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# *Assessment of Hunger and Appetite and Their Relationship to Food Intake in Persons With HIV Infection*

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*Assessments of hunger and/or appetite are common methods of screening for development of illness-related anorexia. There are limited data to determine whether these methods predict actual food intake in persons with HIV disease. Therefore, the authors examined the relationship between self-reported food intake and subjective ratings of hunger and appetite in 31 adults with HIV infection. Participants also indicated presence of additional factors that can decrease amount of food eaten. Subjective ratings of appetite and hunger correlated with each other but not with food intake. Twenty-four additional factors that can affect food intake were reported to be present. The most common were illness-related and factors such as eating with friends or family. These results indicate that measures of hunger and appetite are not sufficient to screen for decreased food intake. Additional factors that can affect food intake should also be included in a comprehensive assessment of adults with HIV infection.*

**Key words:** *appetite, hunger, food intake, nutrition*

**M**aintaining optimal nutritional status is essential for successful management of HIV disease. This goal is frequently hindered by the numerous complications of HIV infection and treatment that interfere with nutrient intake, digestion, absorption, and metabolism. Despite the recent success of highly active antiretroviral therapy (HAART), malnutrition due to inadequate food intake remains a serious problem for

persons with advanced HIV disease (Kotler, 1998). Consequences of malnutrition include greater susceptibility to infection, cachexia, and more rapid disease progression (Chlebowski, Grozvenor, Lillington, Sayre, & Beall, 1995; Sharkey, Sharkey, Sutherland, Church, & GI/HIV Study Group, 1992).

Illness-induced anorexia, characterized by a decreased desire to eat, is listed among the major causes of altered food intake in persons with HIV infection (Keithley, 1998; Macallan et al., 1995). Consequently, early detection and treatment of anorexia is important for the prevention of malnutrition in persons with HIV infection (Kruse, 1998). The loss of the desire to eat can be due to a decrease in the physical sensations that signal the need for food, which typically are referred to as *hunger* (Williams, 1993). It can also be due to decreased appetite, which is related to alterations in the psychological components of eating, including diminished craving for specific foods and lessened enjoyment of the hedonic (pleasurable) aspects of eating (Williams, 1993).

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Researchers and clinicians commonly use subjective ratings of hunger and appetite to determine the onset of anorexia and evaluate the effectiveness of treatment strategies. Surprisingly, few data are available regarding whether monitoring subjective changes in hunger or appetite are predictive of actual food intake in people with HIV infection. Therefore, as part of a larger study investigating the effects of a 12-week aerobic exercise intervention for HIV-infected adults (Smith et al., 2001), we examined the relationships among subjective ratings of hunger, appetite, and self-reported food intake.

A review of the literature raised several methodological issues that were addressed in the design of this study. First, researchers and clinicians typically have not provided specific definitions of hunger and appetite but have assumed that these terms have shared meanings (Anralich et al., 1997; Williams, 1993). Hunger and appetite, however, do not have universally accepted definitions (Bolles, 1980; Castonguay & Stern, 1990; Williams, 1993) and information obtained may vary depending on the individual's definitions of hunger and appetite. Second, it is not known whether the two most common means of quantifying subjective hunger and appetite, the visual analog scale (VAS) (e.g., Arnalich et al., 1997; Beal et al., 1997; Silverstone, 1982) and the Likert scale (e.g., Osoba et al., 1994), provide equivalent information. This raises the possibility that different methods of measuring hunger and appetite may produce varied results. Third, many factors other than subjective hunger and appetite can influence food intake (de Graff, 1993; Mattes, 1990). These include (a) environmental/situational factors such as financial or personal time constraints; (b) disease- and treatment-related changes such as fatigue, nausea, or sore mouth; (c) social factors such as eating alone or with family; and (d) hedonic (appetitive) aspects of food such as taste, color, texture, or presentation (Kruse, 1998; Lennie, 1999). To date, examination of the effect of these factors on food intake of persons with HIV disease has been ignored.

In this study, these issues were addressed by providing specific definitions of hunger and appetite on the VAS, by comparing a Likert scale measure of appetite obtained in the primary study with the VAS rating of appetite obtained in the current study, and by

measuring the presence of factors that have been identified as potentially influencing food intake. It should be noted that a similar comparison between VAS and Likert scale ratings for hunger was not possible as no Likert scale measure was obtained. Therefore, the purposes of this study were to (a) describe food intake, specifically caloric and macronutrient intake of a group of HIV-positive persons at the baseline measurement period of an exercise study; (b) determine whether VAS ratings of hunger and appetite differ when participants are given specific definitions of each; (c) determine the correlation between appetite measured by a VAS and by a Likert scale; (d) examine relationships of hunger (VAS) and appetite (VAS and Likert scale) to caloric intake; and (e) determine the incidence during the previous week of situational, illness-related, and appetitive factors that can influence the amount of food eaten.

## Method

### Participants

Thirty-one adults were recruited from an infectious diseases (ID) clinic at a midwestern university. The primary study required that all participants had documented HIV infection and a CD4 T-lymphocyte cell count between 200 and 499/cubic milliliters at study entry. If participants were taking antiretrovirals, these medications were stable for at least 8 weeks prior to study entry. Participants also had no history of AIDS-defining illnesses or endocrine disease, weighed more than 85% of their ideal body weight, and had no fever or other symptoms of acute infection. Only those individuals who indicated they were not intentionally trying to lose weight were included in the current study. The substudy was approved by The Ohio State University Biomedical Sciences Institutional Review Board.

### Procedure

All data except food intake were collected at the baseline measurement time point of the primary study (Smith et al., 2001) during a visit to an ID clinic specializing in the treatment of HIV disease. Informed consent was obtained after the study was explained

and the project nurses answered all questions. Participants then completed a series of questionnaires for the primary study that included the Beck Depression Inventory (BDI). In addition, they filled out the Food, Eating Experiences, and Diet (FEED) questionnaire developed for the substudy.

#### *Measurement of Caloric and Macronutrient Intake*

At the time of the baseline visit, project nurses reviewed written instructions that accompanied the food diary with participants and answered any questions. In brief, participants were instructed to record detailed information regarding time, type, and amount of all foods and liquids consumed over 4 consecutive days. Refrigerator magnets were provided to hold diet sheets and serve as reminders to record food intake. Measuring cups were also provided to increase accuracy of data. Because eating patterns vary on weekends (Mattes, 1990), each participant included 1 weekend day in the 4-day diary. Foods listed in the diary were coded and analyzed using Nutritionist IV software™ to determine average daily caloric and macronutrient (protein, fat, and carbohydrate) intake. Measurements of body weight and height obtained for the primary study were also used to determine body mass index and in the formula to predict energy expenditure.

#### *Measurement of Appetite and Hunger*

**BDI.** The BDI (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) was used as a self-report measure of current depressive symptoms experienced in the previous week. The 21 items include cognitive/affective and somatic/vegetative symptoms. Participants rated the presence and severity of each symptom, and item scores ranged from 0 to 3 (*greatest severity*). When used in its entirety, the BDI scale is reliable; concurrent validity has been established (Beck, Steer, & Garbin, 1988). The scale has been widely used in general and in persons with HIV infection (Singh et al., 1996; Twiname, 1993). For the purposes of this substudy, only BDI Item 18 was used to provide a Likert scale measure of appetite. Participants indicated whether appetite was (0) *no worse than usual*, (1) *not as good as it used to be*, (2) *much worse now*, or (3) *had no appetite at all*.

**FEED.** The FEED questionnaire provided VAS measures of hunger and appetite. Appetite was defined on the questionnaire as the psychological desire, urge, or craving for specific foods (Williams, 1993). Participants rated their degree of appetite during the previous week by a mark through a 100-mm visual analog scale with the anchors of *no appetite or cravings* and *extreme appetite/strongest cravings*. Hunger was defined on the questionnaire as the physical sensations felt inside the body that signal the need to eat (Williams, 1993). Level of hunger during the previous week was indicated by a mark through a separate 100-mm visual analog scale with anchors of *not at all physically hungry* and *hungriest ever felt*. Participants always filled out the BDI before the VAS.

#### *Measurement of Factors That Can Influence Food Intake*

The FEED questionnaire also contained three sections that measured factors that could potentially influence food intake (Kruse, 1998; Lennie, 1999). Section I measured changes in taste, smell, and enjoyment of major food types. Section II measured presence of illness-related factors that may limit intake or decrease enjoyment of eating such as nausea, difficulty chewing, and soreness in mouth. Section III measured the perceived influence of factors such as eating alone, having limited energy to prepare or eat food, and limited finances or transportation to obtain food. Participants rated the degree to which these factors influenced how much they ate during the previous week using 5-point Likert scales with referent anchors of *much less/not at all* and *much more/a great amount*. Content validity of instrument with respect to factors known to influence food intake in persons with HIV was established by three of the authors (Lennie, Neidig, and Stein) and by an extensive review of the literature.

#### *Data Analysis*

Because data were collected prior to experimental manipulation, participants were treated as a single group irrespective of assignment in the primary study. Item 18 of the BDI was reverse coded to make the ratings consistent with those on the VAS. Data were analyzed using SPSS™ (Statistical Package for the Social

Sciences) version 8.0. Statistical tests consisted of Pearson correlations and *t* tests with two-tailed tests for significance. An alpha level of .05 was set a priori. Food intake was operationally defined as average daily kilocalorie (kcal) and macronutrient intake. Frequency data are reported for items from the FEED questionnaire that can influence food intake as the incidence of each factor was more informative than item means. An item was considered present if participants indicated that it had a moderate to great effect on food intake or, for appetitive and illness-related factors, if participants indicated the item was present or had changed during the previous week.

## Results

### Participants

Participants were predominately Caucasian gay men (80%). Ages ranged from 25 to 57 with a mean of 37 ( $\pm 7$ ). Nineteen (63%) had attended at least 1 year of post-high school education. Body mass indexes were available for 23 participants. These ranged from 19.5 kg/m<sup>2</sup> to 38.26 kg/m<sup>2</sup> with a mean of 26.4 kg/m<sup>2</sup> ( $\pm 4.5$  kg/m<sup>2</sup>). The group as a whole was not cachectic and tended toward being overweight rather than underweight. Only 1 person had a BMI less than 20 kg/m<sup>2</sup>. In contrast, 12 (48%) participants met the definition of overweight or obese with BMIs greater than 25 kg/m<sup>2</sup> (Expert Panel, 1998). The total number of concurrent prescribed medications ranged from 1 to 15 with a mean of 4.4 ( $\pm 2.9$ ).

### Kcal and Macronutrient Intake

The amount of kcal eaten per day ranged from 1,195 to 3,621 with a mean of 2,322 ( $\pm 652$ ). Energy requirements at baseline were estimated by the Harris-Benedict formula multiplied by an activity factor of 1.5 for sedentary individuals (Westerp, 1994). Net energy balance, calculated as the difference between energy intake and estimated energy requirements, ranged from -1,344 to +1,967 with a mean of +640 ( $\pm 803$ ) kcal. Six participants indicated weight loss of 5 pounds or more within the past 3 months. There was a tendency for these participants to have lower kcal

intakes than participants not reporting weight loss (2,014 vs. 2,318 kcal/day, respectively).

The average amount of calories obtained from the three macronutrients were 33% ( $\pm 8\%$ ) from fat, 17% ( $\pm 3\%$ ) from protein, and 48% ( $\pm 10\%$ ) from carbohydrates. In comparison, the U.S. Department of Agriculture (2000) recommends that 30% of calories come from fat, 10% from protein, and 60% from carbohydrate sources. When examined on an individual basis, there was a wide range in the percentage of calories derived from each macronutrient. Participants obtained as little as 18% to as much as 50% of their calories from fat sources. Overall, 68% percent of participants had fat intakes that exceeded recommended daily intake, with 17% having fat intakes more than 1.5 times as large as the recommended amount per day. The range of protein intake was 11% to 22%, which is above the recommended daily amount. Total calories obtained from carbohydrate sources ranged from a low of 31% to a high of 67%. Sixty-eight percent of the participants had carbohydrate intakes below recommended amounts. These were the same participants who reported high fat intakes, which indicates that foods high in fat were substituted for foods with high carbohydrate content.

### Comparison of Appetite and Hunger Ratings

The mean rating on the VAS was 42 mm ( $\pm 21$  mm) for hunger and 51 mm ( $\pm 23$  mm) for appetite. These ratings fell near the middle of the 100-mm scale, meaning most participants did not rate their hunger and appetite levels as extremely low or extremely high. The mean distance between appetite and hunger ratings was 16 cm, indicating that most people rated intensity of hunger and appetite similarly. The average rating of appetite on the BDI was 0.32 ( $\pm 0.54$ ), indicating that most participants (71%) rated their appetite as no worse than usual.

Although most participants gave similar intensity ratings to their hunger and appetite on the VAS, there were several notable discrepancies in individual ratings. A subgroup of 6 participants had differences between hunger and appetite ratings on the VAS greater than one standard deviation from the mean.

The greatest difference was 55 mm by a subject who rated appetite high (81 mm) and hunger low (26 mm).

### Correlations Among Kcal Intake and Measures of Hunger and Appetite

Pearson correlation coefficients among hunger and appetite measured by the VAS and appetite measured by the BDI are shown in Table 1. Hunger and appetite measured by the VAS showed a significant positive correlation. Appetite measured on the BDI also showed a significant positive correlation with appetite measured on the VAS. This correlation, however, was less strong than the correlation between VAS measures of appetite and hunger.

Also shown in Table 1 are the correlations among average daily kcal intake and the subjective measures of hunger and appetite. Interestingly, despite these measures being correlated with each other, none was significantly correlated with kcal intake. Scatter plots of the correlations among VAS measures and kcal intake were examined to determine if a visual pattern could be observed that would explain the lack of correlation of these measures with kcal intake. The scatter plots showed that participants with low kcal intake tended to have lower hunger and appetite ratings on the VAS. Similarly, those with high kcal intakes tended to rate their hunger and appetite as high. In contrast, participants who rated their hunger in the midrange of the scales (indicating hunger and appetite were no better or worse than usual) showed no consistent pattern, with some having low kcal intakes and others having high kcal intakes. To determine if the overall lack of correlation between measures of hunger, appetite, and kcal intake were due to the wide variability in intake among the participants with ratings in the middle of the scales, these participants were removed from the analyses. Kcal intake of participants with lowest appetite and hunger ratings ( $n = 6$ ) were then compared with those with the highest ratings ( $n = 6$ ) by separate  $t$  tests. There was no significant difference between participants grouped by appetite ratings. In contrast, participants grouped by intensity of hunger ratings were significantly different. Those with the lowest hunger ratings ( $< 25$  mm) had a mean intake of  $1,855 \pm 309$  kcal whereas those with the highest hunger

**Table 1. Pearson Correlations Among Kcal Intake and Subjective Measures of Hunger and Appetite**

	VAS		BDI
	Appetite	Hunger	Appetite
Kcal/day	.175	.379	.062
Appetite (VAS)		.555**	.418*
Hunger (VAS)			.197

NOTE: VAS = visual analogue scale, BDI = Beck Depression Inventory (Item 18), kcal = kilocalorie.

\* $p < .05$ . \*\* $p < .01$ .

(> 55 mm) had a mean intake of  $2,803 \pm 754$  kcal,  $t(11) = 2.38$ ,  $p < .05$ .

### Incidence of Factors That Can Affect Amount of Food Eaten

Twenty-four items from the FEED questionnaire that can affect food intake were reported by participants to be present during the previous week. These items along with the number of participants reporting the presence of each item are listed in Table 2. The greatest number of participants indicated the presence of items categorized under situational factors. The next most frequently reported items were those categorized under illness-related factors. A number of items categorized under appetitive factors also had a high incidence during the previous week. With respect to specific items, the two most prevalent were having adequate time to prepare meals and feeling bloated after eating. Having transportation and money to buy food and eating alone or with family/friend(s) were the next most frequently reported items.

## Discussion

### Kcal and Macronutrient Intake

The average kcal intake of participants in this study was comparable to those reported in other studies of people with HIV infection (Chlebowski et al., 1995; Hogg et al., 1995; McCorkindale, Dybevik, Coulston, &

**Table 2. Incidence of Factors That Affect Food Intake (N = 31)**

	<i>n</i>	%
Situational factors		
Having adequate time to prepare meals	21	68
Having transportation to buy food	19	61
Having enough money to buy food	19	61
Eating with family or friends	16	52
Eating alone	11	36
Illness-related factors		
Feeling bloated after eating a meal	20	64
Nausea	15	48
Dryness in mouth	13	42
More energy to shop for food	13	42
More energy to cook meals	13	42
Soreness in mouth	10	31
Vomiting	7	23
Feeling full after small amount of food	5	16
Difficulty swallowing	4	13
Difficulty chewing	2	6
Appetitive factors		
Change in enjoyment of sweets	13	42
Change in enjoyment of vegetables	13	42
Change in enjoyment of meat	13	42
Change in desire to try new foods	12	39
Change in types of food eaten	10	29
Change in enjoyment of new foods	7	23
Change in sense of smell	4	13
Change in sense of taste	3	10

NOTE: Data are presented as the number of participants reporting that a factor was present during the past week.

Sucher, 1990; Sharkey et al., 1992). In addition, the macronutrient intake patterns of participants in the current study are representative of those previously observed in the general population of HIV-positive individuals. The percentage of calories derived from each macronutrient was similar to those reported by Hogg et al. (1995) and Smit et al. (1996). In contrast, McCorkindale et al. (1990) and Sharkey et al. (1992) both reported a 5% higher amount of calories derived from fat (40%) and slightly fewer calories from carbohydrates (43%) and protein (14%).

Our data were collected between 1995 and 1998, when nutritional goals were focused on prevention of weight loss without regard for long-term effects of diet such as heart disease resulting from high-fat foods. Notwithstanding, there was a wide variation in the amount of calories obtained from protein,

carbohydrate, and fat. Some participants reported eating low-fat, low-protein, high-carbohydrate diets; others reported eating high-fat, high-protein diets, whereas others consumed high-carbohydrate, high-protein diets. This variability in macronutrient intake was common among persons with HIV disease during this time period; other studies (Hogg et al., 1995; McCorkindale et al. 1990; Smit et al., 1996; Sharkey et al., 1992) reported similar variances in macronutrient intake. This observation emphasizes the importance of examining not only the amount of food people eat but also the types of food eaten. Given the dynamic nature of HIV disease management, including the new diet recommendations (Kotler & Engleson, 1999), it is important that researchers and clinicians obtain information regarding the decision-making process leading to food choice. This information will be useful in designing interventions that promote timely adoption of new dietary recommendations.

### Distinguishing Between Hunger and Appetite

To test whether people distinguish between hunger and appetite, we provided specific definitions of each and asked participants to rate them on separate VASs. A majority of participants rated both hunger and appetite in the midrange of the VAS. Although similar, these ratings were not identical, as hunger ratings averaged 10% less than appetite ratings. Among the participants who gave widely discrepant ratings, all but 1 rated appetite higher than hunger. It is possible that people eating in response to cravings (strong appetite) rather than physiological signals (hunger) eat sufficient quantities and frequently enough to prevent development of hunger sensations. In sum, these results imply that participants considered hunger and appetite as separate but related concepts. The fact that hunger was significantly related to kcal intake when people in the midrange were eliminated from the analysis suggests that these measures may be more valid when hunger or appetite are abnormally high or low. Thus, the unique influence of hunger and appetite on food intake may only be distinguishable when events suppress or enhance one factor to a greater extent than the other.

### **Correlations Among Kcal Intake and Subjective Measures of Appetite and Hunger**

The Likert scale BDI measure of appetite had a very low correlation with kcal intake. In fact, many participants who rated appetite on the BDI as *worse than usual* had kcal intakes that ranged from average to high. Although limited, this evidence suggests that using a single-question Likert scale to measure changes in appetite is not a good indicator of appetite in this population. Moreover, no significant correlation was found between VAS measures of hunger or appetite and kcal intake. One explanation for this comes from the observation that, despite a wide range in kcal intake, most participants rated their hunger and appetite on the VAS in the midrange rather than at either extreme. These results are similar to those of Mattes (1990), who found that hunger and appetite ratings were not valid proxy measures of food intake in healthy adults. In sum, measurement of subjective reports of hunger and appetite, though useful, are not adequate to predict food intake in persons with HIV infection.

### **Factors Influencing Food Intake**

Environmental, social, and physical (including illness-related) factors are known to influence food intake (Booth, 1994; Kruse, 1998). In the present study, the factors with the greatest incidence were situational. It is not surprising that, among these, eating with family and friends was significant. Eating is as much a social and cultural event as it is a necessity to sustain life (Booth, 1994). In fact, people have recorded food intakes as much as 44% greater when eating with family or friends than when eating alone (De Castro, 1996). Resource issues such as having money and transportation to buy food were also reported by many as having an influence on food intake. Although the group as a whole reported the remaining situational factors less frequently, each was reported to be present by at least 2 individuals. These results emphasize the importance of including social and environmental factors along with recent changes in hunger and appetite as part of a comprehensive assessment of risk for altered food intake.

The high incidence of reported illness-related factors was surprising given the inclusion criteria of the primary study, which required participants to have stable midstage disease and no history of AIDS-defining illnesses. In a less stable population, these factors likely would play an even greater role. Furthermore, factors not measured in this study could also influence intake. For example, although number of prescribed drugs was not related to food intake in this study, the untoward effects of the polypharmacy needed to treat HIV disease can alter food intake. In addition to the volume of pills taken per day, many of these drugs themselves produce anorexia, alter taste, and restrict the timing and type of food eaten (Keithley, 1998). A more detailed study examining the effects of number, timing, and type of drugs taken is needed to determine the effect of medication regimens on subjective hunger and appetite as well as on food choice and total daily food intake.

A large number of people reported changes in factors that influence enjoyment of eating (appetitive) during the previous week. These results show that factors that affect enjoyment of eating are highly variable and demonstrate the importance of routinely including these factors in a comprehensive assessment. This information can be used to make people aware that changes can be expected to occur over time and to encourage people to retry foods that were not previously enjoyable.

### **Conclusion and Nursing Implications**

Effective interventions to reverse illness-induced anorexia require both researchers and clinicians to examine factors influencing food intake in greater detail than is typically done. The use of VAS rather than Likert scales to routinely measure hunger and appetite will allow nurses to screen for changes over time (Lennie, 1999). It should be remembered, however, that these scales may have limited utility in predicting actual food intake. Assessment data obtained from VAS can be improved by noting the frame of reference in which the patient was asked to make the judgement (Booth, 1994). Patients asked to rate hunger or appetite over the previous week (as was done in this study) may provide different responses than if

asked to make the rating compared to pre-illness hunger and appetite. Moreover, if anorexia is prolonged, a patient's perspective may change. A modest increase in food intake (i.e., from two small meals per day to two medium meals per day) may be perceived as a large increase in appetite for a person with chronic anorexia. Therefore, information should be collected in reference to multiple time points such as before illness or within the past year, month, or week. More comprehensive data regarding number of meals eaten per day, amount of food eaten per meal, types of food eaten, and snacks or supplements taken between meals should be collected. Potential factors that may influence food intake should also be assessed. In addition to those listed in Table 2, factors such as esophagitis and effects of polypharmacy as well as psychological changes such as depression and anxiety should be included (Keithley, 1998). Because these factors can change over time, they should be part of routine clinical assessment.

Eating is a complex behavior that is influenced by physiological, psychological, social, and environmental factors. This study has demonstrated that the common practice of simply asking patients about their appetite as a means of screening for altered food intake is inadequate. A comprehensive assessment that includes serial, quantifiable measures of hunger, appetite, and food intake in addition to questions regarding other factors that can affect food intake is necessary. Without this type of comprehensive assessment, patients with alterations in food intake may not be identified until overt symptoms of malnutrition such as significant weight loss are evident. In contrast, early identification of patients at risk will allow implementation of interventions that prevent or minimize the increased morbidity and mortality associated with malnutrition in this population.

### Acknowledgments

Funding for this study was provided by grants from the National Institute of Nursing Research (NR03974) and the National Institute of Allergy and Infectious Diseases Adult AIDS Clinical Trial Group (AI 25924) at the National Institutes of Health.

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