables “TV Watching” and “Availability of Passive Entertainment Options” were converted to the statements “I spend a lot of time watching TV” and “Sedentary entertainment options are readily available”, respectively. These were combined to “I spend a lot of time in front of a screen”. Here, the word “screen” was chosen to replace “TV” as it captures TV as well as other passive entertainment options, and has been shown in the literature to be relevant as many people spend time in front of a computer instead of a TV⁹⁴.

Cognitive and behavioural variables implicated in obesity were explored and several were selected to inform the development of cards. These include eating self-efficacy^{55, 59}, exercise self-efficacy^{51, 65}, binge eating behaviour^{51, 81}, flexible cognitive restraint, disinhibition, and hunger^{83, 85-87}. These were chosen because they had validated and widely used tools to assess them, and they have been shown to be good targets in obesity treatment such that addressing them in conversations between patients and clinicians may be beneficial.

Questionnaires used to construct additional statements include the 20 question weight efficacy lifestyle questionnaire (eating self-efficacy) ⁵⁵, the 18 question exercise self-efficacy scale ⁶⁵, the 16 question binge eating scale ⁸¹, and the 51 question three factor eating questionnaire which measures dietary restraint, disinhibition, and hunger ⁸³. The three factor eating questionnaire measures general dietary restraint of eating, but by selecting certain questions from the general restraint category, it was used to create statements on flexible cognitive restraint instead ⁸⁷. Although an attempt was made to preserve as much of the original wording as possible, the language on the card statements is slightly different from the actual questionnaires and as such, is no longer validated. When possible, statements constructed from variables on the Foresight map were modified to include factors from these questionnaires.

Finally, two additional statements were added based on a literature review of factors that individuals report as being barriers to healthy eating or regular physical activity. A total of 64 statements were developed using these procedures (Appendix 1).

The statements were reviewed with one other researcher, and some minor modifications occurred. An initial assessment of the card statements was conducted by putting the statements on an online web survey and asking 5 other researchers and students who are knowledgeable in the area of obesity to assess the statements. They were given the option to choose “Describes me”, “Does not describe me”, or “Unclear” for each statement. Space was provided to elaborate on why the statement was unclear, and if there were any other factors

that significantly impacted their ability to make healthy behaviour change that was not included in the list. Five individuals completed the questionnaire. A total of 8 statements were marked “Unclear” by 2 participants; no statement as marked unclear by both. Feedback provided by these participants was used to make minor modifications to the wording of 4 statements. A total of 64 cards made up the final deck.

2.3 Questionnaire

A questionnaire was developed to describe the sample and to allow for comparisons and associations in the number of cards chosen. The questionnaire was created in English for adults to assess basic demographic, health, and stage of change information. Specifically, demographic and health related questions asked about sex, age, marital status, education, living status (alone or with others), cultural/racial background, income, past dieting or weight loss treatment, medication, chronic disease(s), mental health, self-report height and weight, and tobacco use. Most demographic and health related questions and possible responses were taken from the 2009 Canadian Community Health Survey ⁹⁵.

Stage of change⁹⁶ was assessed using 4 questions asking about 30 or more minutes of physical activity 5 days a week, eating 5 or more servings of fruits and vegetables a day, avoiding high-fat, high-salt, and/or high-sugar foods, and reducing sedentary activity outside of work ⁹⁷. The 5 stages (pre-contemplation, contemplation, preparation, action, maintenance) were assessed by the following 5 possible responses:

- No, and I do not intend to in the next 6 months
- No, but I intend to in the next 6 months.
- No, but I intend to in the next 30 days.
- Yes, and I have been, but for less than 6 months.
- Yes, and I have been for more than 6 months.

2.4 Semi-structured interviews

Ethical approval was obtained by the Simon Fraser University Office of Research Ethics. Two trained interviewers spent 2 days at a Vancouver area internal medicine specialist's office. Adult patients who were overweight or obese, were seeking treatment for a weight related condition, who could speak and read English, and who had an appointment during that time were eligible. The physician spoke to patients about the study and if they agreed to receive additional information about the project from a researcher, they were directed to a waiting area just outside the interview room. A researcher then went through a consent form with them and provided more detailed information about what interviews would involve and how long the process would take. Those who consented to participate in the study were brought to a private interview room. After obtaining signed, informed consent, participants were asked to complete the questionnaire before the interview. Interviews followed a 3-part sequence (described below), while allowing for new questions or ideas to emerge as the interview progressed. In total, 10 interviews took place lasting between 20 to 60 minutes. Almost all patients who were approached by the physician participated.

2.4.1 Interview part 1 - the card sort

The first part of the interview involved a card sort and initial reactions to the card statements. The deck of cards was given to the participant and they were instructed to look through the deck and choose cards which they feel describe themselves or their situation. If clarification was needed participants were told to select cards that they can relate to. After the cards were sorted, one interviewer wrote down which cards were selected while the other began the conversation.

- What was this exercise like for you?

This question opened up the conversation and enabled the interviewer to get a sense of how the participant viewed the exercise. As participants' spoke about each of the following items, the interviewer checked them off on the interview guide. Follow up points of discussion include:

- Do you feel the statements you chose describe your situation?
- Were there additional factors not listed on a card?
- Were any statements confusing or unclear?
- Did the cards change your understanding of obesity?

2.4.2 Interview part 2 - discussion of the results

This portion of the interview focused on the results from the card sort, and incorporated multiple different ways of discussing the results.

- Can you elaborate on why you chose the cards you did?

- Let's compare some cards you chose to other similar ones you did not.
- Do you view any cards as being health promoting (e.g. do you live or work in a very walkable environment)?
- Can you select 3 cards that you feel were the most important factors regarding your health related behaviour
 - How confident are you that you can address some of these factors?

2.4.3 Interview part 3 - patient willingness to participate

This portion of the interview involved a discussion on who the participant feels most comfortable using the tool with. Additionally, it assessed their willingness to use the cards and act on what they might have learned from the exercise.

- Is this something you would like to use with a health care provider?
 - What type(s) of health care providers?
 - Would this be beneficial to use with friends or family?
- Are changes to your eating and physical activity habits a priority for you right now?

In conducting the interviews, emphasis was given to maintaining the natural flow of discussion as opposed to forcing the participant to address certain items at specific points. As such, all parts began with general questions and are followed with more specific ones. As each part of the interview finished, the

interviewer asked about follow-up questions which had not already been discussed. Conversations with researchers were recorded (Zoom H2 Handheld Surround Recorder, Samsung) and transcribed verbatim (Transcribe! Transcription software; Microsoft Word, 2007), along with researcher field notes and debriefing observations.

2.5 Focus group

Insights gained through interview data collection were further explored by conducting a focus group with a purposive sample of individuals in a weight loss surgery support group. The group was self-organized by patients who had undergone bariatric surgery sometime in the past, although some members were still waiting for treatment. Members were adults who spoke English living near a large urban city.

The guide used by the researchers was similar to that used in interviews. After obtaining signed, informed consent from each participant, they were instructed to complete the questionnaire. Following this, each participant was given a full deck of cards and asked to select cards which describe them or cards they relate to followed by selection of the 3 to 5 most important cards. After some discussion, participants were also asked to select 3 cards which they felt capable of addressing through some form of cognitive, behavioural, or environmental modification to their lifestyle. Additionally, researchers asked participants why they chose these 3 cards, what their confidence is in addressing them, and what it would take to bring their confidence level up. As in interviews, discussion was recorded (Zoom H2 Handheld Surround Recorder, Samsung) and transcribed

verbatim (Transcribe! Transcription software; Microsoft Word, 2007), along with researcher field notes and debriefing observations. In total, 8 people participated in the focus group which lasted 2 hours.

2.6 Quantitative data analysis

Questionnaire and card selection data were entered into Microsoft Excel 2010 and transferred to SPSS (PASW Statistics 18) for statistical analysis. Graphs and figures were produced in both Excel and SPSS. Spearman's correlation coefficients were calculated for age and BMI as they relate to the number of cards selected in the first card sort.

2.7 Qualitative data analysis

Transcripts were coded verbatim using Transcribe! transcription software (Seventhstring software, Version 8.10, 2010). NVivo qualitative data analysis software (QSR International Pty Ltd. Version 8, 2008) was used to track coding themes. All data received multiple passes for coding based upon themes generated inductively from the data. Interpretive Description⁹⁸ served as the conceptual framework for analysis. Grounding for data display and knowledge development was based on a as a complex systems approach to obesity⁹⁹ and a framework for designing effective solutions to complex problems¹⁰⁰.

3: RESULTS

3.1 Quantitative results

A total of 18 participants completed questionnaires and the card sort activity. Both the interview (S1) and focus groups (S2) were similar in make-up (Table 1). A greater portion of the interview sample was single (40%) and had at least 1 chronic disease (90%) compared to the focus group where nobody identified as being single and only 37.5% identified having a chronic disease.

Table 1 - Sample Characteristics

Variable	Interview Sample (n=10)	Focus Group Sample (n=8)
Sex (m/f)	5/5	4/4
Age (years \pm SD) (n=17)	51.0 \pm 17.6	50.9 \pm 13.6
BMI (kg/m ² \pm SD) (n=17)	40.8 \pm 8.5	33.7 \pm 9.7
Marital status		
Married	3	3
Common-law	2	3
Widowed	0	0
Seperated	1	1
Divorced	0	1
Single	4	0
Education		
Less than HS	0	0
HS or trade school	4	2
University	3	6
Advanced degree	3	0
Living with others (y/n)	8/2	6/2
Income		
\$0-\$25,000	2	2
\$26-\$50,000	2	0
\$51-\$60,000	2	1
\$61-\$80,000	1	1
\$80,000+	3	4
Weight loss or diet (y/n)	8/2	8/0
Medication (y/n) (n=17)	9/0	4/4

Chronic Disease (y/n)	9/1	3/5
Arthritis	2/8	1/7
Asthma	1/9	0/8
Angina	0/10	0/8
Back problems	1/9	0/8
Diabetes	6/4	1/7
Heart attack	1/9	0/8
Heart Disease	0/10	0/8
Hypertension	7/3	0/8
Stroke	0/10	0/8
Other	3/7	2/6
Talked about mental health (y/n)	2/8	4/4
Current mental illness (y/n)	1/9	0/8
Stage of change - physical activity (%)		
1	0	13
2	0	13
3	40	0
4	30	13
5	30	63
Stage of change - fruits and vegetables (%)		
1	0	13
2	0	25
3	40	0
4	10	0
5	50	63
Stage of change - high fat/salt/sugar foods (%)		
1	0	13
2	10	13
3	20	13
4	10	13
5	60	50
Stage of change - sedentary activity (n=17) (%)		
1	10	14
2	20	0
3	20	14
4	20	14
5	30	57
Stage of change (mean \pm SD) (n=17)	3.9 \pm 0.7	4.0 \pm 1.3
Current tobacco (y/n)	0/10	0/8

3.1.1 Number of cards

The mean number of cards selected by participants in the first card sort was 25.4 (lowest 5, highest 41) (Figure 2).

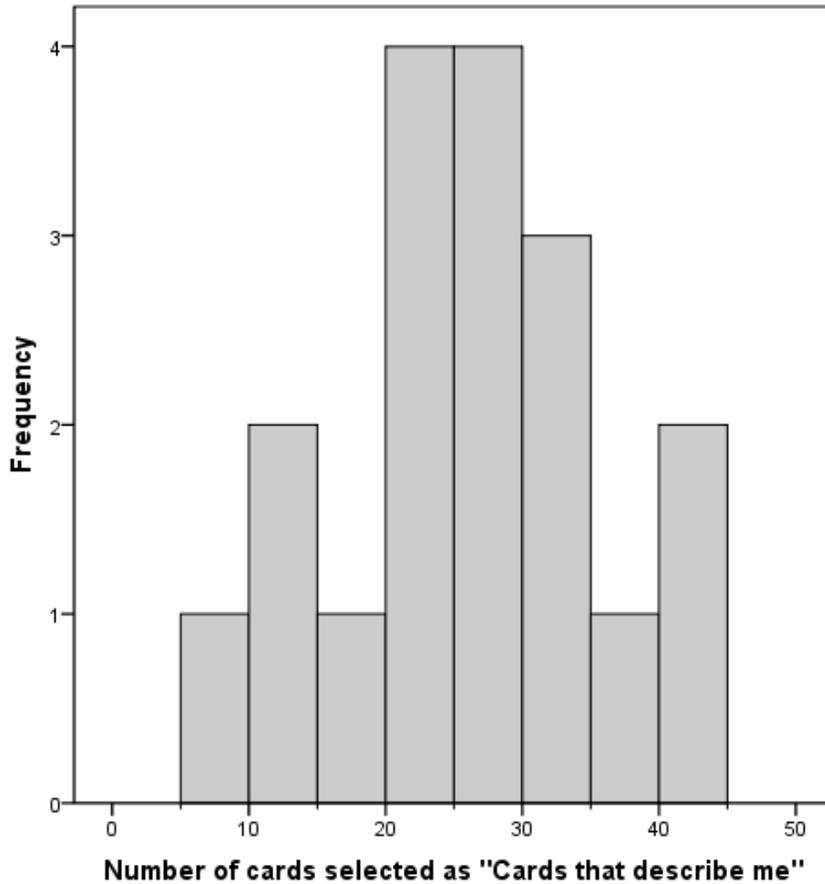


Figure 2 - Number of cards selected by participants as “Cards that describe me”

There was a significant ($p=0.01$), negative correlation between age and number of cards selected in the first card sort with Spearman correlation coefficient -0.58 , explaining 34% of the variance in the relationship (Table 2 & Figure 3).

Table 2 - Spearman correlation coefficients

		Age	BMI
Number of cards selected as "Cards that describe me"	r	-0.58*	0.34
	p-value	0.01	0.19
	n	17	17

* Significance at $p < 0.05$

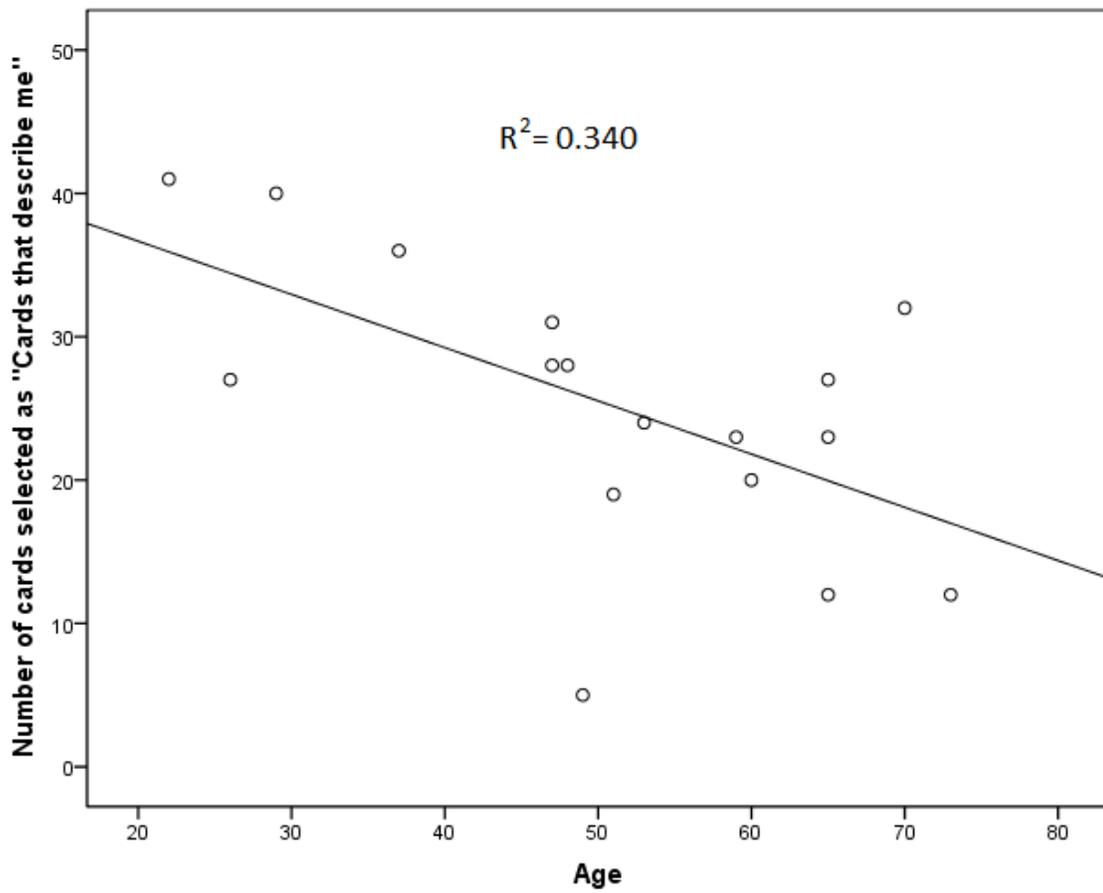


Figure 3 - Number of cards selected as "Cards that describe me" versus age.

3.1.2 Card statements

For the first card sort (“cards that apply to me”), participants were most likely to select a card from the “Physiology” cluster and least likely to select a card from the “Food Production” cluster. For the selection of the most important cards, participants were most likely to select cards from the “Food Consumption”, “Social Psychology”, and “Individual Psychology” clusters, and least likely to select cards from the “Individual Physical Activity” and “Physical Activity Environment” clusters. Finally, for the third card sort where participants selected cards they felt capable of changing (which only the focus group sample completed), cards from the “Food Consumption” and “Social Psychology” clusters were most likely to be chosen while no cards from the “Individual Physical Activity” or “Physiology” clusters were chosen (Figure 4).

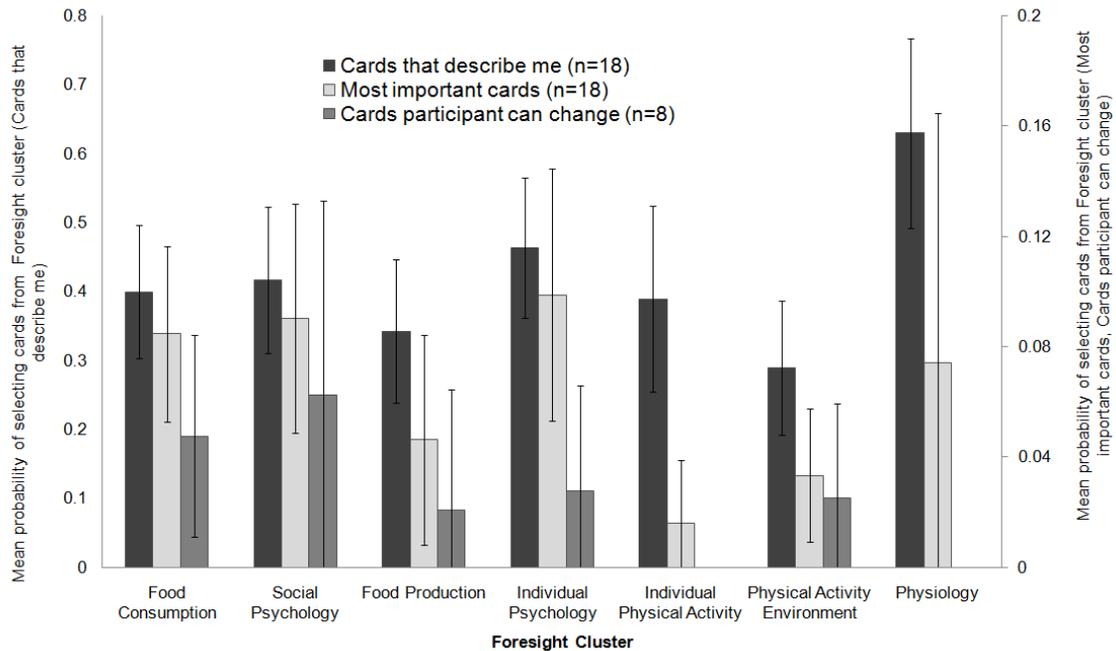


Figure 4 - Proportion of cards selected from each cluster

Bars represent the mean probability for all participants of selecting cards from each Foresight cluster. Error bars show 95% confidence intervals.

Most cards selected were not different for men and women, although there were several exceptions (Figure 5). Specifically, men were more likely to select the cards “I often eat too much food and feel uncomfortable” (8 men, 3 women), “I spend a lot of time in front of a screen” (7 men, 2 women), and “I am a current or former smoker” (6 men, 2 women). No men and 4 women selected the card “I do not pay much attention to changes in my figure”.

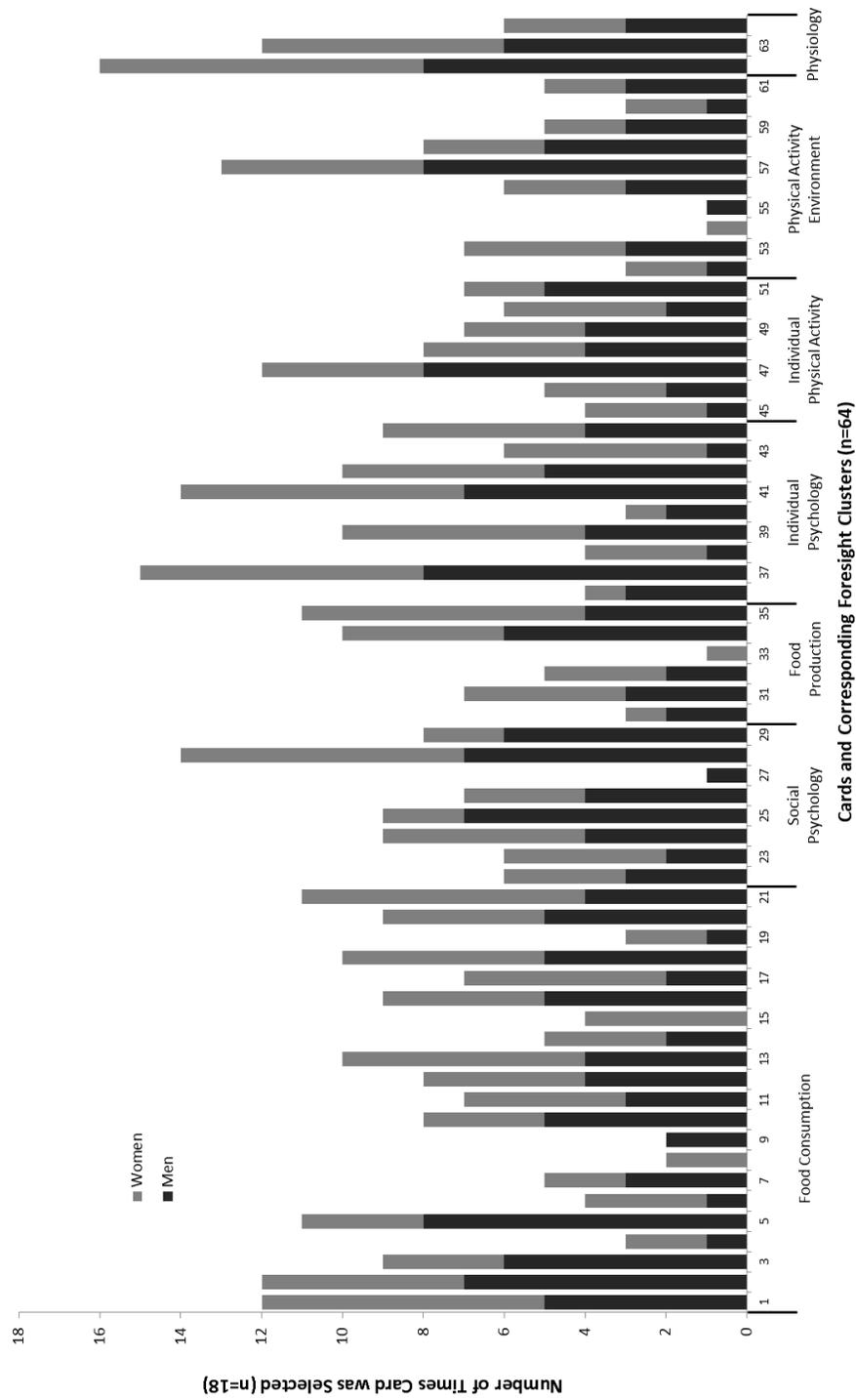


Figure 5 - Card selections by men and women

The four most commonly selected cards in the first card sort were “I have tried dieting and/or weight loss medication” (selected by 16 participants), “I am a very social person” (15 selections), “My body size and shape influence how I value myself” (14 selections), and “I battle between trying to eat healthy and eating foods I like” (14 selections) (Table 3). These cards were selected evenly between participants in both the interview sample and focus group, as well as men and women. Interestingly, the two most popular cards in the first card sort were only selected by one participant in the selection of the most important cards.

Table 3 - Most frequently selected “Cards that describe me” (n=18)

“Cards that describe me” (n=18)	“Most important cards” (n=18)	Statement
16	1	I have tried dieting and/or weight loss medication.
15	1	I am a very social person.
14	4	My body size and shape influence how I value myself.
14	3	I battle between trying to eat healthy and eating foods I like.
13	2	I drive everywhere rather than bike or walk.
12	6	I eat way too quickly.
12	1	I often eat too much food and feel uncomfortable.
12	1	I am not very active around the house.
12	2	I feel I am predisposed to being overweight or obese. It’s in my genes.
11	2	I consume unhealthy foods (high fat, high sugar, low fiber) more often than I should because I like the taste.
11	1	I am concerned about my influence upon my family’s dietary habits.
11	2	I look for variety when buying food.
10	0	I am unlikely to eat less than I want.
10	5	Sometimes, even when on a diet or not hungry, I eat sensibly in front of others but splurge while I am alone.
10	2	I buy food largely based on taste.
10	4	I don’t feel confident in my ability to resist overeating when I am nervous, depressed, or angry.
10	0	At the end of the day, I do not reflect back on how much food I consumed.
9	2	It is very difficult for me to stop eating when there is food left on my plate.
9	1	When I see, smell, or have a small taste of food, I find it very difficult to keep from eating.
9	2	Seeing foods I like, or being with someone who is eating makes me hungry enough to eat.
9	5	I never seem to have free time.
9	3	I spend a lot of time in front of a screen.
9	4	I often feel helpless and incapable of controlling my urges to overeat and feel desperate to regain control.

The most commonly selected “most important cards” were “I eat way too quickly” (6 selections), “Sometimes, even when on a diet or not hungry, I eat sensibly in front of others but splurge while I am alone” (5 selections), and “I never seem to have free time” (5 selections) (Table 4). Interestingly, almost all (5 of 6) of the individuals who selected “I eat way too quickly” were from the focus group sample, and were women (3 of 4). Only participants in the focus group sample selected the cards “My body size and shape influence how I value myself” and “I am preoccupied with food and constantly think about eating” as their most important cards. The other most commonly selected “most important cards” were evenly distributed between both men and women as well as the interview and focus group samples.

Only the focus group performed the third card sort where participants selected cards they felt capable of changing. There was considerable variety in the selected statements and with only 3 cards were selected by multiple participants. Again, “I eat way too quickly” was the most popular card (selected by 4), followed by “Sometimes, even when on a diet or not hungry, I eat sensibly in front of others but splurge while I am alone” (selected by 2) and “I spend a lot of time in front of a screen” (selected by 2). No other cards were selected by more than 1 participant.

Table 4 - Most frequently selected “Most important cards”

“Most important cards” (n=18)	“Cards I can change” (n=8)	Statement
6	4	I eat way too quickly.
5	2	Sometimes, even when on a diet or not hungry, I eat sensibly in front of others but splurge while I am alone.
5	1	I never seem to have free time.
4	1	My body size and shape influence how I value myself.
4	1	I don’t feel confident in my ability to resist overeating when I am nervous, depressed, or angry.
4	0	I often feel helpless and incapable of controlling my urges to overeat and feel desperate to regain control.
3	1	I am preoccupied with food and constantly think about eating.
3	2	I spend a lot of time in front of a screen.
3	0	I battle between trying to eat healthy and eating foods I like.
3	1	I regularly feel disgust, shame, or self-hate from overeating.

3.2 Qualitative results

3.2.1 Card statements

In general participants felt the wording on the cards was very clear and the number of statements was appropriate. Most had no difficulty and did not require any explanation of what the statement meant. Different participants asked for clarification on what was meant by “predisposed”, “variety”, “tend”, and “manual labour”. Additionally, one participant wondered about how much was “often”. Two participants noted that statements with lots of “nos” and “double negatives” were somewhat confusing, and pointed out the statement “I am unlikely to eat less than I want” as being difficult to understand. At least one of these participants reported English as being their second language. Additionally, one participant had trouble reading the cards because of eyesight or literacy problems.

Most participants reported the deck of cards to be quite comprehensive and relevant, and felt that their struggles with health related behaviour change were present in the deck. Several participants pointed out specific variables or concepts that were not captured by the cards. These are listed below, alongside other variables mentioned throughout the interviews and focus group. If a concept or variable was repeated by multiple participants it is noted.

New Card Ideas - Specific

- Disappointment from overeating (less extreme than self-hate).
- Family or friends just don't understand what I am going through.
- Concern about calories in alcohol, not concern about substance abuse.
- People around don't understand my challenge. There is no logical explanation.
- Difficulty knowing how many calories are in meals and foods.
- I don't like to cook.
- All or nothing type personality. Some cards are yes and no depending on current emotional state.
- Craving is 25 on a scale of 1-10.
- Parents always bought high fat/low quality foods growing up.
- I'm never hungry and I eat for other reasons.
- I exercise and enjoy the overall experience, but I don't do it for pleasure.
- I wish I loved exercise. It seems like a chore.
- I exercise it for the wrong reasons.
- I feel too tired to exercise.

New Card Ideas – Open Ended

- Personal story card (specific time, life event that caused weight gain) (3 participants).
- Individual motivations for losing weight.
- The “switch” for an on/off type person.
- Have some open ended cards (e.g. My major concern with weight is ...).
- Family problems, and feelings surrounding them (e.g. parent’s divorce).
- A card relating to different types of exercise and why individuals choose certain types.
- My struggle with healthy behaviour is more subtle than these cards portray.
These cards are blunt.

One participant felt that the physical activity cards didn’t suit them. They brought up the example of work and having a sedentary job where there was nothing they could do at work to make it more physically active. Another participant felt there were cards that they had been working on but were not yet ready to say the card did not apply to them. Several participants mentioned that some form of “gradation” would have been helpful, and in current form this information is missing. Finally, one participant felt that emotional eating could be covered by fewer cards.

Participants overwhelmingly reported that no card statements were new to them. At some point, they had thought about all of them. They were, however,

quite useful in bringing ideas or concepts to the top of their mind and acted more of a reminder as opposed to an educational tool.

3.2.2 The card sort activity

Initial responses to the first card sort were quite positive. First responses upon being asked what they thought of it include “interesting”, “fascinating”, “I think it’s really clear cut... this is either me or it’s not me.”, and “There’s a couple of these that just, I should have posters.”.

Past versus present

One theme that was never specifically asked about but was mentioned by nearly half the participants was a comparison of cards they would have picked in the past to the cards they currently picked. One participant noted “It made me feel good... it made me realize how much I’ve changed and how much I’ve realized that there’s some of those things that I don’t have to worry about.”. Other participants echoed this and stated “It make me realize how far I’ve come”, and “Well, when I look at the pile it’s like, it’s a before and after. You know, uh... you know do you see or smell food and then you want to eat it and I mean that’s before and after it’s no. You know.”

Additional piles

Many participants sorted the cards into 3 piles initially even after being instructed to make 2 piles. Usually this middle pile were cards they were not quite sure about or where they viewed part of the statement as relevant to them and

part of it not relevant. Another explanation for the third pile was that they felt those statements applied to them only sometimes. One participant explained “it’s like ok yes this is me. This is partially me. Cause that’s why the third pile cause it’s like um... yeah, but not all the time.”. Another participant did not speak directly to making a third pile but noted “It would have been nice to have an element of degree, a gradation, in the cards. You know here’s a statement you know I’m somewhat like this, totally like this, or you know I, something to to to qualify these otherwise very definitive statements.”.

Foresight clusters

Two participants who chose cards largely from the food consumption cluster and few from the physical activity clusters were questioned about this. Both felt that this was accurate, and that achieving adequate physical activity was not a current struggle for them and was part of their lifestyle. One participant noted that physical activity is “part of my life” and when questioned about whether getting enough physical activity is a current issue replied “Not for me, not for me. But it sure is for a hell of a lot of other people.”.

Increased awareness

The activity also served to make participants more aware of the various variables involved in making health related behaviour change. As previously mentioned, participants did not find they learned anything new that they had not previously thought of. They did, however, find that the experience of sorting

through the cards was a novel experience that helped them organize their thoughts and increase self-awareness. Participants remarked “you know you become a little bit more aware of kind of how you feel about exercise and or food.” and “It serves to remind you sometimes of things you haven’t thought of in a while, but not unexplored territory. Not for me anyways.”.

3.2.3 Potential uses

Participants were asked about using the cards with different healthcare workers, family or friends, and by themselves. Additionally, they were asked about other potential uses for the cards.

3.2.3.1 Healthcare workers

Sorting the cards with or prior to seeing a healthcare worker was generally viewed as something that would make for a better visit for several reasons. First, as mentioned, participants thought the cards helped bring ideas top of mind and stated this would be useful in helping stimulate patient thinking about what they want to talk about prior to meeting with the practitioner. One participant remarked “... it would be really great having this before like you know when I see [my doctor] because I’d know what to tell her but it just refreshes me what I really want to talk about.” while another said “But, as a communication thing, you know, if you were reading them as an example then you would have a much better idea of what I’m dealing with, as opposed to, you know, just talking about it. So, in that sense I think it would be very good.”. Finally, when asked about the conversation they might have with their physician after sorting the cards, a participant replied

“I think it would be better because I would know specifically what to say, like how, you know, what really affects me. And these, I don’t know how to like think about it, this already says what I. And you know we could just focus on the main thing how I feel.”. A minority of participants did not believe these would be helpful with a healthcare worker, and when asked about if these cards would be useful to look through before seeing a physician, one replied “For me, not. I think I'm a pretty good communicator and I think I'm pretty straight forward and I would be able to tell the doctor what my concerns are.”.

Specific healthcare workers

On the topic of which healthcare providers would be best to use a tool such as this participants generally agreed that obesity specialists, family doctors, dieticians, trainers, and psychologists would be best as they had the time and expertise to deal with these factors. Responses to this question include “And then certainly, the specialists, you know I mean I can relate to my trainer. She’s very much into health and fitness.”, “Maybe a psychologist”, and “[Interviewer] Do you think of that being useful in speaking with that dietitian as well? [Participant] Oh absolutely.”. The perception of the healthcare provider’s purpose was also an important factor in deciding who best to use the tool with, as illustrated by one participant “With a psychologist maybe who’s gonna deal with somebody’s eating disorder it might work quite well.”.

Time constraint

Although most participants believed the cards would be useful with their doctor, there was scepticism to using the tool with them as they were not sure if the doctor would have enough time to discuss the cards the participant selected, or if they would be willing to engage in this type of a conversation. One participant noted "... but waiting for your GP, they're not interested. They're not interested, the GP is not interested in you bringing a bunch of ideas that you discovered on cards because they want you out.". When asked about if the cards would be helpful to use with their doctor another participant replied "It probably would but I think the main thing with them, a lot of the physicians who have patients who are obese is the patient feels the physician doesn't have time for obesity.". Likewise, another participant noted "Oh for sure, as long as she's got the time or he's got the time.". One focus group participant summed up the general feeling and said "If they took the time to look it over and glanced over it, it's gotta be better than going in blind and dealing already with those kinds of misconceptions, you know? Like the oh you should just eat less and exercise more.".

Helpful to physicians

Several participants also mentioned that in addition to helping patients organize their thoughts and identify what they would like to discuss, the cards may help physicians ask more effective and relevant questions. When asked about using these with their doctor one participant replied that the cards may

help with “Avoiding generalities that are going to offend us more than help us. You told me I have to lose weight, yeah I didn’t know it, come on!”. Additionally, a participant suggested that the cards could be separated into their clusters or categories which may provide the clinician with some guidance on where to start and spend the majority of their time.

3.2.3.2 Family and friends

There were mixed feelings about using the cards with family and friends with a relatively even split between finding the cards useful and not finding them useful. Some participants viewed this as a great idea which they would like to use the cards for, while others did not see family or friends as being potentially helpful. Examples from participants who are in favour of using the cards with family or friends stated, “I would be able to use it with my partner and I would be able to use it personally, probably we would do it together.” and “Like my sister she’s like don’t have that and I’m like I know, but it’s hard, just sometimes they don’t know like how I feel. And so maybe like showing them these cards would be like this is how I feel. Like you know, it could like show them ok then she is struggling.”. In terms of not finding the cards useful with family and friends, one participant noted “In terms of family and friends, um..., family know about it, friends who cares.”.

Partners cannot relate

Two participants that did not feel the cards would be useful with family described their partner as not understanding them, or not having to struggle with their weight. One participant explained “Well my family, no. Because my

husband, 145lbs when he, 148lbs and he's been that since grade 12. My daughter wears size 2 and 4 clothes. My son is normal but he's on the island. For me, no, I don't think, I don't bring myself out to my friends, I don't talk about that kind of thing with my friends really.". Another described his wife as being "a relatively slender person who eats, you know, very small portions" who wonders "Why can't you just say no? Why can't you just you know, why do you have to have that extra dessert?". When asked about the cards helping her understand he replied "Not necessarily. But you know, I, and I've had a chat with her and I said you know I wish I could explain it to you. But, I can't."

3.2.3.3 Independent use of the cards

Most participants said they would find the cards beneficial to sort through on their own. One participant explained that they like the idea because "It's not so easy to look at these issues in front of other people even in front of doctors. It's great to do it in a way that you can feel comfortable in your own space to look at these kind of things.". Several different ways of using them were discussed. One participant said that if the cards could be used to provide specific advice he may be able to pick a card and follow that advice for the day. He explained "but if they were more you know, in tune to say say 'well okay, you can't have anything to eat after 7 o'clock' or you know those kind of things you know...where you look through your cards and you go 'Oh shit okay, well I can't eat after 7'" and mentioned that the card could be used as his "thought for the day". Another participant viewed the cards as a potential form of record keeping and stated "I know personally if I were to go through them and be like, okay, at the end of a

week say, be like 'Okay, have I done these things? Which ones have I done? Which ones haven't I done?' You know, like keep a record of it.". Finally, accountability was important for one participant. When asked about using them for one of these purposes one participant explained "Yeah, yeah, it would help. But if somebody checks it."

One participant noted that the cards would only be useful as a personal motivational tool "under the right circumstances and for the right person". When questioned about the right person and right circumstances the participant replied "I think you really have to want to do it. You know? You can't just half ass it, you can't just be like "Oh, you know I should probably lose some weight".".

3.2.4 Most important cards

Participants reported that choosing 3-5 cards was manageable. Some participants had a difficult time narrowing their list down to 3 and were finding it difficult to discard cards after this point as they were all perceived to be quite important. In these cases they may have finished with 4 to 6 cards.

Participants provided a variety of ways the most important cards may be used. Mostly they related to using them to set goals or make certain things a priority by identifying "small steps" that need to be addressed. For example, one participant noted that the cards may be used to set specific and achievable goals, explaining "Yeah, do the laundry, whatever. And then, umm..., take advantage instead of, you know, driving to the store 3 blocks away, walk. Or, you know what I mean, I'm just, I mean that's, I'm just saying, you can come up

without trying for the home run. You just try to get to first base.”. Likewise, narrowing down the list to the most important card helped one participant see what his priority was. He explained “[Interviewer] So that really hits you, number 12? [Participant] Really hard... I knew it. I knew that I had to do it. I know that that’s a change that I have to make and I want to make. But I’ve just never thought about it, like I’ve thought...like there’s a lot of stuff that I want to change. Right? So I guess, yeah, it did help by putting that, that something that I know is a really big hindrance on my weight, that I know that that really really, it’s hindering my process of losing weight.”.

3.2.5 Addressing cards

Several participants discussed trying to make behavioural or cognitive changes according to some of the most important cards they selected. They mentioned there would be days where making the changes would be easier and days where they would be difficult, but generally were in agreement with one participant who said “I think if I did read them and every day, yeah, I could probably do it.”. Several participants selected cards that they felt were possible to address, or cards which they have already tried to address but have not been completely successful. One participant explained “I think you picked them because maybe you’ve, you’ve worked on it before, you haven’t been 100% successful, and it’s not part of the routine as I call it. But you see that there’s potential there.”.

One participant spoke about having to “change everything”, noting that it is impossible to simply change one thing and that a total “change of attitude has to

happen". He felt that to do this you had to "just do one step at a time". He felt the card may help with this.

4: DISCUSSION

4.1 Participants' perception of complexity around obesity

The number and type of cards selected by participants reveals important information on their perception of complexity surrounding obesity and health-related behaviour. Trends in the number and type of cards selected by participants may provide useful information to practitioners for treatment.

4.1.1 Number of cards

The number of cards selected by participants may provide a way of assessing their perception of complexity around obesity, provided all participants receive exactly the same instructions and environment to complete the activity. The fact that age was significantly correlated with the number of cards selected suggests that as people age they perceive that they struggle with fewer variables while making health related behaviour change; their perception of complexity in managing obesity decreases.

There are several possible explanations for this. One may be that as individuals go through life they come to terms with many negative influences on their health and increase their capacity to manage them and do not perceive them to be as problematic. Another explanation may be that younger people have a greater number of variables to manage on a daily basis. Their life may be inherently more complex (or perceived to be) regarding managing healthy

behaviours. This information is important as it may affect how obesity treatment programs are structured for different age groups, such as a greater focus on reducing the complexity or increasing the capacity of younger individuals in managing obesity. More research is required to confirm this finding and determine the reasons behind the apparent greater perception of complexity of younger people.

4.1.2 Trends in the cards selected

In the first card sort, when participants simply selected cards that described them, they selected statements evenly across the different clusters, with cards from the physiology cluster having the greatest probability of being selected (Figures 4 & 5). However, when participants selected their most important cards, they selected relatively fewer from the food production, individual physical activity, and physical activity environment clusters. Both food production and physical activity environment are somewhat distal to an individual as opposed to the more proximal variables of the food consumption and individual psychology clusters. This suggests that individuals perceive the most important factors related to their health as being closer to them and under their direct control as opposed to the somewhat more distal population and community level factors. This may result from an inability to understand the connections that link these distal variables to more proximal ones. At the same time, however, individuals frequently spoke about external influences to their weight such as family history and genetics.

This finding is consistent with some research showing that individuals with obesity frequently blame themselves and believe that the associated factors are under their control, but at the same time are aware of the fact that external influences are very important¹⁰¹. The list of the most commonly selected “most important cards” also reflects this (Table 4), where the vast majority describe individual behaviours or thought processes as opposed to more external or distal variables. Here, even when individuals were presented with more distal community level variables that are known to have a very significant impact on health, they continue to view their obesity as a result of their own doing as opposed to external variables. This suggests that if the goal of some treatment programs is to help individuals understand and internalize the broad causal variables implicated in obesity, simply telling or educating them on these causes will likely be insufficient. More intensive methods are likely required.

The fact that cards in the physical activity clusters were least likely to have been selected as most important cards suggests that either individuals did not identify with the cards, or they perceived a high capacity to manage physical activity and viewed a lack of it to be less problematic. There is evidence for both of these, as one participant felt that the cards in the individual physical activity cluster did not speak to their situation and several participants felt that they were getting adequate physical activity and had dealt with issues surrounding it. As all individuals were specifically asked about how well the cards represent most relevant variables and only 1 participant replied that they felt the physical activity cards did not relate to them, it is likely that this sample believed that physical

activity was less problematic. Many individuals spoke about being physically active and in discussion focused more on eating habits and nutrition rather than physical activity. This suggests they may believe that their obesity is the result of poor eating habits as opposed to sedentary behaviour, and that solutions lie in the food consumption and psychology clusters as opposed to physical activity.

Interestingly, several of the most popular cards during the first card sort, where participants chose all cards that described them were rarely selected as being a “most important card”. These cards include “I have tried dieting and/or weight loss medication”, “I am a very social person”, “I often eat too much food and feel uncomfortable”, and “I am not very active around the house”. This suggests that, in general, the most common barriers and factors affecting health related behaviour change are not necessarily the variables which should receive the most attention in treatment programs or clinical discussions on obesity as they may not be the most important factors. Rather, patients should be asked about what they perceive the most important factors to be and these should be the focus; health practitioners cannot assume that factors affecting the most number of people are the most important targets for intervention.

4.2 Reducing complexity with healthcare practitioners

Participants generally found that the card sort activity was a useful and interesting experience. Surprisingly, participants did not feel that the card statements were educational and did not find they were thinking about any novel variables they had not previously considered. Both the interview and focus group samples had generally been struggling with obesity for quite a while. Many

participants who had completed interviews had previously met with the internal medicine specialist to discuss obesity and related comorbidities. Likewise, all but 1 participant in the focus group had undergone bariatric surgery sometime in the past 10 years. They had likely spoken about health related behaviours extensively, with both health practitioners and within their support group. This suggests that in patients who are relatively well educated on their obesity and health related behaviours, the focus should not be on educating them about variables surrounding their condition. Several participants spoke about some of the more commonly selected cards (e.g. “I eat way too quickly”) and noted that they have been told these things numerous times and they are well aware that they are problematic. Continuing to address them in a simplistic manner was not perceived as beneficial.

Although no longitudinal data were obtained, a significant proportion of participants noted that they had lost a significant amount of weight and had made important changes to their behaviour. This was also evident from the comparison many participants made about their current card selections and how many more they would have selected in the past. There is evidence that patients who feel more educated on their disease and treatment have better outcomes³¹. In this case, many of the participants may have reached saturation such that any additional information about variables and factors implicated in their obesity was not perceived to be useful. Further research is required to determine whether patients who are just starting to become more educated on their obesity and health related behaviours would benefit from this type of education.

Although participants did not believe the cards provided them with more information about obesity, organizing and prioritizing the information they already possessed through various card sorting exercises was generally viewed as beneficial and provided many participants with a new perspective on their condition. One participant spoke about having to change everything, noting that a complete change of attitude has to happen. This may suggest that patients with obesity are overwhelmed at the number of changes that likely have to occur before they can start to manage their obesity. The cards helped many participants sort through this complexity and identify their own key variables, that is, those variables that they feel have the largest impact on their health related behaviour. After identifying key variables, participants were generally able to select a few they felt capable of changing and in one case narrowed this down to one card. Although they reported knowing about these variables beforehand, the process of going through the cards helped them manage the complexity of behaviour change and was ultimately a novel and positive experience. Interventions should therefore involve a method of sorting through this perceived complexity as it may remove feelings of being overwhelmed by the complexity of changes that likely have to occur.

Physicians may also have difficulty sorting through the complexity of the problem. Some participants noted that physicians gave them overly simplistic advice and avoided going into the details of their obesity with them. This suggests that a conflict exists between patients with obesity and the advice they receive from health practitioners. The overly simplistic advice participants often

receive leads them to disregard it and believe the health practitioner does not understand their condition. If participants were to bring in cards they perceived to be the most important in their life or cards they feel they are capable of addressing, this may provide practitioners with a means of addressing obesity without ignoring the complex nature of the problem.

Some participants created 3 piles while sorting the cards despite being instructed to create 2. It was generally easy for participants to spot cards which completely described them and cards which did not describe them at all. Many participants reported that some form of gradation, or a pile of cards which partially or sometimes described them, would have been helpful. This provides another means of dealing with complexity, and an additional topic of discussion. Furthermore, as most participants selected around 25 cards with some selecting many more, a method of reducing this number without reducing the number of cards in the deck may be helpful as 25 or more cards may still be too many to have meaningful discussion with a healthcare worker about. Having a third pile of “partially describes me” cards may make the “fully describes me” pile smaller such that those factors which are perceived to be more important receive more attention. One participant reported that they had been working on some of the cards already and this was not conveyed as these cards were grouped with ones which they had not been working on. Having a third pile to separate these will capture this information and provide another avenue to explore.

Additionally, a 4th pile would allow participants to identify cards that were important to them in the past but are not currently relevant. These cards may

provide a sense of accomplishment to participants and promote motivation to continue making healthy behaviour change. These cards would presumably be put into the “does not describe me” pile and the information surrounding a participant’s accomplishment may be lost. More work is required to explore this, and whether 4 piles may be too confusing or too difficult to sort (especially if participants do not have a table in front of them).

4.3 Using the cards to monitor capacity

One interesting and unanticipated theme that emerged was the comparisons participants were making about how many cards they would have picked in the past when they were in the early stages of dealing with overweight and obesity. Participants who made this connection noted that they would have picked many more cards in the past, with one participant stating that looking through the deck is a positive experience as they realize how far they have come. If the cards are used by participants on a monthly basis, or each time they visit their healthcare provider, it may mean that the number of cards selected can be used to monitor their capacity to deal with the complex obesogenic environment. This may help health practitioners identify patients who are struggling and patients who are successful in making changes, both of whom may require a different approach to management of their obesity.

Changes in weight or BMI are the outcome measures used to gauge success in obesity treatment ¹⁰². These measures may miss progress in other areas that do not directly translate into weight loss, such as increased physical activity, which lower cardiometabolic risk ^{102, 103}. If a change in the number of

cards selected does reflect a change in capacity to deal with obesity or health-related behaviour then a decrease in the number of cards selected can be a source of motivation and a measure of success for patients struggling to lose weight. Additional longitudinal data are required to test this and establish potential target numbers (e.g. decrease card count by 3).

4.4 Other settings for card use

4.4.1 Using the cards with family and friends

Discussion surrounding family and friends revealed varying levels of understanding and comfort with health related behaviour change. Some participants felt that their partners could not understand what they were going through and felt they could not use the cards with them. Generally, unsupportive family viewed obesity as being a matter of simple choice and were ignorant to its complex nature. This presents a large barrier to change, and should be an additional card for conversation as it may be an important element to their health related behaviour change strategy. A review of studies that assessed behaviour change in couples concluded that involving a patient's partner in diet treatment programs provided better outcomes, especially in the long term, provided that the partner took on a defined active role¹⁰⁴. This was also true for physical activity related behaviours. This suggests that although these patients felt their partners may not be helpful, including them in the treatment (possibly using the cards) may be beneficial, provided they are active in encouraging health related behaviour change as opposed to simply trying to understand what their partner is going through.

Through a complex systems lens, a supportive partner can be a source of both reinforcing and balancing feedback and encouragement. One participant remarked that when he does something unhealthy (e.g. eating a peanut butter sandwich right before bed) his wife remarks, “why can’t you just say no?”. If this partner were included and was able to help encourage and support change when it is needed, a new negative feedback loop could be introduced into that person’s life. Although some of these individuals assume family will not be helpful, they may have never tried. This particular participant also stated that they have trouble explaining it to their partner, but did not think the cards will help. Another participant remarked they do not talk about these things with friends and do not bring themselves out like that to friends and family. Again, without this support it may be quite challenging to make lasting health related behaviour change. The cards are one option for talking about this with friends or family and may make the conversation easier to begin, as one participant noted when she stated the cards might help her communicate with her sister who does not struggle to the same degree with healthy behaviour. More work is needed to explore whether or not people who are reluctant to talk about these topics with friends or family may find the cards helpful in this regard.

4.4.2 Using the cards with a healthcare worker

In general, participants did think the cards would be useful with physicians, especially in patients at an early stage of change, although they worried that physicians may not have enough time or want to discuss these behavioural and cognitive elements to obesity treatment. Specialists or other

healthcare workers with the time and experience to engage in meaningful counselling with patients were perceived to be more helpful. There is evidence that when family doctors do engage in behavioural counselling around obesity there are positive outcomes including weight loss^{9, 105} and prevention of weight gain¹⁰. The fact that some participants did not find them helpful or believe they could help may be due to both samples being fairly advanced in their thinking about obesity where more extensive and specialized care was required for them to continue to feel that conversations with physicians were be beneficial. In these cases, family physicians may refer patients to obesity specialists if available or to behavioural counsellors and dieticians who may be able to provide another dimension of care and support.

4.4.3 Independent use of the cards

Participants varied in the ways they would like to use the cards on their own. The two possibilities that participants spoke about were using the cards as a self-reflective and self-monitoring tool to keep track of feelings and behaviour, and as a goal-setting tool where different cards are selected and acted on. As suggested by one participant, this may be especially helpful for some individuals who find these topics difficult to discuss in person.

One participant cautioned that using the cards at home is likely not for everyone. They suggested that the cards may only be beneficial to individuals open to some form of behavioural or cognitive treatment. Together with another participant's concern over accountability when using the cards at home, this suggests that only individuals who are open to using them in this way and

genuinely interested may benefit. Individuals who may not be at a level of readiness or motivation may take the cards home and not follow through with the activity or find it useful. This may then be perceived as another failure in which case it probably would have been better avoid using the cards alone at home at this stage. These individuals may benefit more from using the cards with family, friends, or a healthcare worker where their cards selections can be recorded, monitored, and discussed.

Even if participants do not feel they would use the cards on their own initially, it may be worth pursuing after using them with a healthcare worker. There is good evidence that when obesity treatment stops, weight regain often occurs^{11, 19}. Using the cards on a weekly or monthly basis after regular contact with a healthcare worker may prevent weight regain by keeping healthy behaviour top of mind, as several participants suggested the cards do.

4.5 Practical aspects and tool refinement

The process of sorting cards was straight forward for most participants. It generally took between 5 and 10 minutes. One participant had trouble reading the cards and required assistance. Consistent with a paper describing practical aspects of using cards to stimulate conversation⁴⁸, one participant became very emotional when their most important problems around obesity were laid out in front of them. Additionally, several participants were confused about where to sort certain cards if only one aspect of the card described them, or they felt the card only partially described them, which Neufeld *et al.* also described as being an issue with card sorts.

Data obtained in the qualitative portion of the project will provide a basis for modifying both the card statements as well as the structure of the activity. Words or statements which any participants found confusing or ambiguous will be modified, and statements which were unclear (in particular those with a confusing negative or a double negative) will be reworded.

As previously discussed, it was clear that participants would have benefited from a third or even 4th pile during the card sort to aid with cards participants were not sure how to sort, something that others using card sorts have experienced⁴⁸. Participants may be instructed to organize cards into a pile that fully describe them, partially describe them, do not describe at all, and a pile with cards that used to describe. The most important cards may then be selected, and finally cards which they feel ready and capable of addressing can be identified. A similar process can be used with family or independently, although participants should be given the option of using them in any way that they feel beneficial as there was variability in what participants believed the best use of the cards to be.

4.6 Future direction

There are multiple directions that future work regarding this project might take. To test the tool's clinical usefulness as a communication tool, further research should involve healthcare practitioners so that communication using the cards is assessed in a clinical setting. A control sample might involve recorded conversations between patients seeking behavioural or cognitive treatment and a health practitioner. After the visit both patients and the practitioner would complete questionnaires assessing the quality of the visit (e.g. level of patient

centred communication, quality of visit, or satisfaction). A second experimental group of patients would sort the cards prior to their visit and bring in their selected cards to the practitioner. To minimize bias this experimental group should meet with the same practitioner after the control group. Patients may sort the cards into the 4 piles previously described (cards that apply to me, cards that used to apply to me, cards I have been working on, cards that have never applied to me). Patients would bring their cards with them to the visit and select their most important cards with the practitioner present. If there is not enough time to discuss all 4 piles (as might be the case if meeting with a family doctor or other short visit), patients might simply bring in their most important cards (5-8) and select cards they feel capable of addressing with the practitioner present. After this recorded discussion both patients and the clinician would be given the same questionnaires as the control group. The results would then be compared to assess any impact the card sorting activity may have had.

If the objective is to test whether or not the cards can monitor behaviour change and provide feedback to patients, a longitudinal study with patients starting treatment for obesity should be performed. This might be a continuation of the project described above or a separate one. Patients would complete the card sorting activity at each visit, monitor the changes in their selections, receive feedback at regular intervals regarding their card choices and complete questionnaires meant to assess variables related to success in treatment (weight, waist circumference, stage of change, self-efficacy and other measures).

These questionnaires would also be given to patients in the control group so that comparisons can be made.

To assess the ability of the card sort activity to help patients prevent weight regain following weight loss, another project might have patients complete the card sorting activity independently at home at regular intervals (e.g. monthly) after they have met with a practitioner, or completed some form of obesity treatment program. An online application of the tool may make this logistically easier to manage. Patients could record their card selections and make short journal entries to allow for open ended thoughts, feelings, or realizations to be recorded and reflected on. This would allow for a better interpretation of the results.

Finally, the cards may be used to provide useful information to health practitioners in designing obesity treatment programs for specific populations. With a larger sample size, analysis of the specific cards selected may provide insights into the most important factors to address in certain individuals during clinical visits. Various demographic, health, cognitive, or psychological questionnaires might be given prior to having participants sort the cards. A variety of statistical tests (e.g. principal component analysis) might be performed to assess whether or not specific phenotypes exist. This would be best performed using an online application of the cards.

5: CONCLUSION

This project created and tested a set of cards aimed at educating individuals about the complex causes of obesity while helping them sort through the problem. It was anticipated the activity would improve communication between patients and healthcare workers and provide individuals with some guidance in making health related behaviour change.

Only age was related to the number of cards selected. Qualitative data collected in interviews and a focus group suggests that participants found the exercise useful as it surfaced ideas and provided them with a means of organizing and prioritizing them. No participants found they learned any new variables they had not previously considered. Participants felt the ability to organize and prioritize the cards would be helpful in communicating with family, friends, healthcare workers, and in using them independently. The cards may also be useful in monitoring participants' perception of their capacity to manage obesity with preliminary data suggesting that improvements in health related behaviour are reflected by selecting fewer cards.

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Appendix 1: Card Statements

	Statement (Organized by Foresight Cluster)	Foresight Variables	Source
	Food Consumption		
1	I eat way too quickly.	Rate of Eating	BES
2	I often eat too much food and feel uncomfortable.		BES
3	It is very difficult for me to stop eating when there is food left on my plate.	Portion Size	DIS
4	I often choose quick, prepared, or convenient foods because I don't know how to cook with fresh ingredients or I do not have enough time.	Demand for Convenience, Convenience of Food Offerings, De-skilling	
5	I consume unhealthy foods (high fat, high sugar, low fiber) more often than I should because I like the taste.	Energy-Density of Food Offerings, Nutritional Quality of Food and Drink, Fibre Content of Food & Drink, Palatability of Food Offerings	
6	My food choices are quite limited because of cost, home/work environment, culture, or my personal food preferences.	Food Exposure, Food Abundance	Cost
7	I am preoccupied with food and constantly think about eating.	Tendency to Graze	BES
8	I don't try new foods often.	Food Variety	
9	I am concerned about the level of alcohol I consume.	Alcohol Consumption	
10	I don't feel confident in my ability to resist overeating when many kinds of food are available (such as at a buffet).		WEL
11	I don't feel confident in my ability to resist overeating when not feeling well (such as when I have a headache or feel physically run down).		WEL
12	I don't feel confident in my ability to resist eating while doing sedentary activities (such as watching TV, reading, or just before bed).		WEL
13	I am unlikely to eat less than I want.		FCR
14	If I overeat at one meal or eat food that is unhealthy, I do not eat less at other meals to make up for it.		FCR
15	I do not pay much attention to changes in my figure.		FCR
16	When I see, smell, or have a small taste of food, I find it very difficult to keep from eating.		DIS
17	Certain feelings (such as feeling anxious, blue, or lonely) or social situations (such as being with people who are overeating) cause me to overeat.		DIS
18	Sometimes, even when on a diet or not hungry, I eat sensibly in front of others but splurge while I am alone.		DIS
19	I feel so hungry throughout the day that I		HUN

	have to eat many times.		
20	Seeing foods I like, or being with someone who is eating makes me hungry enough to eat.		HUN
21	I am concerned about my influence upon my family's dietary habits.	Children's Control of Diet	
Social Psychology			
22	I don't feel I know enough about obesity and healthy behaviours.	Education, Conceptualisation of Obesity as a Disease	
23	I am frequently exposed to unhealthy advertising which causes me to eat.	Exposure to Food Advertising, Media Availability, Media Consumption	
24	I never seem to have free time.	Perceived Lack of Time	
25	I spend a lot of time in front of a screen.	TV Watching, Availability of Passive Entertainment Options,	Screen Time
26	I don't feel confident in my ability to resist overeating when there is social pressure to eat.	Peer Pressure	WEL
27	I feel less worried about my weight because so many other people overeat or are overweight.	Sociocultural Valuation of Food, Acculturation, Social Acceptability of Fatness	
28	My body size and shape influence how I value myself.	Importance of Ideal Body-Size Image	
29	I am a current or former smoker.	Social Rejection of Smoking, Smoking Cessation	
Food Production			
30	I feel pressured by society to overeat.	Societal Pressure to Consume	
31	Pressure at work affects my eating and physical activity patterns.	Pressure on Job Performance	
32	I look for low cost or large quantity foods.	Cost of Ingredients, Desire to Minimize Cost, Market Price of Food Offerings, Desire to Maximise Volume	
33	My access to healthy food is limited.	Pressure to Improve Access to Food Offerings, Demand for Health	
34	I buy food largely based on taste.	Pressure to Cater for Acquired Tastes	
35	I look for variety when buying food.	Desire to Differentiate Food Offerings	
Individual Psychology			
36	I am confused by nutrition labels or advice.	Food Literacy, Perceived Inconsistency of Science-based Messages	
37	I am a very social person.	F2F Social Interaction	
38	I tend to keep to myself.	Individualism	
39	I don't feel confident in my ability to resist overeating when I am nervous, depressed, or angry.	Stress, Self-Esteem, Demand for Indulgence/Compensation	WEL

40	I am on medication that makes me gain weight.	Use of Medicines, Side-effects of Drug Use	
41	I battle between trying to eat healthy and eating foods I like.	Psychological Ambivalence, Desire to Resolve Tension	
42	At the end of the day, I do not reflect back on how much food I consumed.	Conscious Control of Accumulation	
43	I regularly feel disgust, shame, or self-hate from overeating.		BES
44	I often feel helpless and incapable of controlling my urges to overeat and feel desperate to regain control.		BES
Individual Physical Activity			
45	I do not feel capable or do not know many ways of being physically active.	Parental Modelling, Learned Activity Patterns in Early Childhood, Functional Fitness, Degree of Physical Education	
46	I don't do much recreational physical activity.	Level of Recreational Activity	
47	I am not very active around the house.	Level of Domestic Activity	
48	I am not very active at work.	Level of Occupational Activity	
49	I do not walk, take public transit, or bike for transportation purposes.	Level of Transport Activity	
50	I don't feel confident in my ability to be physically active when I am nervous, depressed, or tired.		ESES
51	I don't feel confident in my ability to be physically active during vacations, bad weather, or when I have other commitments.		ESES
Physical Activity Environment			
52	There are not many opportunities for individual or group based physical activity in my life.	Opportunity for Team-Based Activity, Access to Opportunities for Physical Exercise	
53	I am not confident that I can be physically active without the support from family or friends.	Sociocultural Valuation of Activity	ESES
54	Safety concerns keep me from walking, biking, or taking public transit.	Perceived Danger in Environment, Safety of Unmotorised Transport	
55	Physical activity is too expensive.	Cost of Physical Exercise	
56	I do not take advantage of opportunities to be physically active (such as taking the stairs instead of the elevator).	Reliance on Labour-Saving Devices & Services	
57	I drive everywhere rather than bike or walk.	Dominance of Motorised Transport, Opportunity for Unmotorised Transport	
58	I have a sedentary job or prefer jobs without manual labour.	Dominance of Sedentary Employment, Social Depreciation of Labour	
59	It is difficult to walk or be physically active in my home, work, or school environments.	Walkability of Living Environment	
60	I don't enjoy physical activity.		Enjoyment

61	I feel embarrassed while exercising.		Embarrassment
Physiology			
62	I have tried dieting and/or weight loss medication.	Reliance on Pharma Remedies	Dieting
63	I feel I am predisposed to being overweight or obese. It's in my genes.	Predisposition to Activity, Appropriateness of Embryonic & Fetal Growth, Appropriateness of Maternal Body Composition, Genetic and/or Epigenetic Predisposition to Obesity, Resting Metabolic Rate, Level of Thermogenesis, Appropriateness of Child Growth, Extent of Digestion and Absorbtion, Degree of Optimal GI Signalling	
64	I am always hungry enough to eat any time. My stomach seems like a bottomless pit.	Level of Satiety	HUN

BES: Binge Eating Scale, DIS: Disinhibition, WEL: Weight Efficacy Lifestyle Questionnaire, ESES: Exercise Self-efficacy Scale, HUN: Hunger, FCR: Flexible Cognitive Restraint