

Athabasca University  Master of Arts - Integrated Studies

INVESTIGATING THE RELATIONSHIP BETWEEN LEARNING
STYLE AND SUCCESSFUL WEIGHT MANAGEMENT STRATEGIES

By

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Introduction

Recognizing individuality is a key objective within health and educational disciplines. Patient centered care is a strategic tenet within the new model of health care (Wagner et al, 2005) and health literacy is an important consideration for patients who wish to be informed decision makers, recipients of treatment and effective self managers. Within the context of obesity management, counseling has targeted lifestyle changes through behavioral and cognitive strategies. However, the inability to manage and maintain weight control has highlighted the “gap” that exists between cognition and behavior. There has been little investigation into the specifics of individualized learning as it pertains to health management constructs or, more specifically, whether learning style is a component for behavioral change related to weight management. The purpose of this research study is to explore the weight management strategies used by a sample of obese individuals and investigate whether there is a relationship to their unique learning styles as determined by VARK Questionnaire and Multiple Intelligences (MI) Questionnaire. Learning style cannot offer a complete solution to obesity and weight control education but may be a valuable part of educational approaches to behavior change, thus bridging the cognition-behavior gap. The overarching goals of the study have potential implications for health literacy and health promotion.

Literature Review

The majority of Canadians are reported as overweight (59%) and 23% are reported as obese. The public health burden is substantial with two billion dollars in direct health care costs to treat these people (*Canadian Community Health Survey*, as

cited in Lau et al, 2007). Weight modifications reduce disease related complications and co-morbidities as demonstrated by stabilized blood glucose, lowered blood pressure and lipid levels (risk factors for cardiovascular disease) and a decrease in medical visits and reduced pharmacotherapy. Yet,

“...Canada and the rest of the world are witnessing an alarming increase in the prevalence of obesity and its related health consequences ...interventions at the individual and population levels...have been ineffective for the most part” (Lau et al, 2007, p.1103).

Diet, physical activity and/or behavioral interventions are most often used for weight loss with higher intensity behavioral methodologies demonstrating greater success (Norris et al, 2005; Whittemore et al, 2003; Wammes et al, 2005; Shaw et al, 2005; Reeder and Katzmarzyk, 2006). However, health behavior changes are not easily assumed; dietary intake modification and maintenance have been shown to be very difficult with low rates of compliance. For example, one study found that although 80% of respondents felt a low fat diet was very important and 90% reported they would reduce fat if it would prevent disease, the respondents mean fat intake still remained quite high (Neuhouser et al, 2002). Often individuals look toward the diet and weight loss industry which injects 33 billion dollars into the economy annually (Coleman, 2000). However commercial weight loss programs are associated with high costs and suffer with high attrition rates and suboptimal clinical evidence of effectiveness (Tsai and Wadden, 2005). Unfortunately, the evidence continues to show that in general, most individuals who achieve weight loss eventually regain the weight (Irwin and Guyton, as cited in Butler &

Mellor, 2006; Elfhag and Rossner, 2005; Heshka et al, 2003; Latner, 2001; Tsai and Wadden, 2005; Sullivan et al, 2007; Wammes et al 2005; Fisher et al, 2005).

Behavior Change Theory

Weight management is often approached through counseling – a concept supported by the Canadian Task Force on Preventive Health Care (CTFPHC) who identified improving diet as one of the primary health behaviors requiring counseling in primary care to reduce morbidity. Counseling may occur during a single encounter, a few repeat visits or a structured counseling process with the recommendation for an interactive, goal oriented and patient centered approach (Elford et al, 2001). Nutrition and physical activity interventions are widely discussed in the literature as central to weight management simply due to an energy input/output balance (Reeder and Katzmarzyk, 2006; Brug et al, 2005; Kremers et al, 2005). But behavior change related to eating patterns and choices is a lifestyle change and a complex process. The daily requirement for nutrition requires proactive awareness and attention, nearly continuous decision making and adjustments to circumstances (Wagner et al, 2005) rather than avoidance behavior. Counseling from a behaviorist approach focuses on modifying or changing a behavior by analyzing and planning changes to the target behavior antecedents, the behavior itself and the consequences related to the behavior (Watson and Tharp, 2002). Counseling recommendations for behavior change have been informed by other theoretical models and a number of cognitive and behavioral factors need to be considered for weight management.

Behavior change is often associated with the Transtheoretical Model of Behavior Change (Prochaska and DiClemente, 1984 as cited in Cioffi, 2002) which describes a gradual dynamic process involving progress through stages of readiness for change. Movement between stages is associated with experiential and behavior oriented interventions (Cowan et al, 1995 as cited in Cioffi, 2002) and stage specific characteristics define various levels of progress. Several psychosocial theories are linked to behavior change models. The most frequently used paradigm in weight management is Social-Cognitive Theory (Palmeira et al, 2007) with the most powerful determinant being self efficacy – also shown to be an important element for movement between stages (Butler and Mellor, 2006). Albert Bandura outlined self-efficacy as the belief in one’s ability to perform particular behaviors and numerous studies support self-efficacy as central to success with weight management (Butler and Mellor, 2006).

Other models such as The Theory of Planned Behavior and Self-Determination Theory also attend to movement from a motivational state to a volitional phase of behavior. Action planning, cognitive restructuring and goal planning are just a few of the processes used for progress through the stages and enhancing self-efficacy (Gollwitzer, 1999 and Fuchs, 1999; 2001 as cited in Lippke and Ziegelmann, 2006). Fuchs (1999, 2001 as cited in Lippke and Ziegelmann, 2006) also reports that individuals who are able to move beyond the formative learning and into more habitual action have gathered more resources and knowledge.

In 2004, the *International Journal of Behavioral Nutrition and Physical Activity* began to debate the theoretical foundations of health behavior change interventions. Individual choice is thought to be influenced by mediators or determinants, including

cognition as well as environmental and social factors. Each may work in combination with another and can change over time, with varying situational or even cultural circumstance (Brug et al, 2005). Elfhag and Rossner (2005) provided a comprehensive description of mediating factors which will be the framework for this discussion.

Weight loss patterns and weight cycling are constructs which affect weight management. Weight loss and maintenance efforts are correlated to one's weight management history. In addition, lofty weight loss goals and failing to achieve one's "dream weight" may be discouraging and affect self efficacy or belief in one's ability and confidence to lose weight. Of particular concern is the mental distress and higher incidence of eating disorders associated with a cyclical dieting pattern (Elfhag and Rossner, 2005). Habit sustaining behaviors improved with higher frequency of contact with a therapist/professional (Cioffi, 2002).

Self monitoring has been shown to be an important component of restraint as individuals are maintaining greater awareness and vigilance which results in more conscious decision making (Elfhag and Rossner, 2005). Self monitoring is an introspective behavior and segues into a description of other psychosocial variables derived from behavior change theories. Motivation is a prerequisite to weight management efforts and perseverance. Individuals with higher motivation prior to beginning weight loss interventions experienced greater weight loss (Elfhag and Rossner, 2005; Butler and Mellor, 2006; Teixeira et al, 2005). Internal locus of control is an internally developed motivation which promotes behavior to create an outcome. This type of motivation is associated with successful weight loss (Kincey, as cited in Butler and Mellor, 2006) and maintenance (William et al as cited in Butler and Mellor, 2006).

Internal locus of control perpetuates autonomous motivation where individuals internalize causality.

Self-efficacy has been the most analyzed construct related to nutrition and activity-related behavior change (Palmeira et al, 2007, Steptoe et al, 2000) and is also related to more confidence, greater independence and goal direction. Individuals with poor stress management and coping skills were found to be eating food in order to regulate mood- an escape avoidance mechanism. Weight re-gainers demonstrate motivational deficits, stress and anxiety, and low self-efficacy (Butler and Mellor, 2006).

Social ecological theory highlights the importance of environmental influences such as availability of nutritious food, cost effective food sources, advertising impact and social trends (Coleman, 2000). Food selection and eating patterns are influenced by psychosocial, behavior and environmental factors (Palmeira et al, 2007; Savoca and Miller, 2001, Fisher et al, 2005). An individual's home, work and school environment are important environmental factors for healthy weight management (Canadian Population Health Initiative 2005-6) with support stemming from life events –stability, positive family relations and social activities (Fisher et al, 2005; Elfhag and Rossner, 2005). The weakness of Social-ecological Theory is that it identifies what needs to be changed rather than how (Fisher et al, 2005; Annunziato and Lowe, 2007). Also running contrary to this theory are the findings from Wardle and colleagues (2001) that appetite and activity preferences in children play a causal role in obesity and occur regardless of familial environment, thus supporting a genetic role.

Personality also appears to be a factor in weight management as anxiety, impulsivity and concern for monotony were negatively related to weight loss.

Dichotomous thinking (good bad, right wrong) is not conducive to weight maintenance whereas more flexible thinkers are more successful (Elfhag and Rossner, 2005; Sullivan et al 2006). Other personality factors for success included close relationships and impulse control. Finding a suitable weight loss strategy involves fitting one's lifestyle and personality (Elfhag and Rossner, 2005). Time for classes or physical activity; cost of classes, physical activities and healthier food; genetics; set point regulation/metabolism are all confounding factors underscoring individual weight management efforts (Kremers et al, 2005; Butler and Mellor, 2006). In addition, there are barriers to weight management which extend beyond behavioral change theories. Screening for psychiatric factors such as depression, anger and anxiety has been suggested (Teixeira et al, 2005) as greater psychopathology, binge eating (Latner, 2001) and psychological distress (Annunziato and Lowe, 2007) have been found among individuals seeking treatment for obesity. These issues may not be sufficiently addressed in existing programs (Annunziato and Lowe, 2007) and may also exceed the capacity of weight management education initiatives.

Knowing the factors influencing progress through these behavior change stages, may help design effective interventions (Nigg, 2003 as cited in Lippke and Ziegelmann, 2006). However, the area of behavioral nutrition and physical activity research is still relatively young and developing further. Some theorists believe the underlying theories have been based upon thought rather than knowledge or empirical evidence. The need for empirical evidence has motivated investigation of predictors of weight loss. Teixeira et al (2005) found several factors, one of which was culture-specific. Steptoe et al (2000) identified self-efficacy and motivation as important predictors however they also stated

that perceived benefits and barriers were related to decisional balance and emerged as relevant to behavior change. Teixeira et al's (2005) literature review found predicting weight loss success is difficult if not impossible even when considering mediating variables.

The lack of empirical evidence to support the behavior change theories has reduced the value of mediating factors for weight loss resulting in more emphasis on behavioral outcomes. Although the CTFPHC recommends future research related to intermediary factors, current practice guidelines focus on evidence demonstrating a reduction in risky behavior; intermediary process outcomes such as knowledge and attitude are scarcely considered.

Brug et al (2005) argue that a determinant of behavior may differ from a determinant of behavior change and thus requires a different theoretical approach. They also argue that determinants or predictors of certain behaviors do not directly explain how to modify a behavior i.e. how to translate determinants into methods or strategies for behavior change. Intentions and motivations don't necessarily generate opportunities or abilities – a notion contributing to the cognition-behavior gap.

The behavioral and cognitive factors related to weight management as well as the environmental, social and intrinsic barriers provide a clear message that there is no single approach that will suit every individual (Butler and Mellor, 2006; Teixeira et al, 2005; Kremers et al, 2005). It is also apparent that an individualized approach to weight loss requires strategies and behaviors that must be learned by individuals with varied life situations and learning abilities.

Health Literacy

Within the new model of health care, patient-centered care includes the important role of patient education and one's ability to learn the various aspects of their condition or disease, the treatment options and self-management strategies (Wagner et al, 2005). Health literacy focuses on "...the degree to which individuals have the capacity to obtain, process, and understand basic health information and services ..." (National Institute of Health as cited in Paasche-Orlow et al, 2006). Literacy and educational levels correlate with health literacy (Hemming and Langille, 2006) however effective education leads to better clinical outcomes and health behaviors (Kessler and Alverson, 2003). The ensuing discussion around health literacy contributes to an understanding of its importance in terms of health outcomes and consequences as well as the role health literacy plays in the provision of holistic care.

Limited literacy has been shown to be associated with poor health and is particularly prevalent among the elderly, minorities, and those with lower levels of educational attainment (De Walt et al 2004 as cited in Paasche-Orlow et al, 2006). By interacting with other social vulnerabilities, health illiteracy may actually contribute to racial and ethnic health disparities (Sentell, Halpin, 2006 as cited in Paasche-Orlow et al, 2006). Paasche-Orlow and colleagues (2006) report over 300 studies have demonstrated that educational materials are incomprehensible to a significant portion of patients. Inability to comprehend health information may increase patient anxiety and prevent information seeking and informed decision making (Wilson et al, 2003). Research also shows noncompliance is associated with inability especially in complex situations (Fisher et al, 2005). For example, inability to understand medication regimes was found among

24% outpatients with “adequate” literacy as compared to 65% inability among “inadequate” literacy (Williams et al, 1995 as cited in Gottfredsen and Dreary, 2004).

The most recent findings indicate 22% of Canadian adults are illiterate while another 26% can only read simple language (International Adult Literacy Survey, 1994 as cited in Rootman and Ronson, 2005).

Higher scores on a measure of obesity related knowledge were associated with lower BMI and higher socioeconomic status suggesting obesity related knowledge is lacking in high risk communities. Physical fitness, low-sugar/low fat diets increase with higher intelligence while obesity increases with lower intelligence or lower education (Gottfredsen and Dreary, 2004; Halkjaer and Sorensen, 2004; Halkjaer et al, 2003). It is widely reported that health promotion including weight management, requires knowledge and skill building especially for individualized lifestyle changes and self care (Timmerman, 1999). Conceptual commonalities from behavior change theories include both knowledge and skills (Whittemore et al, 2003) and are prerequisites for change. Annunziato and Lowe (2007) found that obesity related knowledge impacted efforts and consistently and strongly predicted help seeking behavior.

Patient centered care involves understanding an individual’s life circumstance and preferences, tailoring management to fit their lifestyle, preferences, values, readiness and experience. Under these conditions they can be activated or empowered to participate in decision making which results in greater adherence to treatment and more effective self care (Timmerman, 1999; Wagner et al, 2005). Timmerman (1999) also found that goals were more likely achieved when individuals perceived they had the ability to individualize their strategy.

The self care approach is consistent with holistic care – shifting from a focus on the disease to the patients’ feelings and experiences. Integrating psychological and social factors is an important factor for individualizing treatment (Wagner et al, 2005). Self care competence is enhanced by psychometric intelligence (Gottfredsen and Dreary, 2004) and hindered by poor learning and reasoning capabilities. Large proportions of people do not have adequate information for self-management (Wagner et al, 2005; Hung et al, 2007). “Knowing and doing” capabilities must be assessed. Reading, writing, communication skills as well as reasoning and perception skills, are the foundation for self care ability. Any deficits must be overcome through alternative educational strategies (Wilson et al, 2003).

Learning Style Theory

Health literacy has focused on the content of health information and how it might be best communicated to various individuals. However, individualizing the content of information still does not consider the individual preferences or style(s) of the patient as a learner.

Behaviorism theory suggests that learning involves observable and quantifiable responses, skills and knowledge – often out of the natural setting and measured in a controlled environment. The traditional psychological view of learning was characterized by mental tests seeking to measure underlying mental ability. Research from cognitive psychology has increased understanding of competency and related learning processes. Learning style refers to the use of personal characteristics - an “individual’s characteristic and consistent approach to organizing and processing information” (Tennant, 2006).

Marcy (2001 as cited in Hamilton, 2005) added that learning style includes receiving, processing organizing and understanding information as well as how it is best absorbed and applied (Kessler and Alverson, 2003).

Howard Gardner explored mental abilities for the wide range of roles, activities and achievements of various people. In 1983, he developed the theory of Multiple Intelligences which identified eight different types of intelligences which can be assessed by questionnaire (Multiple Intelligences Questionnaire). Gardner proposed that the unique blend of strengths and weaknesses demonstrated within one's intelligence profile was to be considered rather than simply one type or level of intelligence. Furthermore, he highlighted cultural, linguistic and environmental influences on human development and capacity (Silver et al, 2000). His theory advanced the concepts of the multi-dimensional situated learner who develops through experiences but also increases ability to solve life problems, to find and create questions and challenges and develop culturally-significant products/services (Silver et al, 2000; Tennant, 2006)

Silver, Strong and Perini (2000) assert that Multiple Intelligences (MI) Theory needs to be integrated with learning style assessment because MI Theory is centered on the content of learning whereas learning styles revolve around the individualized process of learning. To this end, the research methodology in this study will include an assessment of learning style. The VARK Inventory is used in several University settings in the United States and Canada. In 1987 Neil Fleming developed a short, questionnaire to investigate how individuals respond to pragmatic situations reflecting their learning preferences – Aural, Visual, Reading/Writing or Kinesthetic (VARK Questionnaire copyright version 7.0). Forrest (2004, as cited in Hamilton 2005) reports that patients will

master new information more quickly and easily when utilizing their learning preferences. Assessment of learning styles can also occur through listening to the type of language a person uses when communicating. Through spoken words, an individual is unconsciously inclined to use visual, auditory and kinesthetic words for self-expression (Chase, 2001).

Recognizing that people learn differently enables an egalitarian community of learners rather than assessing a level of intelligence and labeling people as having high-intelligence/low intelligence, poor or good learning ability etc. (Tennant, 2006). Learning style is “a component of many factors such as personality, brain-dominance, prior learning, aptitudes, abilities, and other factors...” (Sims and Sims, 1995). Jensen (1995 as cited in Chase, 2001) “supported the idea that when learners are taught in their own style, their motivation, initiative, and results improve.” It challenges the present educational methodologies particularly within medically related education to consider the diversity of patient learners and perhaps all learners (Lane, n.d).

Integrating Learning Styles and Behavior Change

The patient’s learning style is an important component to consider in addressing health needs – a concept that must be explored further in order to more completely manage individual concerns and actions. A person’s unique learning style is a key step within a holistic medical model of care. Behavioral theories focus on specific behaviors for change while cognitive theories focus on altering the thought processes related to change. But the challenge remains within the “gap” between cognition and behavior. Brug et al (2005) emphasize the role of ability - “how to” implement behavior change -

rather than just motivation. Translating behavior change theories into methods and strategies requires much more than intention; learning what needs to be done and how to act (behavior change) are two different processes (Saarmann et al, 2000). The following discussion directs attention to individual learning style as a bridge toward better application of knowledge.

Self efficacy is one of the strongest determinants and predictors of weight change and a key function for developing mastery and competence regarding decisions and choices toward exercise and healthy nutrition (Palmeira et al, 2007). Studies report that well-educated individuals are among the more successful weight managers and highlight the importance of a strong knowledge foundation for thinking skills, problems solving and transitional behaviors related to food selection as part of daily management (Neuhouser et al, 2002; Savoca and Miller, 2001).

Savoca and Miller (2001) discovered a common theme among weight loss participants regarding how programs could be more effective. The most common response was that more information was desired regarding individualizing their meal planning. Many of the participants felt unable to transfer nutrition knowledge to practical daily meal preparation skills (Whittemore et al, 2003). In other words, they were unable to take decontextualized learning and develop it into “situated” understanding or practical intelligence (Tennant, 2006). Strategies for simplifying and making meal planning, food choices and portion control more practical have been investigated as educating the patient should result in observable mastery (Paasche-Orlow et al, 2006).

Using a variety of educational techniques has been suggested as a means to assist patient learning (Whittemore et al, 2003; Jeffery and Gerber as cited in Latner, 2001). No

differences were found between computer-assisted and therapeutic interventions suggesting a good adjunct to weight management (Latner, 2001). Internet training and television were shown to be effective tools and could be potentially beneficial to individuals with various learning styles and preferences (Jones and Burkett, 2002; McCoy et al, 2005).

Written educational materials are by far the most frequently used mode for patient education despite evidence that they are not the most effective; most hospital readmissions for uncontrolled diabetes are due to lack of knowledge and diabetes management skills (Gucciardi et al, 2006). In a 1992 National Institute of Nutrition study, there was wide variation of comprehension among individuals who misunderstood or misinterpreted ingredient lists on nutrition panels (Coleman, 2000). Communicating the complexities of health information, treatment and care are pivotal to health management, health promoting behavior and attitude changes as well as patient decision making and self care capabilities (Wilson et al, 2003). Simply providing information is an incomplete step toward learning – a process which involves needs assessment, patient’s learning readiness, skills and abilities, motivation, resources, support and maintenance (Saarmann et al, 2000; Falvo, 1994 as cited in Chase 2001). Shultz et al (2001, p.100) assert “underestimating or misidentifying the patient’s education needs could have a negative impact on educational effectiveness and outcomes.” Jensen (1995 as cited in Chase, 2001) found that learning appropriate to one’s style or preference results in increase motivation and initiative with improved outcomes.

Numerous researchers advocate the need for further research particularly regarding the cognitive, psychosocial variables within behavior change theories and

resulting strategies for weight loss (Palmeira et al, 2007; Wardle, 2007; Neuhouser et al, 2002; Savoca and Miller, 2001; Halkjaer et al, 2003; Teixeira et al, 2005) as well as further enhancing health literacy through effective teaching strategies (Wilson et al, 2003; Hemming and Langille, 2006). Investigating learning styles is an important step in applying effective weight loss strategies that are responsive to individual needs.

Developing teaching strategies that recognize the value of learning according to one's learning style or strength rather than simply a singular approach aimed at cognitive and psychosocial variables is a key facet in this investigation.

Weight control is a complex, multifactorial process (Lau et al, 2007). A holistic approach to weight loss emphasizes a lifestyle focused on wellness rather than dieting or exercising for the purpose of weight loss (Elfhag and Rossner, 2005; Rapoport et al, 2000). A holistic approach to learning a healthy lifestyle begins by recognizing the individuality of the learner/patient rather than a standardized cognitive entity.

The Joint Commission on Accreditation of Health Organizations (JCAHO) and the National Committee on Quality Assurance requires patients to receive education and training related to their specific needs. The JCAHO also indicates that education needs to be specific to the patient's ability, learning preferences and readiness to learn (JCAHO, 2000 as cited in Chase, 2001). An extensive literature search found very little research regarding learning styles as they relate to patient education. In addition, only one piece of research was discovered which included learning styles and weight management specifically. Tober (1996) found self-efficacy, internal health locus of control and personality were predictors of weight loss however her research assessed personality and learning styles in order to evaluate a specific University-based weight management

program. No other research was found regarding learning styles as a learning tool for weight management and behavior change. This paradigm may reflect what Wagner et al (2005 p. S11) describe as “professionals by virtue of their culture, training and social dominance, job stress and other factors are traditionally inclined to be controlling and biomedically oriented and not inclined to explore the non-disease aspects of their patients’ lives...professional attitudes and behaviors that must be altered [sic].” Patient education should extend beyond simply informing or providing information – it must enable and empower patients. “Teaching has to be about learning, otherwise, there is only talking” (Fleming, 2002 as cited in Hamilton, 2005).

Several large-scale goals borne from the research problem must be considered as an important backdrop to the specific objectives of this research study. First, a holistic approach to lifestyle modification – already determined to be successful for weight loss (Rapoport et al, 2000) promotes integration of learning styles for weight-related behavior change. Secondly, the integration of different techniques for weight loss learning and management would enable a patient centered learning methodology which may evolve to greater computer use and e-health resources which are undergoing greater consideration and development (Jones & Burkett, 2002). Finally, improved individual skills for health promotion and prevention would in turn contribute to the larger context of population wellness, health care programming and reduced health care costs.

Method

Two investigators were involved in recruitment and data collection. Both studies investigated patients’ experiences with weight management however this study compared

learning processes (as defined by learning styles/multiple intelligences) related to the reported experiences while the other study focused on the patient's communication/interaction with their physician. The interview outline was designed to draw out similar information from the same target population, however each investigator had a separate and different study purpose and plan for data analysis.

The study was based in a primary health care clinic in Manitoba. Inclusion criteria were: 1) adults interested in participating in the study and; 2) obesity or past obesity as defined by a self-reported or measured BMI greater than 30. Notice/posters were placed in the waiting room at the health care clinic outlining the study and inviting participation. Potential participants who voluntarily responded to the study posters were asked to complete a card which would provide their contact information to the investigators. This card was placed in a collection envelope within the clinic examination rooms and retrieved every 1-2 days by one of the investigators who contacted the individual shortly thereafter. The potential participant was provided with study information, had an opportunity to ask questions and was asked to determine a suitable time for obtaining written informed consent, and completing an interview and learning style/multiple intelligence assessment questionnaire. The participants often chose to meet at the clinic (before or after a scheduled appointment) or in a nearby coffee shop.

During the interview, participants were asked open ended questions related to their weight management experiences. The interview was semi-structured and the protocol consisted of 38 questions. However fewer questions were usually asked as the discussion often produced the required data. For the purposes of this investigation, questions tapped into the following content areas: Use of weight loss programs/strategies,

frustrations, barriers as well as successful attempts followed by questions related to learning preferences and environment. Interviews were audio recorded and then transcribed verbatim. Several participants were interviewed a second time by one of the investigators in order to elaborate or provide greater clarification of responses from the initial interview.

The survey which followed the interview consisted of two instruments to assess learning style– VARK Questionnaire and Multiple Intelligences (MI) questionnaire (Multiple Intelligences Questionnaire, 2001; VARK Questionnaire Copyright Version 7.0, 2006). Neil Fleming and Greg Gay (Learning Disabilities Resource Community) granted permission to use the respective instruments. All instruments, protocol and consent forms received prior approval by the Health Research Ethics Board of the University of Manitoba as well as the Research Ethics Board at Athabasca University. All participants were treated in accordance with the ethical guidelines and assured confidentiality of their individual interview and questionnaire responses.

Data Analysis

Data relevant to this study (i.e. individual experiences with weight management and learning style) was analyzed by this author only. Analysis involved reading and rereading the transcripts which were imported into a qualitative analysis software program for organization. Verbal data units were highlighted and then either 1) categorized according to strategies that patients reported as helpful and/or used frequently; or 2) coded for meaning related to individual experiences. The participants' VARK and MI scores were entered into a spreadsheet alongside various comments, codes

and strategy categories identified in the interviews. The focus was on patterns which were identified between learning preferences and successful weight loss strategies and activities.

Results

Eighteen participants were interviewed but eight were excluded from data analysis. One participant clearly demonstrated emotional barriers and the investigator chose not to include the limited information provided during the interview. Four participants declined or were unable to continue with further investigation and/or questionnaire completion. Two interviews were ruined due to recording difficulties and one participant had never experienced any weight challenges until induced by a recent medication regime. Therefore, the study sample size was 10 female participants with an age range of 49-84 years (average age 61 years).

Table 1: Sample characteristics	
Description	Frequency (n=10)
• Female	10
• Current BMI > 30	5
• Current BMI < 30	5 (History of higher BMI)

Participant interviews ranged from 283 -521 lines of transcribed text. Most responses were between 3-6 lines of text however responses were longer when participants were asked to freely add additional information or provide their opinions on weight loss strategies. The interviews ranged in time according to the breadth of conversation as determined by the willingness of the participant. On average, the interviews lasted 45-60 minutes. Follow up interviews were completely voluntary and lasted only

about 30 minutes. Notes were taken rather than the follow-up interview being taped as it simply provided clarification of earlier discussion points.

Affect

Every interview was marked by direct and indirect comments regarding feelings related to weight and diet behaviors. Stressful situations often mediated eating which the participants described as “being bad.”

Table 2: Feelings related to Weight Issues	
Affect	Frequency
• Stress	8
• Depression	5
• Embarrassment	9
• Low self esteem	5
• Lack of confidence	3
• Guilt	3

Many respondents provided very poignant descriptions of eating behaviors related to stress.

You don't think about eating, you think about how badly you feel and something that makes this go away.

You tend to eat and you do not realize that you are eating.

Lots of things interfere with my thinking

You just don't care anymore- it is easier to screw it and eat.

The magnitude of affect as a mediating factor became particularly clear when one participant stated;

It does not matter if [obesity] is life threatening, or anything to the person, because at the time you are eating, you are not thinking about these things. You are not thinking about that...You need to deal with [the stressful] problem.

Another participant further suggested;

[one]shouldn't be looking at losing the weight so much as getting help for the person in taking care of what is causing you to eat... eating is a symptom; it is not the disease.

The participants have an understanding of their unhealthy weight and a large majority discussed the shameful feelings associated with their appearance and their eating behaviors which contribute to weight gain.

You feel worse afterward because you know [eating or binging] was a stupid thing to do. Why did you do this?

OK. It is a bad cycle where you feel worse and end up eating more.

Yes because you feel guilty.

One participant reproached media messages which contribute to an unhealthy psyche among women and young girls who lament the

unattainable dream and we all feel crappy about being overweight... society says beautiful women are very very thin and it is very destructive mentally.

Learning Preferences

Learning preferences were scored and determined by written Multiple Intelligences and VARK assessment questionnaires completed by the participants. The assessments were not intended to pigeonhole a learner into a single mode or category. Rather, the participants' scores suggest the usefulness of multiple if not all modes or categories. Table 3 provides frequencies of VARK and the dominant MI scores.

Relationships are revealed in the cross tabulation of high scoring modalities or intelligence categories with weight management strategies and activities.

Table 3: Learning Preferences	
Mode	Frequency * multiple categories can apply to one person
• Visual	3
• Aural/auditory	7
• Read/write	2
• Kinesthetic	7
• Logical/mathematical	3
• Interpersonal	8
• Intrapersonal	3
• Multimodal	2

First, the dominant VARK results will be discussed in the context of information defining the learning modes (as described by Carter et al, 2005).

Aural/Auditory.

This modality suggests a preference for information that is heard or spoken through discussion, lecture, and tapes or by talking things through and sorting information out through discussion with others. It also includes talking aloud or to oneself.

The participants who scored high in this category reported a preference for hearing information from other people or working with someone in their weight loss efforts. One participant scored remarkably high in this category. While her downfall was social eating, hearing information and discussing exercise and diet related issues with others was a helpful resource for her. In fact, she recognized that written information was not a useful strategy for her.

Another participant explains how she gives herself messages when she feels the need to eat;

Eat a banana, eat an apple [name] have a glass of water but stay away from the fridge!

This kind of self talk is a behavior noted among learners with aural/auditory preferences.

Kinesthetic.

This modality describes a preference for hands-on or experiential learning (simulated or real) and learners will benefit from demonstrations, analogies, videos and movies, case studies, practice and applications. The information needs to sound practical, real and relevant. In addition, use of all the senses is favorable for such learners and they need to be directly involved or will otherwise be bored.

Respondents who scored high in the kinesthetic category identified other people around them who demonstrated or modeled healthy behaviors related to dietary intake and activity levels. One participant enthusiastically described the value of a scene from a skit which taught the audience about the inadvertent addition of high amounts of sugar during a typical daily diet.

All three individuals who expressed boredom with exercise or diet routines were in the kinesthetic learning category.

Multimodal.

This category of learners tends to choose a mode that suits the situation or alternatively they require input through several modes in order to acquire a thorough understanding.

Two participants could be considered multimodal learners as they scored relatively high in almost all of the categories. As well, they also reported using many different strategies. Whether they adapted to a learning situation or required multimodal input was not assessed.

Second, several dominant MI scores demonstrated a pattern or relationship to certain strategies and will be illustrated here with a description of each intelligence (as described by (Silver, Strong, & Perini, 2000; Multiple Intelligences Questionnaire (2001)).

Logical/Mathematical.

These learners display an aptitude for reasoning, thinking logically and problem solving. They will emphasize the rational and establish causes and effects. Their intelligence may be expressed through sign language, body movement and/or fine motor movement.

Three participants had high scores in this category. One unique characteristic stood out among them; they all were firm in their beliefs about what they needed to do, the internal motivation required and a pragmatic, sensible approach to healthy weight management.

One participant described herself as logical and explained her approach to weight management

I am a thinking person and I know logically what I can do and what I cannot do... I have not tried any yo-yo diets and you know women at work, they give you the cabbage diet, they give you this, they give you that. You know, it is garbage. It is an engine, you put gas in, you rev up the engine and go. That is all there is to it.

Another respondent did not elaborate much during the interview process however the following brief comment demonstrated her logical approach

Like I said, it depends on nobody but me, so you can tell me miracle ways of doing, but if I am not interested, I won't do it.

The “no nonsense” approach described by these participants is consistent with learners with logical/mathematical intelligence who get the most from a planned, rational methodology.

Interpersonal.

This category embraces verbal and nonverbal communication with an emphasis on interaction and relationship building and/or working with others. These people-oriented learners learn best through communication involving sharing and comparing. Body language is a symbol they will often use for expression.

Interaction and working with others was reported among those individuals who scored highest in the interpersonal category. Most participants had relatively high scores in the interpersonal category and demonstrated communication and interaction interest simply by participating in the study interview(s).

Intrapersonal.

This category emphasizes the ability to be in tune with oneself and one's needs and feelings. These learners are often independent and benefit from quiet reflection, journaling or diarizing. Their intelligence is expressed through "self-symbols" (e.g. dreams) and they are good at pursuing their interests and goals and benefit from a self-paced means (Silver et al., 2000).

Participants who scored high in the intrapersonal category reported the need for structure and organization in their daily routines. As well, they were the only people who requested feedback during weight management. Several of these people also had a very direct approach toward weight management. For example;

Every morning, I go to the bathroom, wash and I go on a scale and go to the kitchen and take my blood pressure...I make sure that the fridge gets 2 week supply of things.

I take my medications and then I have to have my breakfast. I make sure

I have, well, I try to get protein in for the morning time. [Muffled]

And then I will have one piece of toast, cereal and banana and a little bit of milk and yogurt.

All of the participants in the intrapersonal category reported concerns about not fitting in to a group environment for weight management or exercise classes.

Discussion

Affect -particularly feeling stressed, depressed or frustrated- was a central issue for participants and experienced frequently and at various times during their weight

management challenges. This is also consistent with the findings from Butler and Mellor (2006) who reported on food consumption as a means for stress management and coping. One participant's directive to attend to the underlying emotional and stressful factors resonates with earlier findings regarding psychopathology and psychological distress among obese individuals (Teixeira et al., 2005; Annunziato and Lowe, 2007). The importance of this issue cannot be ignored however it is certainly beyond the scope of this study and in some cases may indeed exceed the scope of weight management education.

Learning style was investigated as one step toward enhancing self management within the greater context of knowledge, attitude and behavior (Axelson and Brinberg, 1992). Other characteristics such as age, ethnicity/culture, gender, attitudes and beliefs, readiness to learn and psychological profile are important considerations for adult learners (Walker, 1999a). This sample was exclusively women thus the generalizability of this study's findings are directed toward women. Gender differences related to learning were not specifically targeted in this study however raises this concept as an important point for future consideration related to weight management and behavior change strategizing.

Other characteristics shaping the learning process have been previously investigated. Shepherd and Sims (1990) suggest the need for positive cognitive responses to a message in order for the individual to effectively process it and use it in making decisions or actions. Also, as stated previously, self-efficacy has been the most analyzed construct related to nutrition and activity-related behavior change (Palmeira et al., 2007; Steptoe et al., 2000) and is related to more confidence, greater independence and goal

direction. Nevertheless, Bandura upheld the importance of learning and promoted mastery experience as a means toward enhancing self-efficacy. Thoughts regulate actions and many factors influence how information is cognitively processed. The message remains that cognitive processing must be accompanied by requisite skills and knowledge (Pajares, 2002).

The VARK scores corresponded to interview responses related to the participants' reports of general learning strategies, hobbies/interests and employment thus enhancing confidence in this instrument's reliability. Other studies commonly use a similar modality assessment –VAK- among adult learners (Russell, 2006). Inconsistent scoring resulted between the VARK and Multiple Intelligences assessments and undermined the value of triangulation. Although not to detract from the objectives of this study, the correlational deficit prompted further review of the instruments and their theoretical basis.

The first finding was that the definition of “learning style” has only recently received some attention. Anecdotally, learning style has been discussed as a global construct among several studies and references which discounts the specificity with which it is now defined. Mokhtar et al's. (2007) discussion illustrates the concept of learning styles:

Learning styles can be broadly categorized into three groups: information processing-based, personality-based, and multi-dimensional and instructional preferences-based (Yeap et al., 2005). The information processing-based learning style generally assesses individual cognitive approaches to understanding and integrating information...On the other hand, the personality-based learning style examines the influence of Individual personality on preferred ways of acquiring

and organizing information... Finally, the multi-dimensional and instructional preferences-based learning style looks at individuals' preferred environment for learning (p.465).

Stated in this way, the use of the term "learning style" is a macro-theoretical term whereas the practicality of assessment and teaching strategies would more likely follow "learning models" - a differentiation that has not yet been examined.

This leads to the question of how VARK and MI Assessment findings would be categorized. Neil Fleming, the VARK creator, suggests that VARK isn't technically a learning style because a learning style has more than 18 dimensions; VARK is a part of these dimensions but most concerned with the input and output of information in a learning context. However, he further comments that the VARK preferences are part of the Myers-Briggs Personality Type Indicator whereas MI is a cognitive model (how the brain processes learning) which includes some of the VARK modalities.

The second finding from the instrument review was that Silver, Strong and Perini's (2000) integration methodology claimed MI Theory is centered on the content of learning whereas learning styles (based on Jung's theory of learning styles) revolve around the individualized process of learning. As such, integration of the two models was proposed to first recognize the dominant intelligence category and then further specify a learning style within that category. An example from Silver et al. (2000) suggests that an individual with Bodily/Kinesthetic intelligence could be a mechanic or a ballet dancer. Clearly we recognize the differences between the two which are further explained by learning style variations within particular intelligences i.e. the mechanic's strength for

sensing-thinking (Mastery) versus the dancer's strength for intuitive-feeling (Self-Expressive) learning.

Without a well-defined theory of learning style, the VARK questionnaire was substituted in this study as an alternative method of assessing learning style because the investigator thought it was easier for participants to use. Consequently, integrating the VARK and MI outcomes has differed substantially from the theoretical basis of Silver et al (2000). Furthermore, while VARK was a very practical approach to learning strategies, Kallenbach and Viens (2004) advise that "Intelligences operate in combination ...MI theory is a definition and conceptualization of human intelligence. It is not and does not prescribe a particular approach or set of activities" (p. 59).

When designing this study, MI Theory was particularly appealing as it incorporated awareness of cultural differences and situational learning. Kallenbach and Viens' (2004) research found adult learners benefited from MI-inspired teaching because it increased self-direction among the learners, promoted student choice of learning format, increased the authenticity of the learning experience and the learning became more relevant and meaningful to the learners. Students were found to have increased confidence and control of their learning and greater awareness of their own abilities and strengths as learners. These are very valuable considerations for self efficacy and learning transference – cornerstones for weight management education for the adult learner.

With the triangulation deficit aside, the VARK and MI assessment scores were independently compared to weight management strategies. As such, the results from this study were previously reported. In addition, specific strategies reported by the participants in this study could be easily linked to behavioral change strategies

demonstrated in other studies. Two examples of previous research corroborating this study's findings are:

1) Self monitoring is an introspective behavior (Elfhag and Rossner, 2005) and this study found the intrapersonal learners carried out various forms of self monitoring.

2) External factors such as an individual's home, work and school environment influence weight management behaviors (Canadian Population Health Initiative, 2006; Fisher et al., 2005). Diet and exercise were influenced by social factors most frequently reported among the participants that scored highest in the interpersonal category.

These are but two examples that lend support to this author's emergent theory that strategies related to behavioral change (in this case weight management) could be more specifically linked to learning styles/multiple intelligences. As such, there is potential for individualizing education based on learning style assessment.

The most frequent (VARK) modalities among the study participants were auditory and kinesthetic which is consistent with adult education principles. Discussion and activities (Zemke and Zemke, 1995 as cited in Russell, 2006) as well as group work and personal interaction (Martín-García, 2003) dominate in adult education. Adult education theorists advanced the notion of self-directed learning (Knowles as cited in Walker, 1999b) and learning as a meaningful experience for adult learners (Mezirow as cited in Walker, 1999b).

Adult learning is embedded in past experience and an experiential framework. This may challenge the matter of diet and weight management when certain behaviors need to be restricted or "unlearned" in order to follow healthy guidelines. Past experiences may also have many adult learners stuck in a preference for learning because

it has been all they have ever experienced. Consequently, some messages have been foremost among the information received regarding weight management and do not necessarily correspond to one's learning strength(s).

A primary concern addressed in the literature is the need to bridge the cognition-behavior gap and combine "knowing and doing" capabilities. This form of knowledge translation addresses two different processes (Saarmann et al., 2000) and is fraught with great complexity. Foster et al. (2005) reported that planning, choosing, portion control and monitoring are interrelated and complex skills required for weight maintenance. But modification efforts to manage this learning complexity have been directed at simplifying the content (Fisher et al., 2005) rather than modifying, tailoring or individualizing the learning process for mastering such skills. The strength of this study's methodology is that it probed into "real" strategies that participants chose to use to enhance their knowledge and ability to apply that knowledge. Experiential and procedural knowledge was gleaned alongside learning preferences and many interesting relationships were discovered. Tailoring nutrition promotion methods has been shown to be twice as effective in changing dietary behavior (Worsley, 2002) and the correlations between learning styles and weight management strategies may be a concept which will benefit future approaches to tailoring patient education.

An important adjunct to further research regarding learning styles and weight management is a defined curriculum for nutrition education that will provide maximum benefit for the average individual. The literature reveals a lack of consensus regarding consumer nutrition knowledge and how it can most effectively be measured - while also considering which food related knowledge is most important for improving weight

management behaviors (Cooper et al, 2001; Worsley, 2002; Axelson and Brinberg, 1992). Although earlier studies demonstrated a positive relationship between nutrition knowledge and food-related behavior, a recent review reported that none of the included studies could demonstrate a correspondence between nutrition knowledge and healthy dietary behaviors. Furthermore, no information was provided which could describe how the subjects could apply the information or translate the knowledge into behaviors relevant to their individual situation (Axelson and Brinberg, 1992).

This study had several limitations. The final sample size was small thereby limiting its power to suggest generalizable relationships. However, as an exploratory study, the correlations highlighted in this investigation may be the basis for future research. The participants shared several similarities including age and gender. At first glance the fact that participants were all from a similar age cohort may be considered a weakness in terms of generalizability of results. However it is the aged and aging populations that are frequently encountering health issues that require behavior change and are an important target population for learning considerations.

Current affect-related issues, especially emotional eating and behavior change frustrations, directed the interview in many ways and strayed somewhat from the topic of learning weight management strategies. It became quickly apparent that weight management is strongly tied to affect – a confounding variable that may be lessened if a less emotionally charged topic or health behavior is targeted for future research between learning style and health behavior change.

Conclusion

There are barriers to weight management which extend beyond behavioral change theories. A holistic, client-centered and tailored approach to learning may enable and empower individuals to self-manage their health behaviors. The findings from this study contributed to understanding the patient as an adult learner. Attending to individual learning style is a significant consideration for individualized or tailored education and may offer a step toward better processing and application of knowledge.

The non-experimental research design used in this study cannot and did not intend to infer a cause (learning style) and effect (greater success with weight management) relationship. However, as an exploratory study, it is my hope these preliminary findings will spark an interest in pursuing further investigation and inform future research of learning style as an important adult learning construct for health related education and greater health literacy.

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Appendix: Excerpts from THE INTERVIEW OUTLINE

Excerpts from the Interview Outline

Background Information

1. BMI
2. Age
3. Describe current Exercise and Diet

Past Experience with Weight Loss Program

1. What kinds of programs or strategies have you used for weight loss? For each strategy used:
 - How did you decide to use this method?
 - What made you stop?
 - How do you rate your success with the program? How much weight did you lose? OR Why do you think the program did not work for you?
2. Overall, what kinds of activities/strategies do you think worked the best for you?
3. Could you share some frustrations, common difficulties and success that you had with these programs?
4. What do you think is the most important thing in a successful weight loss program?
5. If you knew a person who is about to begin weight loss program, what advice would you give to that person after your experience?

Opinions on Weight Management

1. Based on your experience(s), how difficult is it to lose weight? (On a scale from 1-10 with 1 being the easiest, and 10, the most difficult)
-Describe one of your most difficult challenges.
2. Where or from whom do you find most of your information on weight management?
3. What obstacles interfere with your weight management efforts?

Preferred learning environment/context/tasks

1. What kind of work do you presently do? Which tasks do you find easiest or most enjoyable?
2. What kind of hobbies do you do....or what kinds of things do you do in your spare time?
3. What were your favorite school subjects?