The Development and Evaluation of a Nutrition Education Program for Female Ballet Students Attending the School of the Royal Winnipeg Ballet, Professional Division

by

Lynn H. Wilsack

A thesis
presented to the University of Manitoba
in partial fulfillment of the
requirements for the degree of
Master of Science
in
Foods and Nutrition

Winnipeg, Manitoba

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THE DEVELOPMENT AND EVALUATION OF A NUTRITION EDUCATION PROGRAM FOR FEMALE BALLET STUDENTS ATTENDING THE SCHOOL OF THE ROYAL WINNIPEG BALLET, PROFESSIONAL DIVISION

BY

LYNN H. WILSACK

A thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of

MASTER OF SCIENCE

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ABSTRACT

This project was undertaken to accomplish the following objectives: firstly, to develop, present and evaluate a nutrition education program for the female students at the Royal Winnipeg Ballet School (RWB), Professional Division, and secondly to investigate factors which may potentially affect the relationship of nutrition knowledge and dietary quality for these students.

Twenty three female RWB students between the ages of 13 and 17 years agreed to take part. Prior to the nutrition education program, each of the 23 students completed a nutrition knowledge test, an eating practices questionnaire (EPQ) and the Jackson Personality Research Form AA. Body size dissatisfaction was measured using somatotype diagrams within the EPQ. Twenty-one students recorded food intake for 2 weekdays and one weekend day. Intakes of energy, protein, calcium and iron were calculated from these records, and a dietary quality score based on the Canada Food Guide was applied to all records.

Nutrition knowledge was low for this group: 17.9 ± 4.9 (SD) out of 34 points, as were dietary quality scores: 9.1 ± 2.18 (SD) out of 16 points. Intakes of energy were low with 65% of the students consuming less than 1500 kcal. Nutrient intakes analyzed in terms of estimates of true deficients showed a large percentage of students deficient for iron (23.1%) and smaller percentages deficient for calcium (16.9% without supplements) and protein (7.8%). No effect of place of residence was

observed for dietary quality score, or for nutrient intakes. The mean EPQ score was 111.8 ± 29.2 points. Thirteen of the students scored in excess of 100 points, the score considered to be indicative of unstable eating patterns. This group of adolescents scored within the norms for all personality characteristics. Affiliation, dominance, play and desirabilty were significantly and negatively correlated with EPQ score ($p < 0.05$). Body size dissatisfaction was widespread with 69.6% selecting as ideal, body somatotype diagrams which were at least 10% smaller than the indicated current perceived body size. Body size dissatisfaction scores were significantly lower ($p = 0.042$) for the younger group (13-15 years of age) as were EPQ scores ($p = 0.006$). Body size dissatisfaction was significantly correlated with EPQ score ($r = 0.74$, $p = 0.0001$).

Fourteen of the students completed a posttest nutrition knowledge test and three day food record. Nutrition knowledge scores increased with attendance of the program but not significantly ($p < 0.025$). Increase in nutrition knowledge was correlated with the trait 'order' ($p = 0.008$). No significant change in dietary quality score was observed over the program period, however change in dietary score was correlated with the traits 'harmavoidance' and 'nurturance' ($p < 0.05$).

Results indicate that body size dissatisfaction is a factor which affects the dietary practices of the students leading to unstable eating patterns. Intakes of energy and iron are of concern for this group of girls. There is a need and desire for nutrition education at the RWB, Professional Division.

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Chapter I

INTRODUCTION

Ballet is an art form which demands the strength, agility, composure and endurance of an elite athlete. Ballet dancers are made, not born. Years of rigorous training are required to acquire the ability to perform the ballet syllabus, and to interpret the dance choreography to give it life. In addition, over these years the physique of the dancer is developed to provide the aesthetic lines that define ballet in performance. All students of ballet learn at an early age that the lines of the ballet dancer when in position must be straight and clean. Often, clean means smooth, muscular, 'pared-down'. For dancers, the clean line is achieved through 'good bones', muscularity and a high degree of leanness. For many female dancers, especially those in adolescence, this necessary degree of leanness is difficult to achieve without dietary manipulation. When unguided, these manipulations may lead to unstable eating patterns which may compromise nutritional status.

Benson et al. (1985) have found that dance students did not resist information about nutrition and weight control and that most students tended to obtain this information from dance instructors and other students. Calabrese and Kirkendall (1983) have observed that most of these instructors and peers were misinformed and that in general, there was a lack of scientifically correct information about weight control and nutrition readily available to dancers.

The introduction of a nutrition education program as part of the dance school curriculum could provide students with the factual information necessary to make dietary manipulations for weight loss as healthful as possible. However, since more than factual information about nutrition is necessary in order to motivate people to make favourable changes in dietary habits (Gillespie, 1981), this thesis has been undertaken to accomplish the following objectives.

1. to develop, present and evaluate the nutrition education program for the female students at the Royal Winnipeg Ballet School.
2. to investigate factors which may potentially affect the relationship of nutrition knowledge and dietary quality.

Chapter II

LITERATURE REVIEW

2.1 ANTHROPOMETRIC DATA ON BALLET DANCERS

The professional female dancer is lean but not especially lightweight. Many of the estimates of body composition for these dancers have been determined by means of skinfold measurements, however, two studies have endeavoured to determine these data by hydrostatic technique.

Calabrese et al. (1983) measured the body composition of 20 professional dancers from the Cleveland Ballet Company. The mean height for this group was 168 ± 6.8 cm (± SD), mean weight was 54.5 ± 6.0 kg. The body fat level determined hydrostatically was 16.9 ± 4.7 percent. Skin fold thicknesses were measured as well, for the subscapular, triceps, suprailiac, abdominal, and thigh areas. The sum of the group means for each of these measures for this group of dancers was 50.14 mm. In comparison to the sum observed for a large group of American women, 90.4 mm (Jackson et al., 1980, in Calabrese et al., 1983), this group of dancers is very lean.

The authors noted that these observations for the dancers may be slightly high, as the dancers were assessed prior to rehearsal and performance season and many of the dancers reported that they were dieting to reach the body weights stipulated by their dance contracts.

To investigate this possibility, Kirkendall and Calabrese (1983) measured body composition for 30 dancers during the off-season in August, and during peak performance season in December. The mean body fat level determined by hydrostatic weighing in August was 17.4 ± 5.1 percent, and in December, 16.1 ± 3.9 percent. Training did decrease the level of body fat in these dancers, but a commensurate change in mean body weight was not observed. Weights decreased by 0.2 kg over this period of observation.

It is likely that lean body mass increased slightly as a result of training. Calabrese et al. (1983) had observed that the sample of dancers that were studied resembled the normal weight reference woman in terms of girths for much of the body excepting the bicep, which was 15 percent below that of the reference, and the calf and ankle which exceeded the reference by greater than five percent. The low body fat levels and skin fold thicknesses which were coincident with these girth measurements indicate that it is lean body mass that is contributing to these girths, rather than excessive, dispensible deposits of body fat.

Descriptions of body composition of adolescent dancers in professional training programs are rare in the literature, and none utilizing hydrostatic techniques has been reported. Anthropometric assessments of body composition have been undertaken by two groups of investigators, while a number of others provide means for height and weight of training dancers. These young dancers are shown to have heights comparable to norms for age, with weights for age or height, and body fat levels that are consistently below standards based upon observations of large, normal populations of adolescents.

Fifty one female students (10-18 years of age) attending the National Ballet School of Canada were measured for height, weight, and skin fold thicknesses by Bright-See et al. (1978) as part of an investigation into the nutrition beliefs and practices of ballet students. Heights and weights were compared to the growth standards used by Hospital for Sick Children, Toronto. Height for age ranged from the third percentile to greater than the 90th percentile. Weights for age, however, were much less widely dispersed, with all but one student having a weight for age below the 50th percentile. Approximately 20% of the sample had weights below the third percentile.

Skin fold thicknesses for the triceps, subscapular and suprailiac areas were found to be consistently less than means observed for nonballet students of the same age groups, sustantiating these low body weights. Percent body fat was estimated from six skin fold measurements according to the formula of Yuhasz (1962). For this sample of 51 students, body fat levels were estimated to be 8.53 ± 0.66 %, 9.26 ± 0.83 %, and 9.83 ± 0.83 % for the 10-11, 12-14, and 15-18 year olds respectively.

Dolgener and coworkers (1980, in Calabrese et al., 1983) reported anthropometric data for professional and student female dancers. They described their average ballet dancer as 164.1 cm tall, 51.1 kg in weight and 22.1 % body fat. No differentiation of professional or student dancer was made because data were similar. The method of Wilmore and Behnke (1970) was used to determine body fat estimates.

The estimates of body fat from these two groups of authors are dissimilar. The adolescent dancers in the study of Dolgener et al. were in late adolescence and were considered to be training at a high level, as were the older dancers reported by Bright-See et al., yet estimates of body fat levels for the former are approximately twice those of the latter. It is probable that assessment technique and the use of differing body fat equations contributed to some of the observed differences. The validity of the Yuhasz method for use with adolescents is unknown. Thorland et al. (1984) found that the quadratic equation of Wilmore and Benhke correlated well (R^2 = 0.58) for females when assessed against the results obtained by underwater weighing methods corrected for residual lung volume. Thus, it is apparent that body compostion data are seriously lacking for adolescent dancers, and the information which is available is in need of substantiation.

The remainder of the anthropometric data collected for adolescent dancers is reported only as mean height, weight and age. These values are presented in Table 1. For reference, values for similar variables from the National Centre of Health Statistics (NCHS) (Hamill et al.,1979) and from the Nutrition Canada Survey (Health and Welfare Canada, 1980) are presented.

TABLE 1

Mean Height, Weight and Age for Groups of Adolescent Dancers

AUTHOR	NUMBER OF SUBJECTS	HEIGHT(CM) mean (± SD)	WEIGHT(KG) mean (± SD)	AGE(YR) mean (± SD)
Frisch et al., 1980	89	162 (0.5)	45.5 (0.5)	16.8 (0.2)
Abraham et al., 1982	29	160 (4.0)	46 (3.0)	16.8 (0.8)
Benson et al., 1985	92	160.2	46.8	14.6
Hamill et al., 1979		157	48	13-15
		160	53	16-18
Health and Welfare	166	158-160	53.6	12-17
Canada, 1980	138	160-162	52.5	12-17
	94	162-164	55.3	12-17

2.2 ENERGY REQUIREMENTS OF BALLET DANCERS

The degree of leanness expected of the female dancer poses a dilemma for most of these young women, as the type of physical activity which figures most prominently in their training each day is one which requires only moderate energy output.

The physiologic responses to classical ballet class were assessed by Cohen et al. in 1982, and by Schantz and Astrand in 1984. In each case, professional dancers were studied. Cohen and coworkers measured heart rate and oxygen consumption during class barre and centre floor exercises for eight female volunteers from American Ballet Theatre. Schantz and Astrand assessed similar variables for seven females in 1971 and six in 1983, all of whom were members of the Royal Swedish Ballet Company. In each investigation, maximal oxygen uptake was measured using standard treadmill or bicycle ergometer tests. Both groups of dancers were found to have above average aerobic fitness levels which were similar to those

found for non-endurance athletes. The mean VO_2max for the American dancers was 43.7 $ml.min^{-1}.kg^{-1}$, and for the Swedish dancers, 51 $ml.min^{-1}.kg^{-1}$. The average oxygen uptake during class was close to 40% of maximal oxygen uptake for both groups. Barre exercises yielded a mean oxygen uptake of 38% VO_2max for the American dancers and 36% VO_2max for the Swedish dancers. Centre floor exercises which are completed without the support of the barre, required an uptake of 46% VO_2max for the American group and 44% VO_2max for the Swedish dancers.

The mean gross energy cost inferred from the oxygen uptake measurements was 0.08 kcal per minute per kg body weight for barre exercise and 0.10 kcal per minute per kg body weight for centre floor work. Cohen and coworkers (1983) estimated the net expenditure for a ballet class of professional calibre to be 200 kcal per hour on average. For a typical day of training which includes five to six hours of class, this figure translates to an energy expenditure of approximately 1000 kcal over sedentary expenditure.

These are data observed for highly trained dancers whose levels of fitness have developed as a function of the duration of moderate activity occuring over years of progressively more difficult training (Kirkendall and Calabrese, 1983). There are no data describing the physiologic cost of ballet classes designed for the young dancer training for professional status. Schantz and Astrand (1984) speculate that oxygen uptake would be lower, and rest periods longer or more frequent during classes prepared for these students. They state that several years of daily classical training are necessary before advanced technique with its attendant greater motional activity is achieved.

Ferland et al. (1980) observed that the inefficient movement of an unskilled dancer did not increase the workload in any appreciable amount. Thus it is likely that many students, particularly the ones in the lower levels who dance two to three hours daily, use insufficient energy through dance, in spite of the time and effort invested, to attain and maintain the leanness that is expected of them without careful dietary management. Other physical activity, in addition to dance would enhance fitness levels and increase energy output, but few young dancers find time to include these activities in their schedules (Bright-See et al., 1978).

The desire for leanness in dancers by those in decision-making positions in ballet does not go unnoticed by the aspiring dance student. Calabrese and Kirkendall (1983) note: "The pressure on young dancers is enormous. A strong desire to please their mentors along with the fear of failure often magnifies the importance of weight-loss." Thus it is not surprising that dietary energy intakes are consistently low among dance students, as well as among professional dancers. This is a necessary condition for most young women who must attain body fat levels below those for normal weight females, while the physical activity which consumes much of their day is characterized by low energy expenditure.

Bright-See et al. (1978) analyzed three or four day food and activity records, which included one weekend day, for 32 adolescent female dance students at the National Ballet of Canada. All dancers lived in a supervised school residence. The average energy intakes for the 26 dancers between the ages of 13 and 15 years was 1867 ± 107 kcal (± SEM), and for the six students between 16 and 18 years of age, the mean intake was

1747 ± 161 kcal. These intakes are lower than the recommended intakes for girls of similar age and average activity levels, 2200 and 2100 kcal for the younger and older groups respectively (Health and Welfare Canada, 1975), and are lower than the average energy intake of 2243 kcal observed for the general adolescent female population (12-17 years of age) in the Nutrition Canada Survey (Health and Welfare Canada, 1973)

In 1985, Benson et al. examined the diets of 92 female ballet students aged 12 through 17 years. All students were enrolled in professional programs at six schools in the U.S.A. Each dancer completed a three day food and activity record for two weekdays and one weekend day. The average energy intake for this group was 1890.2 kcal. However, 48.1% consumed fewer than 1800 kcal per day, 28.9% consumed fewer than 1500 kcal per day, and 10.8% consumed fewer than 1200 kcal per day.

The professional dancer is also subject to low energy intakes. Calabrese et al. (1983) documented intakes of food, drink and nutritional supplements for 25 female dancers in the Cleveland Ballet Company. Records were kept for three days of a typical rehearsal week. The reported intakes of energy were consistently low. When compared to the physiological reference for energy from the United States Recommended Daily Intake (USRDA), nineteen of the 25 dancers consumed less than 85% USRDA for energy, ten consumed less than 60% , and five took in less than half of the USRDA for energy. The mean energy intake for this group was 1350 kcal and ranged from 550 to 2115 kcal per day. Such low intakes of energy for moderately active women would be expected to result in considerable weight-loss. Some of the dancers stated that they were dieting for weight-loss explaining some of the low intakes. In

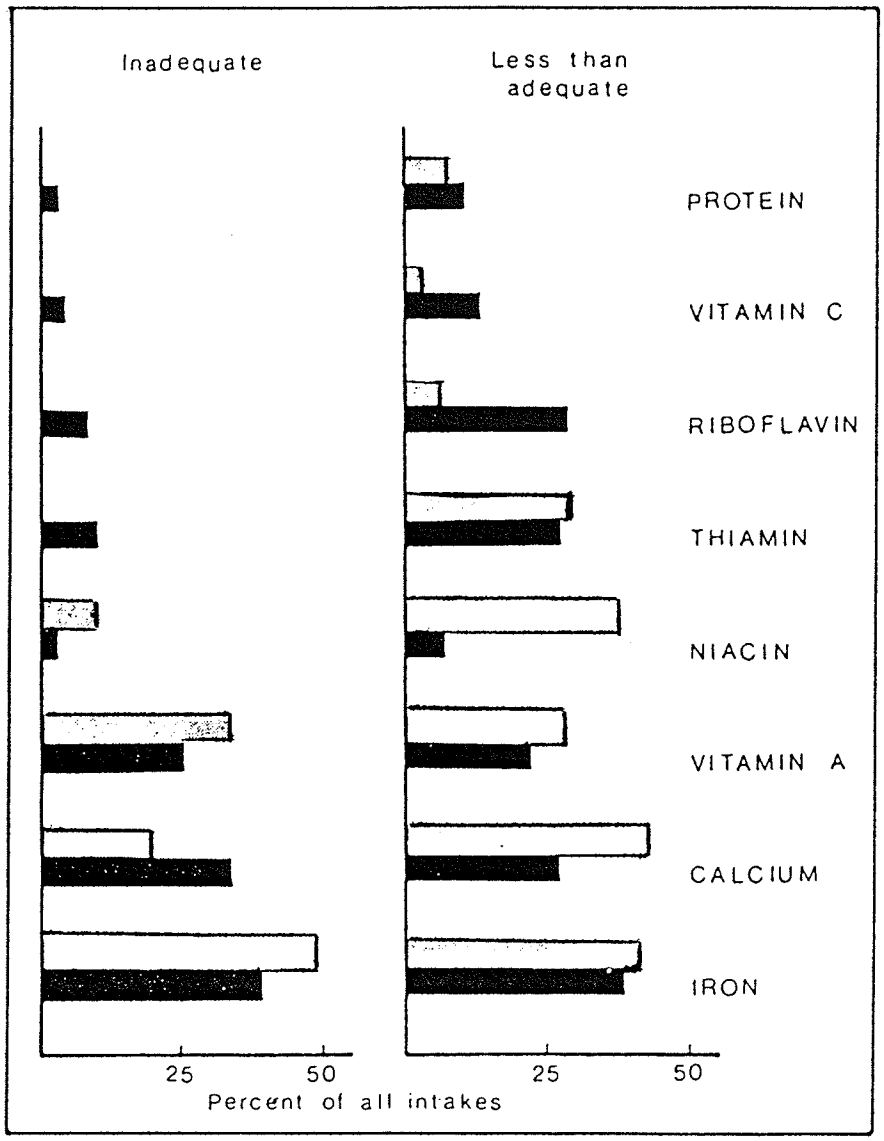
addition, Calabrese and coworkers speculated that changes in dietary patterns on weekends and the high incidence (70%) of moderate food bingeing may counterbalance the potential weight-loss effects of these low intakes.

2.3 NUTRIENT INTAKES

In light of the low energy intakes observed for both student and professional dancers, the adequacy of intakes of other nutrients is of concern.

Bright-See et al. (1978) evaluated selected nutrients for adequacy against the standards used for the Nutrition Canada Survey (Health and Welfare Canada, 1973). Comparisons of their data from 32 completed records to the Nutrition Canada findings are shown in Figure 1.

Most of the female students had adequate intakes of protein, vitamin C, riboflavin and thiamin. None of the intakes of these nutrient were considered to be inadequate. Interestingly, the percentage of the ballet students with low intakes for vitamin C, protein and riboflavin was less than that found for the general Canadian population (Health and Welfare Canada, 1973). For calcium, the percentage of intakes of the ballet students rated as inadequate and less than inadequate were similar to that found for the general population. Again, there were fewer inadequate intakes among the ballet students. Slightly lower intakes of vitamin A and iron were observed. Low niacin intakes were inexplicably prevalent among the dancers with nearly half of the students having inadequate or less than adequate intakes as compared to 10% of the general population.



reproduced from Bright-See et al. 1978

KEY

FEMALE BALLET STUDENTS

CANADIAN ADOLESCENTS (GENERAL POPULATION)

Figure 1: Percent of the Intakes of Female Ballet Students and Adolescents in the General Population Rated as Inadequate and Less than Adequate in Selected Nutrients

Bright-See et al. (1978) observed that the dancers at the National Ballet School of Canada were faring as well as other Canadian teenagers in terms of nutrient adequacy, but that is not to say that the quality of their diets needs no improvement. The nutrients that appeared to be of concern for this group were thiamin, niacin, vitamin A, calcium and iron.

The dietary nutrient analysis of the young dancers reported by Benson et al. (1985) revealed that intakes were low for many nutrients for a large proportion of the sample. Table 2 lists the nutrients, mean intakes for the group and the proportion of the group whose intakes were less than two thirds of USRDA. More than 40% of the sample had intakes below two thirds USRDA for vitamin B_6, folacin, calcium, magnesium, iron and zinc.

Calabrese et al. (1983) reported intakes of vitamins and minerals for 25 professional dancers in relation to a standard of 85% USRDA. Much of the study sample had nutrient intakes which fell below this standard, as can be seen in Table 3.

Vitamin and mineral supplementation was common among the dancers in the reported investigations. Bright-See et al. (1978) found that 45 of the 51 students studied routinely used some type of dietary supplement. These included vitamin C, halibut oil and multivitamin type preparations. No analysis was made of the potential contribution to nutrient intakes these supplements may have provided. Sixty percent of the adolescent dancers (Benson et al., 1985) and forty percent of the professional dancers (Calabrese et al., 1983) reported use of supple-

TABLE 2

Vitamin and Mineral Intakes of Adolescent Ballet Dancers

VITAMIN/MINERAL	MEAN INTAKE	SD	NUMBER CONSUMING LESS THAN 2/3 USRDA (%)
vitamin E (mg)	9.4	11.4	38.0
vitamin A (ugRE)	1410.0	1067.7	9.7
vitamin C (mg)	148.3	108.9	7.6
thiamin (mg)	1.65	1.90	11.9
riboflavin (mg)	1.95	.99	2.1
niacin (mgNE)	20.2	10.5	7.6
vitamin B_6 (mg)	1.56	1.04	42.3
vitamin B_{12} (ug)	5.13	5.6	16.3
folacin (ug)	266.0	179.3	58.6
calcium (mg)	932.8	458.9	40.2
phosphorus (mg)	1214.2	415.4	17.3
magnesium (mg)	227.6	89.1	43.4
iron (mg)	13.4	7.6	48.9
zinc (mg)	7.65	3.4	75.0

Benson et al., 1985

TABLE 3

Intakes of Selected Vitamins and Minerals for Female Professional Ballet Dancers

VITAMIN/MINERAL	NUMBER TAKING LESS THAN 85% USRDA (%)
folic acid	96
vitamin B_{12}	91.6
vitamin A	52
vitamin D	92
iron	96
calcium	68
phosphorus	37

Calabrese et al., 1983

ments. In either case, supplementation was carried out without appropriate guidance, and seldom corrected the observed dietary deficiencies. Benson et al. (1985) noted that only seven percent of those using supplements improved the intake of at least one nutrient to more than two thirds of the USRDA for that nutrient.

The differing criteria used to judge the adequacy of nutrient intake make comparisons between these groups of dancers difficult. The criteria in each case are some fraction of recommended intakes, and cannot be interpreted as indicative of dietary deficiency for individuals. Recommended intakes for nutrients are based upon scientific and political grounds, and are set to meet or surpass the requirement of most people in a healthy population. Recommended intakes vary from country to country, and are determined in relation to the amount and type of information available at the time these decisions are made. Diagnoses of deficiencies among individuals cannot be made on the basis of dietary data alone, but inferences for risk of deficiency among the population are appropriate. On this basis, it can be said that the low energy diets of dancers put a large proportion of them at risk for low intakes of many vitamins and minerals. This risk suggests that some dancers may be deficient for some nutrients, but clinical evaluation is necessary to determine the extent to which these deficiencies exist among dancers.

2.4 EATING PATTERNS AMONG DANCERS

It is not surprising, given the low intakes of energy and nutrients reported for dancers, that dancers have erratic eating patterns with a high incidence of food faddism (Calabrese and Kirkendall, 1983).

The schedule of the training dancer makes it difficult to eat regular meals (Benson et al., 1985), and the fatigue frequently experienced after a day of dance classes often prevents dancers from preparing and choosing nutritionally balanced meals.

Bright-See et al. (1978) reported that 17% of the study group were following self-prescibed weight reduction diets at the time of their survey. However, from the low energy intakes reported by the dancers in the previously reviewed investigations, it is evident that many dancers are restricting food intake much of the time.

2.5 POTENTIAL HEALTH CONCERNS ARISING FROM THE NUTRITIONAL HABITS OF DANCERS

There are no available data describing overt clinical deficiency symptoms for any nutrient among dancers (Calabrese and Kirkendall, 1983). However, there are substantiated hypotheses linking many health problems commonly observed among dancers with the nutritional patterns described above. These concerns are compounded for adolescents whose nutrient needs are influenced by requirements for growth, and conversely, whose growth is influenced by adequacy of nutrient intakes.

2.5.1 Improper Weight Loss Techniques

In order to attain and maintain the lean look expected of female dancers, diets of low energy and nutritional densities are often consumed. If habitual, these eating patterns can be nutritionally unsound and possibly dangerous. The American College of Sports Medicine (1983) states that severe restriction of food intakes may result in the loss of large amounts of electrolytes, minerals, glycogen stores, and lean tissue with less than desirable amount of fat loss.

Calabrese and Kirkendall (1983) interpret the low energy intakes coincident with the training schedules of 30 hours or more per week among higher level dancers as modified fasting. The physiologic sequelae of fasting are often serious and include hypoglycemia, ketonuria, decreased urinary output, loss of lean tissue, reduced blood volume and hypotension, weakness, fainting, and glycogen depletion. Lack of energy and generalized fatigue are common among dancers and are a result of poor eating habits coupled with prolonged, vigorous exercise (Calabrese and Kirkendall, 1983). This fatigue can lead to injuries, as musculoskeletal injuries occur more frequently among fatigued athletes (Calabrese and Kirkendall, 1983).

Some dancers use stimulants and laxatives as diet aids (Maloney, 1983). Each of these methods is ineffective and they place the health of these physically active females at risk. Stimulants may cause irregular heart beats, excessive perspiration, trembling, alterations in balance, and other uncomfortable symptoms. They are addictive, and only fleetingly effective as appetite supressants (Hamilton et al., 1985).

Laxatives do not prevent absorption of most nutrients including the energy nutrients, as is commonly believed by those who use them. Instead, the apparent loss of weight following laxative use is a result of dehydration and may lead to electrolyte disturbances which could place the health of dancers in danger (Kirkley, 1986).

2.5.2 Eating Disorders

Ballet dancers have a seven fold increased chance of developing anorexia nervosa compared with normal high school students (Garner and Garfinkel, 1980). In the experience of Calabrese and Kirkendall (1983), anorexia or anorectic-like symptoms are more commonly encountered in the aspiring student than in the established professional. These authors feel that it is because the pressures on the student are greater, and the fear of not being accepted into a company or of not having a chance to train to become a professional dancer are greater than the fear of not excelling once the dancer has been accepted as a professional.

Distinguishing between anorexia nervosa and compulsive dieting is difficult but necessary so that proper treatment can be prescribed. All dancers are conscious of their weight, most have dieted to control their weight and some use drugs and vomiting to aid weight loss (Maloney, 1983). However, not all weight preoccupied dancers demonstrate the psychological disturbances which typify anorexia nervosa. Garner et al. (1984) found that 69% of dancers and college students (n = 35) classified as weight preoccupied on the basis of scores on scales which assess body dissatisfaction and extreme desire to be thinner did not demonstrate the psychopathology observed among the control group of anorexia nervosa patients.

It is possible that weight preoccupied dancers practise the improper methods of weight control described in section 2.6.1, and thus are at risk for the resultant sequelae. In addition, the biopsychosocial model for the etiology of bulimia (Kirkley, 1986) supports the possibility that bulimia may be common among dancers who restrict their food intakes for long periods of time. There are no hard data depicting the extent of the incidence of bulimia among dancers, but cases of bulimia among dancers have been reported (Maloney, 1983). The biopsychosocial model proposes that most bulimia stems from an interaction between biological and/ or psychological risk factors and environmental pressures. In an environment which emphasizes extreme thinness among young women, they may be motivated to restrict food intake so that real or perceived food deprivation occurs. Over time, this deprivation paradoxically leads to overeating, which may be perceived by these women as a loss of control or binge. The risk of bingeing is increased if the individual frequently experiences anxiety, depression or other negative emotions. The fear of weight gain following a binge is likely to lead to severe restriction of food intake or purging, perpetuating the vicious cycle known as bulimia (Agras and Kirkley, 1986, in Kirkley, 1986).

2.5.3 Fluid and Electrolyte Losses

The satisfaction of water and electrolyte requirements is essential for safe physical activity and optimal athletic performance. Failure to replace the water and electrolytes lost in sweat may result in poor thermal regulation and hypothermia, decreased circulating blood volume leading to hypotension and syncope (Calabrese and Kirkendall, 1983). A

three percent loss of body water can result in impaired performance (Anon., 1980).

Dancers are highly prone to disturbances of fluid and electrolyte balance for a number of reasons. Environmental factors such as poorly ventilated studios, long classes which are structured in a way which prohibits fluid replacement until following class and dressing in layers of wool and unventilated plastic apparel to keep muscle groups warm and flexible increase the amount of sweat lost while exercising (Calabrese and Kirkendall, 1983). Abuse of laxatives, diuretics and stimulants, including caffeine, increase water and electrolyte losses. Poor eating practices which restrict food intake and involve poor food choices decrease the amount of electrolytes made available to replace these losses. Fear of weight gain may prevent some dancers from replacing fluids adequately following exercise (Peterson, 1982).

2.5.4 Delayed Menarche and Menstrual Irregularities

Restriction of energy intakes and dieting begins for many dancers in early adolescence as is evident in the reported energy intakes and dieting behaviour observed by Bright-See et al. (1978) and Benson et al. (1985). If severe or prolonged, restrictive diets impose energy deficits that may deter growth and normal physical development (Pugliese et al., 1983).

As reported in section 2.1, most ballet students have normal heights. However other delays in normal development have been reported. Delayed menarche and menstrual irregularities are common among young ballet

dancers (Frisch et al., 1980, Warren et al., 1986, Brooks-Gunn et al., 1987). The etiology of these menstrual problems is unclear. Low body weight, low body fat to lean ratio (Frisch et al., 1980), strenuous physical exercise (Abraham et al., 1982), and more recently, dieting and eating problems (Warren, 1983, and Brooks-Gunn et al., 1987) have been proposed as possible causes.

Brooks-Gunn et al. (1987) found that the amenorrheic dancers (19%) in their study of 55 adult female dancers were leaner, had lower body weights and had higher EAT-26 scores (a test indicating eating problems including food restriction and bulimic episodes). Prolonged amenorrhea was associated with eating problems but oligomenorrhea (40% of sample) was not associated with body weight, leanness or incidence of eating problems. Whether eating problems play an important role in causing delayed menarche or menstrual irregularities among adolescent dancers remains undetermined.

2.5.5 Delayed Skeletal Development and Potential Decreased Bone Densities

Delayed sexual maturation may alter the development of the skeleton. A delay in bone development associated with delayed menarche and secondary amenorrhea has been reported in ballet dancers who restrict their weight and exercise heavily (Warren, 1983; Warren et al., 1986). Prolonged hypoestrogenism in young adolescent girls with a delay in bone development may favour long bone growth (Warren et al., 1986), inadvertently producing a desired body type among dancers.

Warren et al. (1986) observed a higher incidence of scoliosis and stress fractures in the lower extremities among adolescent ballet dancers who had delayed menarche or prolonged intervals of secondary amenorrhea. A delay in sexual maturation in conjunction with low intakes during adolescence, of calcium, vitamin D, and other nutrients which form bone may result in inadequate calcification and skeletal stability during the rapid growth phases of adolescence. Apposition of bone during puberty may be decreased leading to lower than normal bone densities at maturation, a risk factor for the development of osteoporosis later in life (Warren et al., 1986). Blood tests showed no biochemical evidence of vitamin D deficiency or metabolic bone disease among the dancers studied, but Warren et al. (1986) warn that bone biopsies are necessary to ascertain bone density and to differentiate osteomalacia from osteoporosis.

2.6 FACTORS AFFECTING THE DIETARY QUALITY OF ADOLESCENT FEMALES

2.6.1 Nutrition Knowledge

A direct relationship between knowledge of nutrition and dietary quality does not exist, as all experimental evidence investigating this relationship point to this finding. No work investigating this relationship for ballet dancers has been published. How much dancers know about nutrition has not been investigated in any detail. Bright-See et al. (1978) assessed the nutrition knowledge of 63 adolescent dancers, 12 male , 51 female, using a short multiple choice quiz based upon the four food groups. The mean score was 9.1 out of a possible 15, indicating that nutrition knowledge was low among these students. No attempt was

made to analyze the relationship between knowledge of nutrition and dietary quality, but Bright-See and coworkers noted that most students held positive attitudes about nutrition and these authors hoped that nutrition education could direct these attitudes into more healthful eating practices.

Nutrition knowledge and its relationship to eating practices among high school athletes was examined by Douglas and Douglas (1984). Nine hundred and forty three male and female athletes from ten randomly selected high schools in Connecticut took part. Nutrition knowledge was assessed using 33 conceptual and factual questions about vitamins, minerals, lipids, proteins and carbohydrates, and 15 true/false format questions dealing with misconceptions about food. Eating practices were assessed using a frequency questionnaire and were evaluated using a score based upon Food for Fitness- A Daily Food Guide which yielded five points if appropriate numbers and sizes of servings of milk products, meats and alternates, breads and cereals and fruits and vegetables were consumed. Results indicated that the female athletes had significantly higher nutrition knowledge scores and lower food practices scores than the males in the study. The Pearson product-moment correlation coefficient between nutrition knowledge and food practices among the females was weak, $r = 0.15$.

Douglas and Douglas (1984) also analyzed these variables according to sport form. Only gymnastics and field hockey team participants scored significantly lower in food practices as compared with all other athletes combined. Nutrition knowledge of these athletes did not differ significantly from that of the other athletes. No explanation was

suggested for this finding, but it is interesting to speculate that the slender body form required of gymnasts, and that field hockey is predominantly a sport for females may each have played a role in these observations.

Perron and Endres (1985) also investigated the relationship between the nutrition knowledge and attitudes and dietary practices of female adolescent athletes. The sample consisted of 31 females between the ages of 13 and 17 years. Dietary data were collected for three days, using a 24 hour recall for day one, and food records for days two and three. Nutrition knowledge and attitudes were obtained using a modified version of the self-administered questionnaire of Werblow et al. (1978). A positive correlation between nutrition knowledge and attitudes was found indicating that the more nutrition knowledge a subject had, the more favourable was the attitude toward nutrition. However, analysis of the data showed that nutrition knowledge explained little of the variation in any of the nutrient intakes , indicating that the subjects did not always apply their knowledge of nutrition. In addition, attitudes toward nutrition, were not reflected in the food choices of the subjects.

Perron and Endres (1985) also asked for the subjects' perception of of body weight. Eighty one percent of these young athletes were unhappy with their present weight, and 73% wanted to lose weight. Although Perron and Endres did not analyze statistically the relationship between body dissatisfaction and dietary quality, they suggested that a concern for weight may have played a role in determining the food practices of the subjects, overriding the knowledge of nutrition that they possess.

2.6.2 Body Dissatisfaction

There is considerable evidence that perceived overweight prompts dieting behaviour among adolescent females. Dwyer et al., (1967) compared body weight discrepency (real minus preferred weight) , triceps skin fold thickness, and dieting behaviour for 446 senior high school girls. It was found that for all triceps categories (obese, above average, below average, and lean), the number of dieters exceeded nondieters when desired weight was five to nine pounds less than the reported weight.

Storz and Greene (1983) observed in a study of 203 adolescent girls that 169 of the girls wanted to lose weight. Fifty six percent wanted to lose at least ten percent of their body weight, and 44% wanted to lose a smaller amount, in spite of the fact that 62% of these girls had weights which fell within the average range for body weight according to the NCHS standards. Attitudes toward methods of weight reduction were also assessed. All subjects rated higher the more healthful methods of weight reduction, slow weight loss, variety of foods in diet, and exercise, however those wishing to lose ten percent or more of their body weight rated fad diets, appetite suppressants and food replacements as desirable. These results may be interpreted to indicate that the desire to achieve a particular body shape may override knowledge of healthful nutrition practices.

An investigation into pathogenic weight control behaviours in female athletes (Rosen et al., 1986) found that half of the athletes who perceived themselves as having a history of obesity practised pathogenic

weight control behaviours. This was not the only factor, however, since 30% of the athletes who used these methods did not perceive themselves at risk for obesity. Rosen et al. (1986) found that 32% of 182 varsity level female athletes regularly practised at least one of the following pathogenic behaviours for weight control: self induced vomiting (14%), laxatives (16%), diet pills (25%), diuretics (5%), bingeing twice or more per week (20%). The gymnasts reported these behaviours most frequently, with 14 of the 19 gymnasts surveyed practising at least one of these methods for weight control. None of these young women was perceived as suffering from anorexia nervosa. It is apparent that these were methods used to achieve or maintain a desired body size, but no assessment of psychological functioning was made.

Macdonald, Wearring and Moase (1983) theorized that food intake may be related to bodily appearance, since dissatisfaction with body appearance (particularly size) may lead to a change in eating behaviour, such as weight reduction diets. The purpose of their study was to identify variables which could differentiate girls with good and poor dietary intakes. Two hundred and seventy six female students between 14 and 18 years of age were included. Dietary quality was assessed using Canada Food Guide scores as applied to 24 hour food records. Three psychological variables, self esteem, social recognition, and energy level, were measured using the Jackson Personality Inventory (Jackson, 1968). In addition, desired body image choice, past and present dieting behaviour and physical activity levels were measured.

The group classified as having good food intakes had diets higher in energy and more total food per day. Group one (n = 50) had a mean energy

intake of 2253 kcal per day, group two (n = 50) had a mean energy intake of 1203 kcal per day. These groups did not differ statistically on any of the demographic variables assessed. Group two was more likely to skip one or more meals per day (22 % vs. 7%), was dieting in greater numbers on the survey day (48% vs. 28%), and had attempted to diet in greater numbers in the past (74% vs. 32%). When presented with various ideal or desired body shape selections, both groups selected ectomorph to mesomorph shapes. However, the subjects' current appearance did not necessarily reflect the ideal. In fact, group two, those with poorer diets ate significantly less, but weighed more and were significantly fatter in terms of skin fold thicknesses than group one. None of the psychological variables differed significantly for the two groups.

Discriminant analysis was used to select predictor variables for dietary quality. The three variables selected explained 37% of the variance between groups. Those subjects with poorer diets were less likely to engage in active pursuits, had dieted more frequently in the past, and selected an ectomorphic body shape as ideal for themselves.

Thus it is apparent that body image satisfaction may play a key role in determining dietary quality, since adolescents who perceive themselves as overweight are more likely to reduce food intake for weight reduction, compromising the nutritional adequacy of their diets. This factor may supercede cognitive awareness of proper nutrition for health and growth. Those adolescents who have to exert little effort or concentration to maintain a body shape that they feel comfortable with will likely eat well, by eating more. They will also be less likely to engage in pathological eating behaviours such as bingeing, purging, or

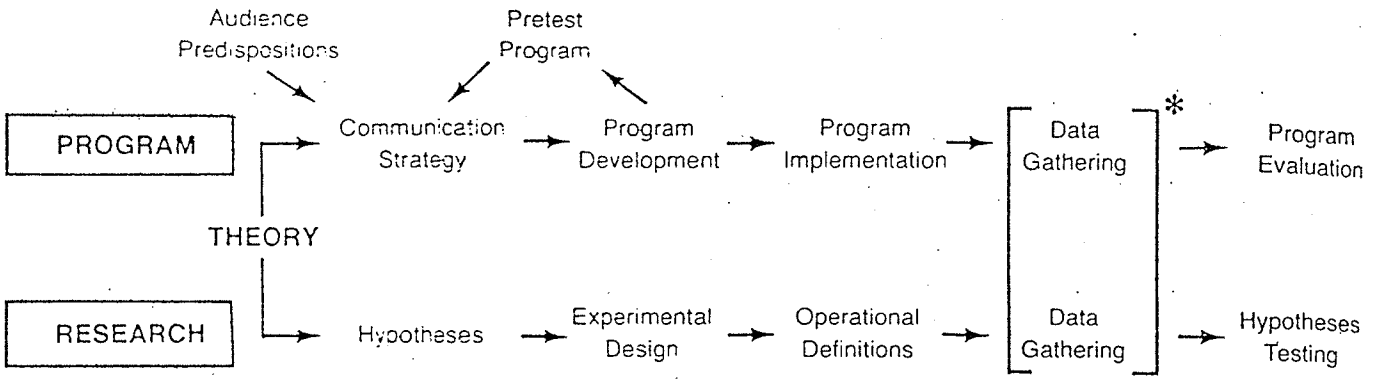
laxative abuse. Those adolescents who are not comfortable with their body size may attempt to go to great lengths to achieve this ideal.

The environment in which adolescent dancers find themselves may exacerbate the body dissatisfaction that most adolescent females experience increasing the likelihood that these dancers will use any method of weight control at their disposal, placing their nutritional health in a precarious position.

2.7 MODEL FOR NUTRITION EDUCATION RESEARCH

The development and evaluation of this nutrition education project resembles the model for nutrition communication research provided by Gillespie (1981) which is diagrammed in Figure 2.

Gillespie (1981) highlights the importance of involving all individuals in the food reference group, in this case, fellow dance students, ballet teachers, and parents, so that all receive similar messages about nutrition. In addition, Gillespie (1981) recognizes that nutrition education programs must be provided in a holistic context which incorporate nutrition principles into the receivers' current social and psychological envirionment. Thus, the focus of this education program is not merely to provide facts and figures about nutrition concepts important to dancers, but also to delve into the area of self image, body dissatisfaction and provide an arena for discussion of the dancers' concerns in this area. Similarity between the nutrition educator and the audience can enhance the success of the program through the reciprocal empathy that exists and develops during the program. This type of envi-



*some overlapping of data

Reproduced from Gillespie (1981)

Figure 2: Model for Nutrition Communication Research

ronment facilitates the transmission of information, and may motivate the audience to consider the information more thoughtfully. The nutrition education program developed for the RWB ballet students attempts to encompass all of these factors.

2.8 SUMMARY

Adolescent female dancers training in professional schools must cope with not only those pressures typical of adolescence in the 1980's, but with pressures inherent to becoming a professional dancer as well. She must be adept in ballet performance and she must project the current image of a performing dancer, lean, graceful, delicate yet physically strong. These contradictory requirements give rise to a great deal of confusion and stress among these adolescents, particularly in the areas of body image, body size, and weight control.

The energy expenditure required for ballet class is low and consequently, the degree of leanness expected of female dancers is difficult to achieve for many young women without diets low in energy. Intakes of food and energy which are consistently low place these young dancers at risk for nutrient deficiencies, fatigue, menstrual irregularities, delayed skeletal development, decreased bone densities, and development of anorexia nervosa and/or bulimia.

Numerous factors interrelate to affect dietary quality in adolescent females. While knowledge of nutrition is necessary in order to make appropriate food choices and to select adequate quantities of these foods for health, it is apparent that other more pressing factors tend

to compete with this knowledge, and often override this knowledge. For adolescent girls, one particularly salient factor appears to be body dissatisfaction. For the most part, the trend in this dissatisfaction today is that girls are not lean enough. Thus, many girls diet in the attempt to attain this desired body size often at the expense of nutritional concerns and of their overall health. The proposed education program for the ballet students at the RWB must attempt to address these issues within the context of the realities in the world of ballet.

Chapter III

RESEARCH OBJECTIVES AND EXPERIMENTAL HYPOTHESES

This study was undertaken for the purposes of meeting two overall objectives. Firstly, to develop, present and evaluate a short-term nutrition education program developed specifically for adolescent ballet students at the Royal Winnipeg Ballet School (RWB), Professional Division. Secondly, to assess nutrition knowledge , food-related behaviours and body dissatisfaction of the students and to obtain personality profiles for the purpose of testing interrelationships among these variables which may help to explain discrepencies between nutrition knowledge and behaviour.

The experimental hypotheses are:

1. Nutrition knowledge scores will show an increase from pre-intervention to post-intervention.
2. Dietary scores will demonstrate an increase from pre-intervention to post-intervention.
3. Dancers attending the group instruction plus individual interview program will exhibit greater change in nutrition knowledge scores than the group attending the lecture portion only.
4. Dancers attending the group instruction plus individual interview program will show greater change in dietary scores than those assigned to the group instruction only program.

5. The study sample will exhibit low dietary intakes for the nutrients energy, protein, iron and calcium (pre-intervention).
6. There are personality characteristics which may be related to changes in nutrition knowledge scores or changes in dietary scores upon receipt of the intervention.
7. There are personality characteristics which may predispose dancers to gain differentially in knowledge and/or improve eating practices upon receipt of the group instruction plus individual interview program.
8. There is a relationship between body dissatisfaction scores and scores on the eating patterns questionnaire.
9. There are personality characteristics which will be more predictive of the likelihood that the dancer will have high scores on the eating patterns questionnaire as well as high body dissatisfaction scores.
10. There are differences in nutrient intakes and dietary scores among residence and non-residence students.
11. Nutrition knowledge scores, eating patterns questionnaire scores and dietary scores will differ by age group (13-15 years or 16-18 years of age).

Chapter IV

METHODOLOGY

4.1 NEEDS ASSESSMENT

The needs assessment phase of the project was carried out during 1985 and 1986. The purpose of this phase was to identify the target group, their education needs, and how these needs might be met. More specifically, investigative approaches which included a literature search, informal discussions with staff and students, a newsletter to parents, focus group interviews and the pretest nutrition knowledge test were used to answer the questions presented below.

1. Is there a need for a nutrition education program at the RWB school?
2. Who needs this type of a program? Who is the target group? What are their characteristics? How many people make up this group?
3. Does interest in such a program exist, on the part of the intended target group as well as those people who exert direct influence on this target group?
4. Will those people who are influential support the program?
5. What does the target group need to know about nutrition?
6. What does the target group already know about nutrition?
7. What does the target group want to know about nutrition?

8. What are the objectives for this program, from the perspectives of the researcher, target group and the staff at the school?
9. What teaching methods are most appropriate for this group? What resources are available to be used for this program?

Interviews with small groups of students from the Professional Division (five to six in a group) took place in the fall of 1985. These interviews employed the focus group technique (Manoff, 1985) to determine which fitness and nutrition issues were of uppermost concern to the dancers themselves. The information gained from these interviews contributed to the resolution of questions 5, 6, 7, and 8.

Conducting the needs assessment required patience, tolerance, and respect for the privacy and integrity of all those involved. As an outsider, it was necessary for the investigator to understand that the attempt to become accepted into an environment which chooses to remain distant and private in many respects, would be difficult and time-consuming. It was necessary to establish a rapport with the students and staff. In addition, it was essential to develop a reputation as one who could be trusted to be supportive, helpful, and discreet.

4.2 VARIABLE MEASUREMENT

The instruments used to gather data for this study included a Nutrition Knowledge Test, Eating Patterns Questionnaire, Jackson Personality Research Form AA and a three day food intake record. Copies of all instruments but the Jackson Personality Research Form (JPRF) are presented in Appendix A. The JPRF (Jackson, 1968) is a standardized

instrument purchased for use in research investigations. Additional information describing the means of measurement and how scores were derived is presented below.

The descriptive variables, age, body weight, height, source of nutrition information, and how students determine proper body weight were self-reported in the Eating Patterns Questionnaire.

Attitudes toward nutrition were measured using a agree/disagree format prior to the intervention as part of the Nutrition Knowledge Test.

Attendance at each session of the program was self-reported in response to an item included in the post-intervention Nutrition Knowledge Test.

Nutrition knowledge was measured as a total point score on a 34 item test adapted from a test developed by Werblow et al. (1978). Questions on the test were altered to reflect the content of the education programme designed for this particular group of ballet students.

Nutrition knowledge change was calculated by subtracting the pretest score from the posttest score earned on the Nutrition Knowledge Tests.

Three day food records were used to gather food and nutrient data. The food intake was assessed by means of a dietary quality score (Guthrie and Scheer, 1981). This numerical score was adapted so that it is based upon Canada's Food Guide recommendations for adolescents, both in terms of number of servings and serving sizes. Half servings were computed into the score. The allocation of points is shown in

Table 4. Dietary scores for each day of the three day recording period were calculated, and then averaged to provide a mean dietary score for each individual before and after the intervention.

TABLE 4

Dietary Quality Score

Food Group	Points per serving	Possible Score
Milk and Milk Products	1	4
Meat, Fish, Poultry and Alternates	2	4
Fruits	1	2
Vegetables	1	2
Breads and Cereals	1	4
	TOTAL	16

Change in dietary quality score was calculated for each individual by subtraction of the pretest dietary quality score from the posttest dietary quality score.

Nutrient intake data were also derived from the three day food record. Records for each day were coded for and analyzed by the 1986 Nutrient Analysis Program at the University of Manitoba. The totals for each day of the three day recording period were averaged to provide mean intakes for each individual.

The personality characteristics were measured with the Jackson Personality Research Form AA (Jackson, 1968). This instrument is standardized and has been evaluated for reliability and validity and may be used with adolescents and adults of both sexes. Scores for twenty characteristics are derived from true/false responses to 440 items. A listing and description of these characteristics is presented in Appendix B.

The extent to which eating practices may be affected by emotional cues, and one's response to perceived environment was measured by means of a Likert formatted questionnaire adapted for this group from an instrument designed by Crockett and Littrell (1985). These questions appear in Appendix A, Eating Patterns Questionnaire, questions 1-44. Scoring was designed so that the higher point score indicated frequent performance of an undesirable food-related behaviour. Total point score for the instrument was used as an indicator for the presence of maladaptive eating practices. A high scorer is more likely to binge-eat in response to boredom or emotional upset, may use purging methods and is less likely to eat a variety of foods. She is also likely to be highly preoccupied with her eating patterns.

Body dissatisfaction was measured using somatotype diagrams (Storz and Greene, 1983). A numerical score was derived by determining the difference between the respondent's perception of her current body shape and weight and that which she would prefer to have. In addition, respondents were asked to describe themselves as underweight, overweight or neither using a multiple choice type question. Responses to each of these questions were correlated ($r = 0.79$). However, because agreement

was incomplete, and no other pattern of association was demonstrated for these variables, responses to each of these questions were analyzed separately.

4.3 PRETESTING OF INSTRUMENTS

A group of ten students from the General Division of the Royal Winnipeg Ballet School were selected for pretesting of the instruments which were to be used in the study. This sample was selected to be as similar as possible to the study group with respect to age, sex and interest in dance. Only females were included. The ages of the students ranged from 14 to 17 years of age with a mean age of 15.6 years. Examples of the recruitment letter and consent form may be found in Appendix C.

The nutrition knowledge questionnaire and eating patterns questionnaire were completed by all students at meeting one held in April of 1986. Comments and questions were solicited regarding wording , phrasing and perceived meaning of the items on these instruments.

No changes were made to the Eating Patterns Questionnaire as all comments were favourable, and the group displayed no difficulty in understanding nor discomfort when answering any of the items.

The phrasing and wording of items 7, 11, 16, 22, and 24 on the Nutrition Knowledge Test were altered to clarify the meaning of these statements. These changes were prompted by oral comments and questions made during the meeting.

Response to the written instructions on the food record was also sought. All students acknowledged an understanding of these instructions, and sought only an expanded explanation of how to measure and report quantities of foods that were eaten.

The Jackson Personality Research Form (JPRF) and the three day food record were not fully pretested because none of the subjects attended the second meeting. This unfortunate lack of response was not seriously detrimental to the accomplishment of the pretest objectives, however, because the instruments which had been modified and were therefore, untested, were tested at the first meeting. Both JPRF and three day food records have been used with other adolescent populations with apparent success (Jackson, 1968 and Schorr et al., 1972).

4.4 SAMPLING PROCEDURE

All female students in the Professional Division between the ages of 13 and 17 were invited to take part in the study. Correspondence describing the purpose of the study was sent to all eligible dancers (n = 45). This correspondence consisted of a letter and consent form from the researchers as well as a letter from the staff of the Professional Division endorsing the study and encouraging participation. Copies of all correspondence are presented in Appendix C. A notice was posted on the professional division bulletin board to notify all students about the study as well as to request that students indicate living arrangement on the consent form. Students were instructed to return the consent form to the registrar in a sealed unmarked envelope so that confidentiality of participation was preserved.

Response to this call for subjects was neither as prompt nor as extensive as was expected. Therefore, the deadline for agreement to participate was extended several more days. During this extension, a new and more noticeable poster was erected and instructors of the ladies' classes made mention of the study in class and encouraged the students to take part. Several more dancers consented to participate after this effort bringing the sample size to 22.

After all consent forms had been collected, the participants were first sorted according to living arrangement, and then assigned randomly to intervention group 1 (lecture sessions only) or intervention group 2 (individual interview in addition to the lecture sessions).

4.5 EXPERIMENTAL DESIGN

The design of this project most closely resembles a one group pretest posttest design. It is recognized that the inclusion of a control group would have strengthened the design but it was not possible to find an appropriate comparison group at the time of the study. The students at the RWB, Professional Division, form a small, unique and closely knit group. Because of the small number of potential subjects and the interrelationships among the students, it was not possible to create a control group from within the professional division. The lifestyle of this particular population is unique in relation to other adolescent populations so that no other group, including the students in the General Division of the school, was considered appropriate to be used as a comparison group for the evaluation of the education program.

The experimental protocol is summarized in Table 5 and described in more detail below.

TABLE 5

Summary of Experimental Protocol

Pretest
Meeting One: May 12, 1986
Nutrition Knowledge Test administered
Eating Patterns Questionnaire administered
Three day food intake records explained and distributed
Food intake recorded Thursday to Saturday May 15-17, 1986
Meeting Two: May 17, 1986
Jackson Personality Research Form AA administered
Intervention
May 20,26,30 1986
Three hour long sessions involving a mixed format of lecture, large and small group activities.
Each session evaluated at the end of the session for content and presentation format by all who attended.
Posttest
June 2, 1986
Package containing Nutrition Knowledge Test, and Three day food intake record booklet sent out to all participants.
Food intake recorded Thursday to Saturday June 5-7, 1986

4.5.1 Pretesting

Two separate meetings were planned for the pretesting in order to decrease the time commitment required for each of these meetings. During meeting one, the study was briefly explained. In addition, the Nutrition Knowledge Test and Eating Patterns Questionnaire were administered. Code numbers were assigned to each of the participants and the three day food record booklets were distributed and explained.

The Jackson Personality Research Form was administered at the second pretest meeting. Three new participants joined the study after the first meeting but before the second. A package containing a code number, consent form, introductory letter to new participants, the Nutrition Knowledge Test, Eating Patterns Questionnaire and Three day food intake booklet were given to each of the new participants. An example of the introductory letter is presented in Appendix C. The students who were selected into group 2 were notified at the end of the second meeting, and were told that an interview would be arranged within the next two weeks.

A memo was sent to all participants during the week between the two pretest meetings. This memo summarized the times and places for meetings and contained a reminder to begin recording food intake on the Thursday of that week. A copy of this memo is provided in Appendix C. In addition, during this week, a package containing the Nutrition Knowledge Test, and a letter inviting all teachers to attend and evaluate the sessions was delivered to all teaching staff. A copy of the letter sent to the teachers is presented in Appendix C.

The food intake record booklet (Appendix A) was set up in a manner which would easily allow the collection of the records on a daily basis. The records were collected and checked during a brief personal interview for accuracy and completeness. Not all records were checked, however subjects were contacted for clarification when necessary.

4.5.2 Intervention

The intervention consisted of three hour-long sessions. A summary of these sessions is presented in Appendix D. The content of these sessions focussed upon the nutrition information needs as determined during the needs assessment which was described earlier in this chapter (Section 4.1). The selected style of presentation, planned activities and handouts were a function of previous education experience on the part of the researcher as well as the availability of resources from a number of food marketing agencies in Manitoba, and the Ontario Milk Marketing Board Nutrition Education Programs.

Each of the sessions was evaluated by all participants. An evaluation check-sheet (Appendix D) was developed for use in this project based upon the evaluation model of Edwards et al. (1986). The check-sheet assessed the participants' perceptions of the relevance of the presented information, organizational clarity, and presentation style.

The proposed alternate intervention, the individual interview based upon nutrient analysis of the pretest recorded food intake did not take place. Technical difficulties prevented completion of the nutrient analysis within the allotted experimental period of two weeks. The analyses were not ready in time for the individual diet counselling to be carried out.

4.5.3 Posttesting

A time could not be agreed upon for the posttest meeting because participants were scheduled for rehearsals at various times preventing the participants from meeting as a group. Rather, it was decided at the third session to give each participant a package containing the Nutrition Knowledge Test and a three day food record booklet and a letter of instructions. A copy of the letter is presented in Appendix C. Students were instructed to complete the test as individuals and then return it to the Registrar's office in a sealed envelope. Brief interviews took place on each of intake record days. Again, some records were not checked with the subjects, but all records from the residence students were verified.

4.6 HYPOTHESIS TESTING AND ANALYSIS

Statistical methods to test the experimental hypotheses (Chapter 3) were selected according to the type of data generated by the research. The approach taken for each hypothesis is discussed in turn. All statistical analyses were completed using the SAS programs available through the the University of Manitoba Computer Services (SAS, 1985).

For hypothesis one, the independent variable is receipt of the programme, and the dependent variable is change in nutrition knowledge test scores. In order to ensure volunteerism, attendance of each of the lectures could not be made mandatory, but attendance by subject for each lecture was monitored. Thus attendance was used as an additional independent variable, having two levels (yes or no) and three categories (lecture one, two or three).

The nutrition knowledge test had been adapted for this study to reflect the content of the programme, with thirteen questions related to lecture one, eleven for lecture two, and eight for lecture three. The variable, 'Increase in nutrition knowledge score' was calculated separately for each set of questions related to lecture content, and had two possible levels: yes or no.

The significance test used to analyze this hypothesis was the Fisher's Exact Test. This test computes the exact probabilities of obtaining the observed distribution of values in addition to the probabilities of obtaining more extreme distributions. Fisher's Exact Test is designed for use when the number of observations is small (less than 15), and when each test variable has only two levels. Either of one or two-tailed hypotheses can be tested using this statistic (Steel and Torrie, 1980). In this case, a one-tailed hypothesis was tested with a probability level of 0.025.

The independent variable in hypothesis two is receipt of the programme, and the dependent variable is change in dietary scores. An analysis of variance was first applied to test for the possibility of a significant attendance and lecture interaction. No statistically significant ($p = 0.05$) effect of lecture and attendance on change in dietary score was observed, indicating that attendance of any one lecture did not affect the change in dietary score in a meaningful way. This established, all subjects who attended at least one lecture were grouped together. A Student t-test ($p = 0.05$) was used to test the null hypothesis that the mean change in dietary score for those who attended the programme is equal to zero.

Hypotheses three and four could not be tested as sufficient data were unavailable for reasons outlined earlier in this chapter (Section 4.4.2).

Hypothesis five is an attributive hypothesis requiring a method of analysis which compares observed mean nutrient intakes for each individual to a standard. Postulations regarding the adequacy of these intakes are made for the group as a whole.

A flaw in the conventional method of assessment, evaluating individual intakes as a percentage of the recommended intake, is that it neglects to compensate for the distribution of requirement among individuals. This results in overestimation of inadequate intakes for the individuals within a population (Anderson et al., 1982). These authors outline an alternative method for assessment of nutrient intakes for individuals as part of a population termed the probability approach. This method utilizes statistical probability factors associated with proportions of area under the normal curve to estimate the number of individuals at risk for dietary nutrient inadequacy. The validity of this method depends upon the satisfaction of the following assumptions (Anderson et al., 1982):

1. the distribution of requirements for the nutrient is normal.
2. the coefficient of variation is 15%.
3. there is a very low correlation between intake and requirement after confounding variables to which both relate are eliminated.
4. the recommended nutrient intake is set at two standard deviations above the mean requirement.

For the analysis of protein and calcium in this study, it has been assumed that all conditions are satisfied. It is not known and not verifiable as to whether this assumption is appropriate in the case of the second and fourth conditions. The Recommended Nutrient Intakes for Canadians (Health and Welfare Canada, 1983) does not specify the coefficients of variation or the other parameters used in the determination of these recommendations. Beaton (1975) states that the third assumption can be justified for protein provided that protein recommendations and intakes are calculated according to body weight. These values were calculated for each subject before analysis took place.

The probability method is inappropriate for use with energy because the third and fourth assumptions cannot be justified for this nutrient. Rather, energy intakes were evaluated against the calculated recommended average energy intakes (Health and Welfare Canada, 1983) for adolescent females using self-reported bodyweights and ages.

Iron requirement for menstruating females does not follow a normal distribution and as a result, the probability factors used by Anderson et al.(1982) are inappropriate. It is not known how many of the subjects had normal menstrual cycles over the study period, however for the purposes of analysis, it is assumed that all are menstruating normally. Analysis of iron intakes for this group was then carried out as directed by Beaton (1972) using probability factors appropriate for the skewed distribution of iron loss in menstruating women (basal losses considered constant at 0.8 mg per day), where the recommended intake is 14 mg based upon an absorption rate of 20 percent.

For hypothesis six, the independent variables are 20 psychological characteristics as measured by the Jackson Personality Research Inventory (Jackson, 1968), and the dependent variables are change in nutrition knowledge score, and change in dietary quality score. Pearson Product Moment Correlation Coefficients were calculated to indicate the strength of the linear relationship between each of the 20 independent variables with each of the dependent variables. For each pair of related variables, a Student t statistic was used to test the null hypothesis that no linear relationship exists (Mendenhall and Reinmuth, 1978).

Hypothesis seven could not be tested statistically as sufficient data were unavailable.

To test hypothesis eight, two methods of measurement were used to assess body dissatisfaction, the independent variable. One used somatotype sketches to elicit a numerical score, and the other used a Likert-style question to provide a non-numeric verbal assessment of body weight satisfaction. Since the dependent variable, the eating patterns questionnaire score (EPQ) is numeric, a Pearson Product Correlation Coefficient could be used to determine the strength of the relationship between the body dissatisfaction numerical score and the EPQ score.

For the verbal measure of body dissatisfaction, the consistency of its relationship to EPQ score was demonstrated by plotting these two variables using a histogram.

Hypothesis nine was tested in a manner similar to that used for hypothesis six, but with EPQ score as the dependent variable. Insufficient numbers of subjects precluded the statistical testing of

the hypothesis exactly as stated. Multivariable multiple regression analysis would be necessary to include 'body satisfaction' in this analysis. This technique requires many more observations than variables in order to be effective (Steel and Torrie, 1980).

For hypothesis ten, a Student t-test ($p = 0.05$) was used to test whether significant differences in the dependent variable, pretest dietary scores occurred with place of residence (YWCA or private home) as the independent variable.

Multiple analysis of variance was used to test the effects of place of residence on the dependent variables, intakes of energy and the nutrients protein, calcium and iron. This analysis investigates the effect of the independent variable on each of the dependent variables separately in addition to determining if there is a significant overall effect due to place of residence on nutrient intakes. The significance of the overall effect is determined using Wilks' Criterion ($p = 0.05$).

For hypothesis 11, the effects of age group (13-15 or 16-18 years) on pretest nutrition knowledge scores, eating patterns questionnaire scores, and dietary scores were tested for significance using an independent Student t-test ($p = 0.05$).

Chapter V

RESULTS AND DISCUSSION

5.1 FOCUS GROUP INTERVIEWS

The focus group interviews were quite successful. The candor of the dancers was exceptional and contributed greatly to the usefulness and success of the two meetings. It was interesting to this researcher that the most important concern shared by all of the dancers was lack of privacy. Many of the dancers stated that they felt "watched" much of the time, mainly by RWB staff, but also by their peers. They felt that eating was a personal action and should not be scrutinized to the extent that they felt it was. Most of the dancers admitted to feeling unhappy about the size of their bodies. They placed some of the blame on the mirrors at the school (the mirrors are warped). They also acknowledged that these perceived mirror images interacted with their own feelings about how they looked and how well they performed in class that day to the point that a student could feel very depressed by the end of that day.

The teaching staff played a role also. The teachers occasionally made comments about weight, body size, eating and nutrition. Each of the students admitted that they often took the criticisms personally even when not directed at them, and decided to make weight changes as a result in order to please their teachers. A couple of the students

expressed anger at the ballet hierarchy for placing so much emphasis on "skinniness" to the point where a "girl feels guilty for having normal female curves".

As for concerns about nutrition, all of the dancers wanted to know how much food was necessary to stay healthy and thin. There were no specific concerns about nutrients except for calcium and supplementation. The residence students were unhappy about the availability of food at the residence. The food choices were limited and some students admitted to hoarding food in response to the cupboards being locked in the evenings.

The conclusions drawn from the information gained in these interviews were the following. Appropriate food choice for health and leanness, self image and body dissatisfaction would be major topics in the education program. The position of RWB nutritionist must be seen as being apart from the RWB staff, not physically so much as in terms of discretion in information sharing. Respect for personal privacy must be obviously upheld or the students will refrain from utilizing the service regardless of its usefulness.

5.2 CHARACTERISTICS OF BALLET STUDENT SAMPLE

The mean age, height and weight by age group of the ballet students who took part in this project is presented in Table 6.

The group of dancers involved in this project were very similar in height and weight for age group to other groups of dancers described in the literature (see Table 1, section 2.1). The dancers were much lighter

TABLE 6

Self-Reported Age, Height, and Weight by Age Group of RWB Student Sample

Characteristic	Group 1 mean (SD)	N	Group 2 mean (SD)	N	Total Sample mean (SD)	N
Age (years)	14.0 (.81)	10	16.6 (.51)	13	15.5 (1.5)	23
Height (cm)	161.4 (6.8)	9	164.3 (6.2)	13	163.1 (6.5)	22
Weight (kg)	46.2 (4.7)	9	48.4 (5.0)	13	47.5 (4.9)	22

for height than the teenage girls described in the Nutrition Canada Survey (Health and Welfare Canada, 1980; see Table 1 also).

The age, height and weight variables for this study were self-reported, and therefore the possibility that error may be present in these means cannot be discounted. It is possible that the weights in particular, may have been underreported by the dancers as a result of feeling self- conscious about their weights in response to the expectation or belief that dancers are supposed to be lightweight. The extent to which this may have occured cannot be ascertained, but the observation that the current data are very similar to data collected by trained personnel for the other investigations provides support for its validity.

5.3 ATTITUDES ABOUT NUTRITION

For the most part, the dancers in this study had positive attitudes about nutrition. A summary of the frequency of responses toward seven attitude statements can be seen in Table 7. The dancers generally agreed that good nutrition was important to good health and good dancing. Almost 80% of the dancers felt that nutrition counselling was important to help dancers make weight changes. The dancers also felt that although the teachers needed to have good attitudes about nutrition, it was not necessarily the responsibility of the teachers to educate their students about this subject.

Bright-See et al. (1978) found that the young dancers in their study also had positive attitudes about nutrition and its importance to health and dancing. Ninety-four percent of the students stated that nutrition was important or essential to general good health, 88% stated that nutrition was important for physical stamina, and 76% felt that good nutrition was important to professional dancing.

TABLE 7

Frequency of Responses of RWB Students to Attitude Statements about Nutrition

Attitude Statement	Agree	Disagree (n=24)	No opinion
The relationship of good eating habits to good health should be stressed to the dancer.	21	2	1
Ballet instructors need to have good attitudes toward nutrition because of their close contact and influence upon dancers.	23	0	1
What a dancer eats is only important if she is trying to lose weight.	0	24	0
Learning facts about nutrition and practising them is the best way to achieve favourable changes in food habits.	21	1	2
Nutritional counselling would be important to a dancer who is trying to make weight changes (loss or gain).	19	1	4
It is the responsibility of the dance instructors to stress good nutrition practices to their students	14	6	4
The type of food a dancer eats affects her physical performance.	20	1	3

5.4 SOURCES OF NUTRITION INFORMATION

The sources from which these dancers obtained nutrition information were varied, and ranged in perceived importance. The frequency of responses for the ranking of various sources of nutrition information are presented in Table 8. Health professionals were rated as most important by half of the sample, dance instructors were rated second in importance by eight of the students. The printed media and schools played minor roles as sources of information about nutrition.

TABLE 8

The Ranking of the Importance of Various Sources of Nutrition Information by RWB Students

Source	Most Important 1	2	3 (n = 22)	4	Least Important 5
Health Professionals	11	3	1	5	2
Dance Instructors	3	8	4	5	2
Friends, Relatives	5	2	7	5	3
Books, Magazines, Newspapers	2	4	7	4	5
School	1	4	4	3	10

Only three of the students listed other sources of nutrition information. These were the Canada Food Guide and food labels.

Peterson (1982) had observed in her work with dancers that dancers usually obtained advice on weight control from other dancers, and that in general, there was a lack of correct nutritional information that was easily available to dancers. Although the dancers at the RWB school

acknowledged that friends and relatives played a role as a source of information, it is apparent that these dancers were more likely to turn to health professionals or dance instructors for information. In theory, the accuracy of the information obtained from these sources would be high, but the validity of this assumption cannot be verified in this case. It is encouraging that health professionals were readily utilized by many students as this indicates that the services of a staff nutritionist may be accepted quite readily.

5.5 HOW DANCERS DETERMINE GOAL WEIGHTS

The dancers tended to rely on their own perceptions and standards when determining how much they should weigh. The opinions of dance instructors provided an important secondary influence. Table 9 summarizes the frequency of responses to the statement, 'I determine how much I should weigh by consulting:'

Their comments provide some insight into the sources of their perceptions and standards which were so important in determining their goal weight. How other dancers look was an important factor. One student wrote "I look at other dancers, and how good they are, like Evelyn Hart, for example". Another wrote that she determined how much she should weigh by the way she liked to see others look on stage. Other dancers commented that how they felt about their looks and body shape affected how they determined their body weight. One student claimed to use the prominence of her hip bones as an indicator, another by simply whether she looked fat or not. One student admitted that she used the warped reflections from the studio mirrors to judge her weight, and that these reflections profoundly influenced the determination of her body weight.

TABLE 9

Frequency of Responses to Sources of Influence on Goal Body Weight Determination

Source of Influence	Frequency (n = 25)*
Height/weight charts	6
Health Professionals: doctor	5
Friends and/or dance instructors	3
Dance Instructors	11
Myself: how my clothes fit and look	22
Other: comparison to other dancers	4
the scale: a specific weight	1
degree of difficulty in achieving fifth position	1
I don't worry, I let my body regulate itself	2

*respondents chose as many sources as applied

The general responses to this statement indicate two things in particular. Firstly, the dancer's own perception of herself is very important to goal weight determination. Secondly, this goal weight almost always implies a loss of weight. How the dancer sees herself profoundly affects her decisions about her body weight. Her vision of herself is strongly affected by her own opinions as well as by those of significant others. That dance instructors were cited as an important influence to many of the dancers reinforces comments made in the focus group interviews. The opinions of the instructors influence many of the dancers, even when comments are not directed to them personally.

5.6 SESSION EVALUATIONS

All students and teachers who attended the sessions were invited to evaluate each of the sessions. On the whole, response to this program was overwhelmingly positive. The responses to each of the evaluation statements were collated separately for students and teachers. Table 10 lists the statements and the frequencies of response of the students and the teachers for each session.

The positive tone of the evaluations was certainly gratifying to this researcher. In addition, the response communicated the receptiveness on the part of the audience to this program. Both students and teachers learned new and useful information about nutrition as it related to dance. The presentation style appeared to be appropriate and the leader of the sessions was well accepted.

Perhaps this audience was less critical than it may have been had attendance been mandatory. Eight of the students involved in the study did not attend any of the sessions. Some may have avoided the sessions out of disinterest, although several students did make efforts to explain their absences. In each of these cases, the students had made commitments for dance rehearsals with other groups in the city.

TABLE 10

Student and Teacher Evaluations of Nutrition Education Sessions: Frequency of Responses

Statement	Session	Response: Agree S*	Agree T+	Undecided S	Undecided T	Disagree S	Disagree T
I learned something new about nutrition at today's session	1	10	3	2	0	0	0
	2	11	4	0	0	0	0
	3	14	3	0	0	0	0
The presentation was organized in a way that was easy to follow	1	12	2	0	0	0	1
	2	11	4	0	0	0	0
	3	14	3	0	0	0	0
The session lasted too long for one lecture	1	0	0	0	0	12	3
	2	1	0	4	0	6	3
	3	0	0	0	0	14	3
The information was presented in a way that was easy to understand	1	12	3	0	0	0	0
	2	11	4	0	0	0	0
	3	14	3	0	0	0	0
The information discussed today is useful to me as a dancer	1	12	3	0	0	0	0
	2	11	4	0	0	0	0
	3	14	3	0	0	0	0
The topics discussed today were interesting to me	1	11	3	1	0	0	0
	2	10	4	1	0	0	0
	3	14	3	0	0	0	0
The presentation used too much lecture	1	0	0	0	0	12	3
	2	0	0	1	4	10	4
	3	0	0	1	0	13	3
The presentation involved too many group and individual activities	1	0	0	1	0	11	3
	2	0	0	2	0	9	4
	3	0	0	2	1	12	2
The leader was easy to understand	1	12	3	0	0	0	0
	2	11	4	0	0	0	0
	3	14	3	0	0	0	0
The leader spoke a) loudly enough	1	12	3	0	0	0	0
	2	11	4	0	0	0	0
	3	14	3	0	0	0	0
b) at the right speed	1	11	3	1	0	0	0
	2	11	4	0	0	0	0
	3	14	3	0	0	0	0

*students: n = 12, 11, 14 for session 1, 2 and 3 respectively
+teachers: n = 3, 4, 3 for session 1, 2 and 3 respectively

5.7 NUTRITION KNOWLEDGE

Baseline nutrition knowledge scores for this group of dancers were low, 17.9 ± 4.9 points out of a possible 34 points. The scores ranged from 10 to 28 points (n = 23). Bright-See et al. (1978) found that the adolescent ballet students in their study also had low levels of nutrition knowledge. On a test which assessed basic knowledge of foods and food groups, the dancers scored 9.1 out of a possible 15 points. The nutrition knowledge test used in this study (Appendix A) assessed knowledge of more complicated aspects of nutrition as it related to dancers than simple food classification. Although the scores were generally low for this test, some of the dancers in this group appeared to have a substantial base of knowledge about food and nutrition.

In answer to hypothesis one, there was an increase in the subjects' nutrition knowledge over the experimental period. The general trend was that, for those students who attended a session, nutrition knowledge increased. However, as can be seen in Table 12,the trend for improvement did not reach statistical significance for any of the lectures ($p = 0.025$). Perhaps the trend may have reached significance had lecture attendance been greater.

TABLE 12

Frequency of Increase in Nutrition Knowledge by Session Attendence

Session	N	Attendance	Increase (frequency)	No increase (frequency)	Fisher's Exact Test (p value, 1 tailed)
1	14	Yes	6	2	0.156 n.s.
		No	2	4	
2	14	Yes	8	2	0.095 n.s.
		No	1	3	
3	14	Yes	8	2	0.311 n.s.
		No	2	2	

5.8 DIETARY QUALITY SCORES

The mean baseline dietary quality score for the entire sample for which there were complete data (n = 21) was 9.1 ± 2.18 points out of a possible 16 points. The dietary scores ranged from 3.3 to 12.8 points. No student achieved a rating of 16 points for any day of the three day recording period. The low scores indicate that the students were either neglecting to select foods from all of the four food groups, or were consuming too few servings to meet the basic Canada Food Guide recommendations.

Dietary scores were significantly and positively correlated with energy intake ($r = 0.53$, $p = 0.0133$) indicating that a linear relationship between the amount of food eaten (in terms of kcal) and the quality of the diet existed. Thus, at least to some extent, it can be said that dietary quality was related to the amount of food eaten. Macdonald et al. (1983) also observed this relationship between dietary quality and

energy consumption. The adolescent girls with high quality diets consumed almost twice as many kilocalories than did the girls with poor quality diets.

In general, the low dietary scores indicate that not enough nutritious food was being consumed by the dancers during the recording period. From scanning the dietary records, it was apparent for most of the students, that in some cases, simply too little food was being consumed, and in others, the low scores were a result of poor food selection. There did not seem to be a pattern of food choices, although for many of the students there appeared to be a trade-off between the meat, fish, poultry and alternate (MFPA) group and the fruits and vegetable group. That is, on the days when adequate amounts of foods from MFPA were consumed, few servings of fruits and vegetables were selected, and vice versa.

The mean post-intervention dietary score showed a negligible increase of 0.47 points over the mean baseline dietary score. This difference was not found to be statistically significant ($t = 1.03$, $p = 0.3253$). Thus, the quality of the diets of the dancers did not improve over the experimental period. Although this finding was disappointing, it was not surprising. Eating patterns are affected by many factors and are as entrenched as any habit could be (Gillespie, 1981). Availability of food, busy schedules, prospective stage performance, and evaluation interviews each likely influenced the food choices of the students, as well as the amounts consumed. The students would consider weight gain disastrous at this time of the year since stage performance was only several weeks away, and weight was often a topic during the evaluation

interviews. The factors described above, combined with the fear of gaining weight at such a crucial time likely contributed to the lack of demonstrable change in eating habits, and therefore in dietary score.

5.9 NUTRIENT INTAKES

Methods for calculation and evaluation of intakes were discussed in Section 4.6.

5.9.1 Energy

The mean energy intake for the 13-15 year old group was 1529 ± 513 kcal per day. Intakes ranged from 820 kcal to 2469 kcal. For the 16-18 year old group, the mean intake was 1510 ± 598 kcal per day, with a range of 842 kcal to 2756 kcal.

The reported mean energy intakes are slightly less than those reported by Bright-See et al. (1978) for similar age groupings. These intakes were 1867 ± 107 kcal (± SEM) and 1747 ± 161 kcal for the younger and older groups respectively.

These means are also less than the mean energy intake of 1890 kcal for the group of 92 dancers between the ages of 12 and 17 years studied by Benson and coworkers (1985). Thirteen dancers (65%) in the present study reported energy intakes below 1500 kcal per day, compared to 28.9% in the research of Benson et al. (1985). Six (30%) reported intakes less than 1200 kcal per day as compared to 10.8% in Benson et al. (1985), a rate considered alarming by those authors.

The extent to which individual intakes met recommended intakes calculated for body weight and age (Health and Welfare Canada, 1983) is diagrammed in Figure 3. The proportion categories used for comparison in this figure are similar to those used in the analysis for adequacy of intakes of protein and calcium (see Section 4.6). Figure 3 illustrates that most of the dancers had reported intakes which fell below the recommended energy intakes calculated for age group and body weight (Health and Welfare Canada, 1983). It is difficult to assess the appropriateness of these recommendations for young dancers. These adolescents are moderately active, but are expected to be unusually lean. Each of these factors play a role in energy requirement. As long as the students continue to grow and develop, it is incorrect to say that they are deficient in energy intake. The energy intakes which would promote optimal growth may not be realistic for dancers as these intakes may also cause an increase in body fatness which is considered innappropriate for these adolescent females if a future career in dance is to be considered. Instead, other standards for energy intake for student dancers have been proposed.

Benson et al. (1985) recommend for adolescent dancers an energy intake of 30 kcal per pound of ideal dance weight during the growth spurt, and 15 kcal per pound of ideal dance weight thereafter. Ideal dance weight is to be calculated in the following manner, 87-90 pounds for the first five feet of height and 4 pounds for each inch thereafter (Benson et al., 1985). The recommended energy intakes were calculated for the older group of dancers but not the younger group because the researcher had no way of ascertaining if the younger students were

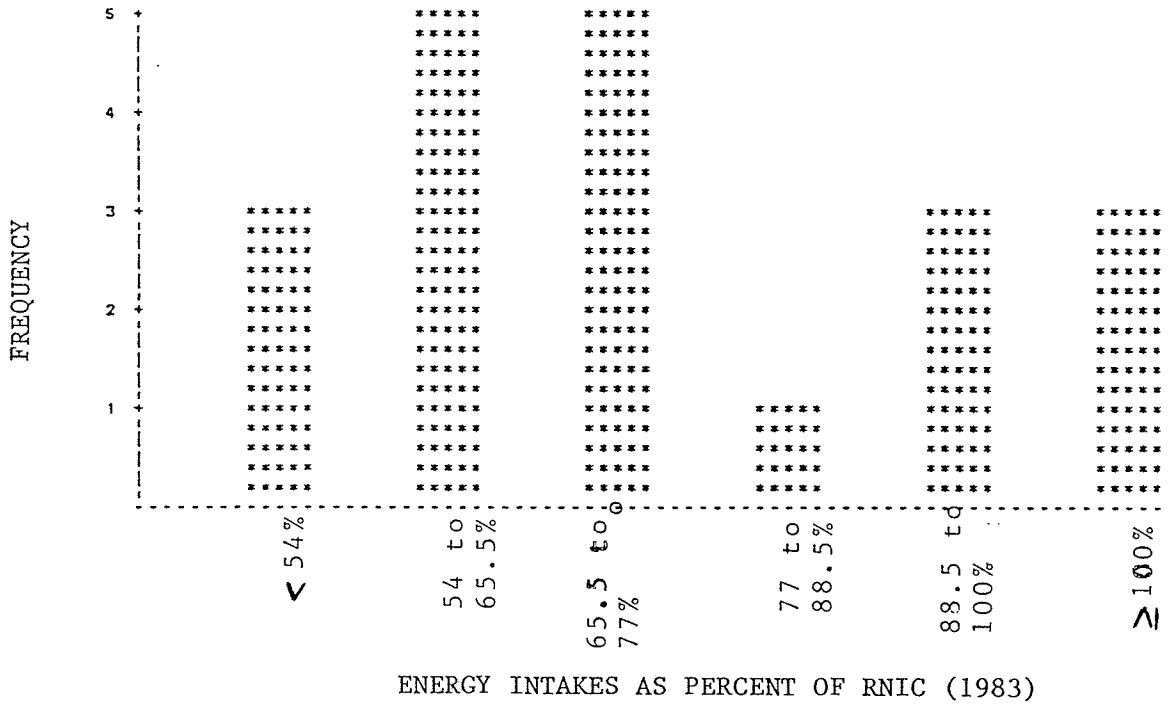


Figure 3: Frequency Bar Chart of Reported Energy Intakes as a Proportion of Recommended Intakes based on Body Weight and Age

experiencing a growth spurt due to unfamiliarity with the students at the time of data collection. The calculations were completed for the older group and are presented in Table 13.

The energy intakes for the students who were 16 and 17 years of age often did not meet the recommendations of Benson et al. (1985). Thus, there is no doubt that the reported energy intakes were very low. However, energy needs are subject not only to variation between individuals but also variation within an individual, and thus any recommendation for energy intake is at best an estimate from which to begin, and must be adapted for the individual. These low reported intakes of energy are of concern since many of these adolescent dancers are at apparent risk for any of the physiological sequelae related to low energy intakes described in Section 2.5 of this paper.

It is also prudent to consider that although every precaution possible was taken to ensure that the food records reflected accurately the eating patterns of each student by including a weekend day in the recording period and through the method of collection (see Section 4.5.1), there may have been a strong compulsion for those who wished to present themselves and their eating habits in a postive light to eat differently than usual during the recording period, or to under or over-report consumption. This possibility seems especially likely in this situation where eating and body weight are particularly sensitive topics, and where the student could reveal only what she wanted to reveal. An attempt to overcome this possibility was made by ensuring confidentiality of the information, but there is no means to ascertain the success of this attempt. This is not to say that the students may

have been dishonest. Rather, because much of the overeating that was reported in the EPQ (Section 5.12) was not apparent in the diet records, there was some omission of information that may have made these records less than representative of the general eating habits of the students. Therefore, the overall energy and nutrient intakes may be quite different from those reported here.

TABLE 13

Comparison of Energy Intakes of RWB Students 16 - 17 Years of Age to Intakes Recommended for Dance Students*

Subject	Height (inches)	Reported Weight (pounds)	Ideal Dance Weight^ (pounds)	Energy Intake as Percentage of Recommended Intake (%)
3	66.0	100	112.5	88.6
4	68.0	118	120.5	90.3
6	64.75	110	107.5	56.9
7	65.5	120	106.5	87.4
9	59.0	88	84.5	67.9
12	68.0	114	120.5	82.7
13	64.0	96	104.5	175.8
14	65.5	97.5	110.5	50.8
16	64.0	110	104.5	151.1
18	63.0	98	100.5	74.9
20	66.0	120	112.5	115.8
21	66.0	123	112.5	75.5

^88.5 lb per 60 inches plus 4 lb per additional inch of height.
*Benson et al., 1985

5.9.1.1 Proportionate Contribution of Energy Nutrients to Total Energy Intake

The contributions of the three energy nutrients to total energy intakes were calculated for each of the dancers. The group mean, stan-

dard deviation and range of values for protein, carbohydrate and fat, as a proportion of total energy intakes are presented for both pre and post-intervention nutrient intake data in Table 14.

TABLE 14

Contribution of Protein, Fat and Carbohydrate to Total Energy Intakes

	Nutrient	N	Mean	SD (percent)	Range
Pre-Intervention	Protein	20	15.9	4.5	8.5 - 22.9
	Carbohydrate	20	57.1	9.9	33.1 - 69.9
	Fat	20	29.2	7.0	20.7 - 47.5
Post-Intervention	Protein	15	16.2	2.1	11.9 - 20.0
	Carbohydrate	15	52.5	7.1	37.7 - 61.9
	Fat	15	33.4	7.2	21.8 - 47.7

Benson et al. (1985) found that 15.6%, 34.6% and 49.8% of energy came from protein, fat and carbohydrate respectively for their group of adolescent dancers. They, too, observed a wide range of values among the individual dancers for these dietary components.

The mean proportions of the energy nutrients for the present group of dancers were quite satisfactory, according to the guidelines for nutrition and physical fitness from the American Dietetic Association (Anon., 1980). It is recommended that fat intake remain between 30 to 35% of energy. Carbohydrate should provide most of the energy at approximately 50% of energy intakes. Protein intake should range from 15 to 20% of intakes for low-calorie diets in order to compensate for some use of

protein as energy so that enough protein remains available for growth and tissue maintenance.

As is indicated by the wide ranges which exist for these values (Table 14), not all of the students satisfied these recommendations. However, all but one student (within the pretest collection period) demonstrated the desirable pattern of obtaining the majority of energy from carbohydrate. Seventy percent of the students consumed at least 50% of the energy intakes as carbohydrate. Of the remaining students, two thirds consumed between 45 and 50% of energy as carbohydrate.

The percentage of energy consumed as fat by the individual students often fell below the recommendation of 30 - 35% of energy. Fifty-five percent of the students had intakes which were below 30% of energy intakes. Twenty-five percent of the students had intakes within the recommended range and 20% had intakes which exceeded the recommendations. Benson et al. (1985) observed that 25% of the adolescent dancers in their investigation had intakes of fat which contributed greater than 40% of the energy. In this present study, only one student (5% of sample) consumed more than 40% of energy as fat. It is neither alarming, nor of concern that many of the dancers did not meet the recommendation for fat since there is no risk to health as a result of low fat intakes unless the requirement for essential fatty acids is not met. Essential fatty acids must make up 1-2% of daily energy intake (Health and Welfare, 1983). For these students the apparent awareness of fat as indicated by the low intakes is likely related to weight control concerns.

The protein intakes as a proportion of energy intake fell within the recommended range of 15-20% for 40% of the dance students. Forty percent of the students had protein intakes which fell below 15% of energy, however only two (10% of sample) had intakes of less than 10% of energy. Twenty percent of the students had intakes which exceeded 20% of total energy. Of those seven students whose energy intakes were below 1200 kcal, two had intakes of protein which contributed less than 15% of energy. For these two students, this finding may be of concern because a significant proportion of the protein intake may be used for energy rather than for tissue maintenance or growth, a trade-off which is undesirable in the pursuit of longterm health.

5.9.2 Protein

Intakes of protein were more than adequate for 17 of the 20 dancers for which there were complete data. As can be seen in Table 15, two students had intakes which fell between 77 and 88.5% of the recommendation based on body weight and age, and the intake for one student was between 54 and 65.5% of the recommendation. The portion of this population calculated to be at risk for inadequate intakes of protein was low at 7.8% using the method of Anderson et al. (1982).

Bright-See et al. (1978) also observed that intakes of protein exceeded the recommendations for most students. Benson et al. (1985) found that all students had intakes of protein which exceeded the USRDA. Thus, protein appears to be one nutrient that most dancers manage to consume in adequate amounts.

TABLE 15

Intakes of Protein of RWB Students in Relation to Recommended Intakes*

Subject	Protein Intake (mg)	Recommended Intake (mg, based on age and body weight)	Intake as Percentage of Recommendation
2	39.0	48.1	81.2
3	70.1	36.5	192.3
4	85.6	43.0	199.0
5	55.3	45.3	122.2
6	40.5	40.1	101.0
7	44.0	43.7	100.6
8	59.4	45.3	131.3
9	18.3	32.1	57.1
10	46.7	36.8	126.7
11	63.5	35.6	178.1
12	59.5	41.5	143.2
13	87.1	35.0	248.9
14	29.0	35.5	81.6
16	102.9	40.1	256.6
17	54.3	38.4	141.2
18	51.9	43.7	145.3
20	65.8	44.8	150.4
21	72.8	41.3	162.4
23	55.5	39.3	134.5
28	53.0	40.1	132.3

* Health and Welfare, 1983, pp 40-41

5.9.3 Calcium

Most of the dancers had intakes of calcium which exceeded the recommendations for the appropriate age group. Sixteen of the 21 students had intakes greater than recommended. Three students had less than two thirds of the recommendation and two had intakes between 77 and 88.5% of the recommended intakes. Using the method of Anderson et al. (1982), the percent of this total population calculated to be at risk is 16.9%. Table 16 illustrates the use of this method for analysis of the dietary adequacy of calcium for the RWB student dancers.

TABLE 16

Frequency of Calcium Intakes and Associated Probabilities for Dietary Deficiency for RWB Students*

Calcium Intake (% of RNIC)	Observed Number	Probability of Deficiency	Predicted Number of Deficient Subjects
< 54%	2	1.00	2
54 ≤ R < 65.5%	1	0.93	0.93
65.5 ≤ R < 77%	0	0.69	0
77 ≤ R < 88.5%	2	0.31	0.62
88.5 ≤ R < 100%	0	0.07	0
> 100%	16	0	0
Total	21		3.55 (16.9%)

*method of Anderson et al., 1982

Of the five dancers whose intakes fell below the recommended levels, two reported use of calcium supplements. Both of these students had reported intakes which were less than two thirds of the recommended intakes. In each case, the calcium content of the supplement exceeded the daily recommendation for calcium for these students. The rate of dietary deficiency of calcium was calculated to be 7.7% when intakes of calcium through supplementation were included in the analysis.

The mean intake of calcium for the younger group in this study was 907.6 ± 280.3 mg, and for the older group, 1036.6 ± 453.6 mg. The recommended intakes are 800 and 700 mg respectively for the younger and older groups (Health and Welfare Canada, 1983). The mean calcium intake observed by Benson et al. (1985) was 932.8 ± 458.6 mg which is only slightly lower than those observed for the present sample, yet over 40% of those students were considered to be at risk for dietary deficiency

of calcium. There are two reasons for this apparent discrepency. The method of Anderson et al. (1982) for estimation of adequacy of nutrient intakes attempts to take into account the variable individual requirement providing a more realistic representation of nutrient intake adequacy of groups. Secondly, the USRDA for calcium intake for adolescent girls is 400 mg higher than that recommended for Canadian adolescent girls. Thus, with a higher standard it is to be expected that fewer individuals would be able to meet it.

Bright-See et al. (1978) observed that calcium intakes were less than adequate for approximately 35% of the female students and inadequate for approximately 20% of the female students (see Figure 1, Section 2.3). The standard for adequacy in this case was 700 mg. That is, those students whose intakes fell below this figure were considered to be at risk for dietary deficiency of calcium. This figure is very similar to those used for analysis of data for the present study. From this perspective, it is apparent that more dancers in this study had adequate intakes of calcium than did the dancers studied by Bright- See and coworkers (1978).

It is interesting to speculate on the reasons for this observation. Calcium has certainly become a high profile nutrient in recent history. The milk industry and supplement producers have invested a great deal of money to increase the awareness of this nutrient and its importance to health. It is quite probable that this influence has reached the dance world making many dancers more aware of the importance of this nutrient to their current and future health, and more aware of sources of this nutrient. The correlation between calcium and protein intakes was high

($r = 0.75$, $p = 0.0001$) indicating that milk and milk products were significant dietary sources of both of these nutrients and that these products were important constituents of many of the dancers' diets.

5.9.4 Iron

Iron intakes ranged from 4.0 to 17.5 mg. The mean intake of iron for the younger group of dancers was 9.9 ± 3.1 mg , and for the older group, 10.4 ± 3.8 mg. The mean daily intake per 1000 kcal was 6.8 ± 2.1 mg and 7.0 ± 1.6 mg for the younger and older groups respectively. Four students reported use of supplements which contained iron.

The predicted prevalence of dietary deficiency of iron for the entire group of RWB students was calculated to be 23.1% using the method of Beaton (1972). Table 17 illustrates the method used to calculate this figure of predicted prevalence of dietary deficiency of iron.

The use of this method in this particular case may have been inappropriate. This method requires the satisfaction of a number of assumptions (see Section 4.6). The females must be menstruating normally and have a recommended iron intake of 14 mg. In addition, the absorption rate of iron in the gut is assumed to be 20%. The extent to which these assumptions were met for this group of dancers is not possible to ascertain. No assessment of menstrual history was made. From other reports about adolescent dancers and their menstrual histories, it is evident that a significant number of these young dancers experience menarche later than most adolescents and many are amenorrheic (see Section 2.5.4). Thus, it is possible that many of the dancers included in this

TABLE 17

Frequency of Iron Intakes and Associated Probabilities for Dietary Deficiency for RWB Students*

Iron Intake (mg)	Observed Number	Probability of Deficiency	Predicted Number of Deficient Subjects
< 4.0	0	1.00	0
4.0 - 4.9	1	0.92	0.92
5.0 - 5.9	2	0.75	1.50
6.0 - 6.9	0	0.50	0
7.0 - 7.9	3	0.32	0.96
8.0 - 8.9	1	0.23	0.23
9.0 - 9.9	4	0.16	0.64
10.0 -10.9	1	0.12	0.12
11.0 -11.9	3	0.08	0.24
12.0 -12.9	2	0.06	0.12
13.0 -13.9	0	0.05	0
14.0 -14.9	2	0.04	0.08
15.0 -15.9	1	0.03	0.03
16.0 -16.9	1	0.01	0.01
	21		4.85 (23.1 %)

*method of Beaton (1972)

analysis were not menstruating, thereby decreasing the requirement for iron for these students.

The recommended intake of iron for adolescent girls is 13 mg for 13-15 year olds and 14 mg for 16- 18 year olds (Health and Welfare Canada, 1983). These figures are either very close or the same as the recommendation used for Beaton's (1972) method of analysis. Therefore this would contribute little additional error.

The final assumption relates to the absorption rate of iron. It is unlikely that the absorption rate was as high as 20% for the most part.

Few of the meals that were consumed included meat, a number of the students drank tea and coffee with their meals, and sources of vitamin C in the form of fruit were often consumed as snacks rather than with meals. Each of these factors indicates that a much lower absorption rate was more likely the case for these students (Monsen et al., 1978). Higher intakes of iron are necessary to compensate for decreased absorption.

One further assumption that Beaton (1972) makes is that basal losses through feces, urine and skin are constant at 0.8 mg per day, and do not vary among individuals . In reality, these losses are not constant. Increased iron loss through skin in perspiration is a potential source of iron loss that is likely to occur in these physically active adolescents. However, Brune et al. (1986) have shown that these losses are generally quite small among athletes. Thus these losses would not likely increase dietary iron needs significantly.

In summary, it is possible that the potential increase in dietary iron needs in response to decreased absorption rate, and increased losses in perspiration would be offset by the decreased losses in the absence of menstruation. There is no available means of verification of this hypothesis and therefore, it has been assumed that this method of analysis is as useful as any other available method.

The prevalence of dietary deficiency of iron for the group of female students at the RWB was calculated to be 23.1%. Bright-See et al. (1978) reported a rate of risk for dietary deficiency that was much higher for the 53 female students involved in their investigation. Approximately 10% of the students had dietary intakes of iron which were considered to

be adequate (> 15 mg per day) using the Nutrition Canada Standards (Health and Welfare Canada, 1973; see Figure 1). Almost half of the students had intakes of iron judged as less than adequate (10-15 mg per day), and approximately 40% had inadequate intakes (< 10 mg per day). Benson et al. (1985) found the mean dietary intake of iron to be 13.4 ± 7.6 mg per day, and that 48.9% of their sample of 92 female adolescent dancers had intakes which fell below 2/3 USRDA (< 12 mg per day).

The observation that the rate of dietary deficiency of iron for the RWB students was less than those observed by Bright-See et al. (1978) and Benson et al. (1985) does not necessarily mean that the students in the present study were more adequately nourished for iron. The standards for adequacy vary among the studies. The standards used for the studies of Bright-See et al. (1978) and Benson et al. (1985) were higher and did not use a probability approach which would take into account varying individual requirements for iron. In addition, it is prudent to note that the observations of dietary deficiencies of nutrients are merely indicators for potential clinical deficiencies, and thus a true deficiency state cannot be inferred.

However, it is evident from the incidence of dietary deficiency calculated for this group of adolescents that it was apparently correct to direct attention within the education program to the roles in health and physical activity that this nutrient plays, as well as its food sources and the combinations of foods which enhance the absorption of iron in the intestine.

5.10 PLACE OF RESIDENCE

Fifteen of the 23 students initially involved in this project lived in the supervised student residence at the YWCA in Winnipeg. The remaining eight students lived in private homes. Of the fifteen students who lived at the residence, five were between 13 and 15 years of age, and ten were between 16 and 18 years of age. Of those who resided in private homes, five were between 13 and 15 years of age and three were between 16 and 18 years of age.

No significant effect of place of residence on dietary score, or nutrient intake was observed. The mean dietary quality score for the 14 students who lived in the supervised residence was 9.2 ± 2.0 points. The mean dietary quality score for the remaining seven dancers was 8.8 ± 2.7 points. These means were not found to be significantly different ($t = -0.3748$, $p = 0.7120$). In addition, no significant effect of place of residence was evident for intakes of protein, calcium, iron or energy when analyzed individually, nor was an effect observed for overall nutrient intake (Wilks' Criterion = 0.82, $p = 0.50$).

5.11 AGE GROUP

As can be seen in Table 18, neither nutrition knowledge scores nor dietary scores differed significantly by age group. However, the EPQ score was significantly lower for the younger group than for the older age group.

TABLE 18

Characteristics by Age Group of RWB Student Sample

Characteristic	Group One Mean (SD)	N	Group Two Mean (SD)	N	t Statistic	p Value
Age	14.0 (.81)	10	16.6 (.51)	13		
Nutrition Knowledge Score	17.6 (4.5)	10	18.1 (5.4)	13	-0.2263	0.823
EPQ Score	93.1 (20.2)	10	125.7 (28.6)	13	-3.06	0.006*
Dietary Score	9.0 (1.1)	9	9.2 (2.8)	12	-0.2651	0.794

*statistically significant, $p < 0.05$

5.12 EATING PRACTICES

The mean score for the eating patterns questionnaire (EPQ, Appendix A) was 111.8 ± 29.2 points. The range of scores fell between 57.0 and 179.0 points. The minimum possible score for this questionnaire is 44 points, however scores below 100 points[1] can be considered indicative of eating patterns which are non-compulsive and generally unrelated to emotional cues. As the score increases, there is increasing indication that the individual's eating behaviour is governed to a greater degree by compulsive, maladaptive eating patterns which include overeating or bingeing in response to emotional cues or state of mind, excessive preoccupation with, and negative feelings about, one's eating patterns.

[1] Scores below 100 points on the pretest indicated overall eating behaviour which did not include frequent bingeing, purging, and self-conscious feelings about eating patterns.

In general, the higher the score, the more that the eating patterns govern the life of the individual and the more she feels trapped by these behaviours. Thirteen of the 23 students who completed this questionnaire had scores above 100 points.

A relationship between age and EPQ score was indicated in Table 18, Section 5.11. The younger students had significantly lower scores for the EPQ than did the students 16 and 17 years of age. Of the thirteen students who scored 100 points or more, only two were between the ages of 13 and 15 years. Thus, it is apparent that the younger students had eating patterns which were less affected by emotional cues, less likely to include periodic overeating and less likely to be considered problematic by the students themselves.

The behaviour statements related to food bingeing and purging in the EPQ are presented in Table 19. Within this table also are the frequency of responses to the five levels of frequency of these behaviours. Bingeing was reported by many of the dancers, with most of these dancers practising this type of behaviour only some of the time. Purging was much less commonly reported. Vomiting following binges was reported by three students. Use of laxatives as weight control aids was reported by four students, diuretics by two students.

It was interesting to observe that the dancers who reported use of laxatives and/or diuretics also reported that they felt in control of their eating behaviours.

Both students who admitted to vomiting following overeating are no longer with the school. One student answered yes to one statement but not to the other. This was one of the youngest students, and it is the

opinion of this researcher that it is quite possible that she misunderstood the statement to mean involuntary vomiting rather than an induced voluntary response.

TABLE 19

Frequency of Response to Eating Behaviour Statements Related to Bingeing and Purging

Statement	Frequency of Performance of Behaviour (n = 23)				
	Always	Often	Sometimes	Seldom	Never
I eat everything in sight	0	3	8	6	6
I go on eating binges	2	0	9	7	5
I go on eating sprees during which I feel I have little control	2	5	4	8	4
I eat to the point of stuffing myself	0	3	8	10	2
I vomit after I stuff myself	1	0	1	1	20
I cause myself to vomit after overeating	1	0	1	0	21
I take laxatives after overeating	0	0	1	3	19
I take diuretics (water pills) after overeating	0	0	1	2	21

"How do you define an eating binge?" was asked by one of the respondents on the questionnaire. This question aptly illustrates the subjectivity involved in defining a binge to oneself or another. It is the opinion of this researcher that the energy content of the binge is a

much less important criterion than the feeling that one has lost control over one's eating. It may have been the perception of loss of control that defined 'binge' to these young dancers rather than excessive intakes of kilocalories at one sitting. It is possible that because these girls eat very little as a rule, that a normal sized meal could be considered overeating or as a binge or an indulgence.

5.13 PERSONALITY TRAIT PROFILES

The group of students (n = 21) scored within the norms for females for all traits. The mean scores for exhibitionism, play and defendence were at the upper range of the norms (close to 60% of standard score), but the 95% confidence interval for these means did not exclude these norms, therefore this group of dancers was not found to be statistically different from other females. The means for the group of dancers as compared to the standards for these traits in females are presented in Figure 4.

There were several significant Pearson product-moment correlation coefficients observed for specific personality traits and other variable scores. The change in nutrition knowledge score over the experimental period was significantly correlated with the trait 'order', $r = -0.83$, ($p = 0.0008$, $n = 12$). As nutrition knowledge score change increased, the score for order decreased. The R^2 is 0.69, indicating that 69% of the variance in nutrition knowledge score change was explained by variance in the order score. That is, one who prefers orderliness, neatness, and everything in its place was less likely to demonstrate an increase in nutrition knowledge score over the program period of three weeks.

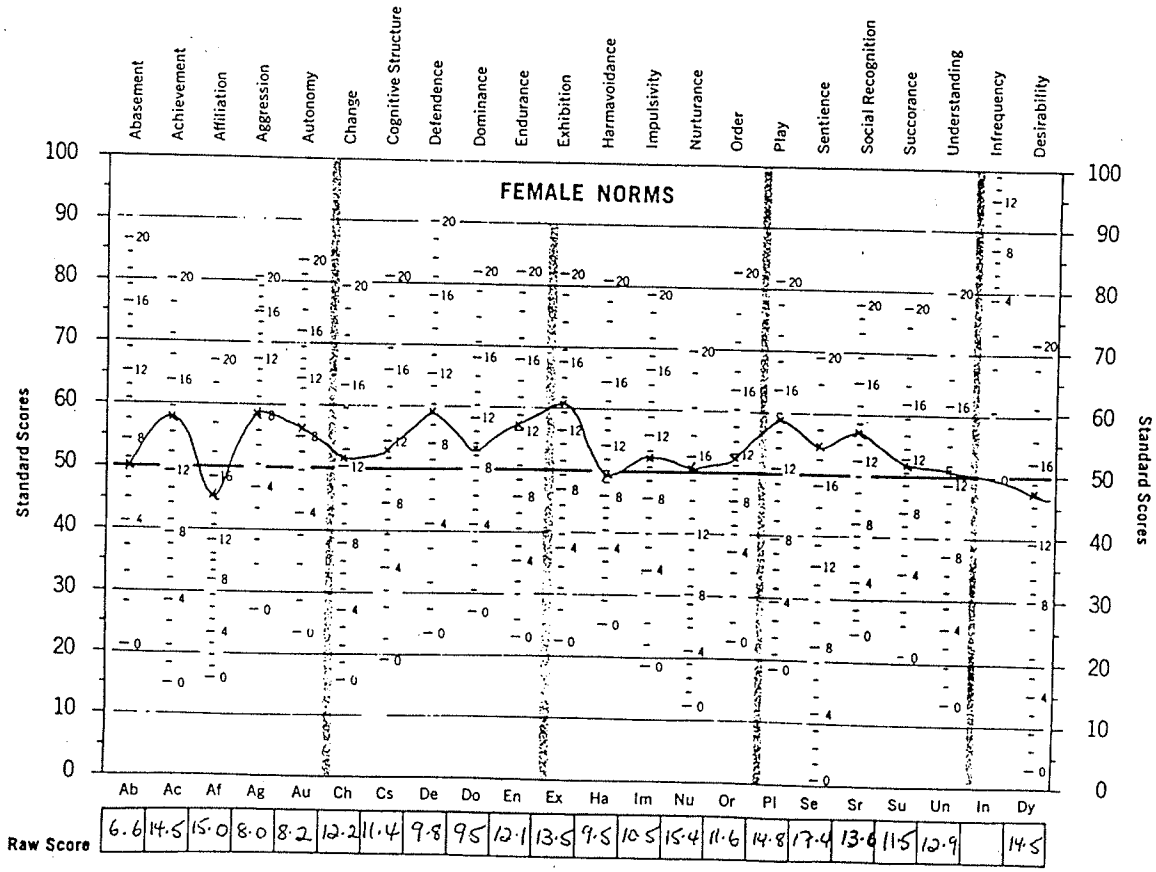
PERSONALITY RESEARCH FORM-AA/BB

PROFILE SHEET: FEMALE

Name GROUP MEANS N = 21 Age 13-17 years Form Administered AA

Date Tested MAY 1986 Other Information BALLET STUDENTS: RWB

NOTES



Profile Sheet for the Personality Research Form, by Douglas N. Jackson, Ph.D. Copyright © 1967 by Research Psychologists Press Inc., P.O. Box 984, Port Huron, MI 48060. All rights reserved. Printed in U.S.A.

Figure 4: Mean Scores of RWB Student Sample for Traits Measured by Jackson Personality Research Form

Perhaps the dancers who prefer this orderliness were less inclined to change their views on nutrition, and were less likely to retain new information which would threaten this orderliness.

Change in dietary score over the experimental period was correlated with the traits 'harmavoidance' and 'nurturance'. The coefficient for harmavoidance and change in dietary score was 0.75 ($p = 0.008$, $n = 11$), and for nurturance and change in dietary score was -0.75 ($p = 0.007$, $n = 11$). In each case, the R^2 was 0.56 indicating that 56% of the variance in change in dietary score can be explained by variation in either the harmavoidance scores or nurturance scores. An improved dietary score was associated with the trait of avoiding risk of bodily harm, and seeking to maximize safety, and with an unlikeliness to give sympathy and comfort, or assist others when possible. Perhaps it was the dancers who had strong motivation for self-preservation and less concern about others who were more likely to see to their own nutritional needs.

The scores on the eating patterns questionnaire were significantly correlated with four traits: affiliation ($r = -0.53$, $p = 0.0126$, $n = 21$), dominance ($r = -0.69$, $p = 0.0005$, $n = 21$), play ($r = -0.53$, $p = 0.0144$, $n = 21$), and desirability ($r = -0.44$, $p = 0.0457$, $n = 21$). As scores on the EPQ increased, scores for affiliation, dominance, play and desirability decreased. All correlations are significant statistically indicating that a linear relationship exists. However, the predictive or 'explaining power' of these correlations were quite low, except that for dominance ($R^2 = 0.48$). In addition, it is noted that these coefficients are not additive in their explaining power. A higher score on the eating patterns questionnaire was associated with one or more of the following personality trait descriptions:

1. one who is less likely to enjoy being with people, or accept people readily.
2. one who is less likely to influence or direct other people, or be a leader.
3. one who is less likely to do things just for fun.
4. one who is less likely to answer questions in a manner considered to be socially desirable.

It appears that it was the dancers who were more socially isolated and 'kept to themselves' who tended to have maladaptive eating patterns.

5.14 BODY SIZE DISSATISFACTION

Many of the dancers were dissatisfied with the size of their bodies. Over half of the dancers labelled themselves as moderately or very overweight. Only seven (n = 23) of the dancers chose the same somatotype diagram when asked to choose which diagram most accurately depicted current body size and which most resembled the body size she would like to be. Most of the dancers selected somatotype diagrams which depicted body sizes between 10 and 20% smaller than themselves as ideal.

Bright-See et al. (1978) observed that approximately half of the 63 ballet students involved in their investigation considered themselves to be overweight, yet all but one of the female students had weights for age below the 50th percentile (of standards used by Hopsital for Sick Children, Toronto) and many of these students had weights which fell below the 25th percentile. Thus, it is apparent that although these students were very lean, they were not of the opinion that they were lean enough to succeed in professional dance.

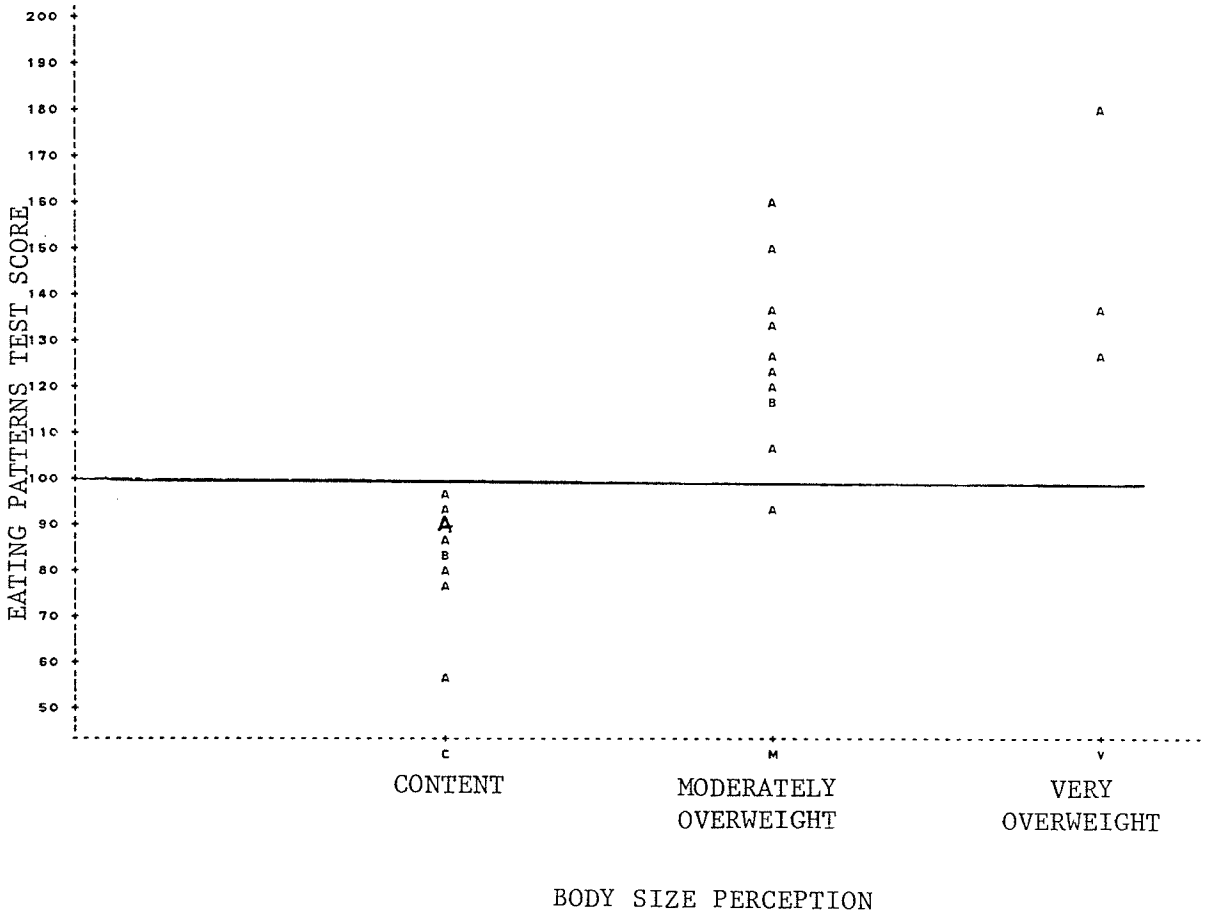
This desire for leanness is not confined to dance students. Storz and Greene (1983) observed that 83% of 203 adolescent girls desired to be smaller, with 56% of these girls desiring to be at least 10% smaller. Searles et al. (1986) found that body image satisfaction scores were negatively correlated with weight for height and weight for height and age for 138 female adolescents aged 14 to 16 years. No relationship was observed for height for age implying that it is inadequate leanness rather than 'bigness' that fuels this dissatisfaction.

Macdonald et al. (1983) also reported a disparity between the body shape which the adolescent female (n = 100) preferred to be and that which she considered herself to be at the time of the investigation. This trend was observed for adolescents in the high dietary quality group as well as the low dietary quality group (n= 50 in each group; see Section 2.6.2). The ideal body shape selections were similar for both groups, with a clear majority in each group choosing an ectomorphic figure as ideal (similar to selection 2, EPQ question 46 in Appendix A). However, the groups differed significantly (Chi Square = 18.54, $p < 0.001$) for current body shape selection, with the poor quality diet group selecting more of the larger body size choices. It was this observation which led the researcher to consider the relationship between perceived overweight (disparity between current and preferred body size) and eating patterns. It was apparent in the study by Macdonald et al. (1983) that those girls with the largest disparity between current and ideal body size had the poorest quality diets, skipped meals and otherwise restricted food intake more frequently.

A statistically significant correlationship was found for the variable 'perceived overweight' (as measured by somatotype diagrams) and scores on the EPQ. The correlation coefficient was 0.74 ($p = 0.0001$). The R^2 was 0.55, indicating that 55% of the variation in EPQ score can be explained by variation in perceived overweight score, or vice versa.

Body dissatisfaction was also assessed by verbal statement selection. Each dancer was asked to state whether she felt content with her body (neither under nor overweight), moderately overweight or very overweight. Figure 5 shows these assessments plotted against the EPQ score. The plot demonstrates again the strong relationship between body dissatisfaction and EPQ scores. No student who felt content with her body reported a high incidence of maladadaptive eating patterns, and only one who felt that she was overweight reported moderate eating patterns.

Thus, for this group of 23 female adolescent dance students, it was apparent that body size dissatisfaction was related to self-reported eating patterns (EPQ score), and that the correlationship between these variables indicated a positive and strongly linear trend which may be interpreted as follows: as perceived body size dissatisfaction increased, so did the EPQ score. That is, the more dissatisfation in body size that a student perceived, the more likely she was to have eating patterns unduly affected by emotional cues, and the more likely she was to report periodic overeating, and general preoccupation with her eating patterns.



KEY

A = one observation

B = two observations

Figure 5: Body Weight Perception as Compared to Eating Patterns Questionnaire Scores

In order to investigate and possibly explain the observation that the younger students had signifcantly lower EPQ scores (Table 18, Sections 5.11 and 5.12), a t test was performed to test for age-related differences in perceived overweight. The scores for perceived overweight were found to be significantly lower for the younger group of dancers ($t = -2.1719$, $p = 0.0421$). Thus, it seems that the younger students were more likely to perceive a smaller discrepency between ideal and current body size, and that this decreased dissatisfaction was reflected by the overall lower EPQ scores.

It is useful as an educator to speculate upon the reasons for this age-related difference in body dissatisfaction, and in eating practices. It is possible that since most of the younger students would still be in the more rapid growth phases of puberty, many of these students would be able to eat for the most part, according to appetite, and in the process consume quantities of food which would feel satisfying but which would not promote large deposits of fat. In addition, while weight consciousness would likely be high for many of these young student dancers, most of these girls would not have yet experienced the body shaping effects of the female hormones, and thus were less likely to feel dissatisfied with their bodies. Another possible factor is that the teaching staff at the RWB school do not emphasize body weight as an important facet of dance, or make direct references to students concerning weight until students enter levels 5 or 6 (ages 15-17 years). Thus, most of the younger students would not have yet experienced extreme pressure from potentially important outside influences concerning their body size.

The older students, on the other hand, would have developed adult body forms for the most part, which for many of the girls would be perceived as being too curvy to succeed as a ballerina, and therefore would be more likely to be in the process of experimenting with various eating patterns to reduce body weight. These experimentations may include restrictive diets which often lead to an increased preoccupation with food, and longterm deprivation of food may lead to compensation for that deprivation among even the most disciplined of young women. This compensation in the form of overeating or bingeing would be perceived as a loss of control which she must balance with further food deprivation. Kirkley (1986) describes this pattern as one pathway toward the development of bulimia. But it need not develop into a clinical eating disorder for it to be harmful. This excessive preoccupation with food and body size depletes mental energy which could be used more profitably elsewhere. For ballet students, this preoccupation often diverts attention from the more important aspects of dance - the acquisition and correct execution of the ballet syllabus. In addition, unstable eating patterns interfere with the ability to concentrate, deplete nutrient stores, and create more internal unhappiness for the student which may serve to perpetuate these problems related to eating and self-image.

Chapter VI

SUMMARY AND CONCLUSIONS

6.1 SUMMARY

The selection of discussion topics for the education program proved to be appropriate, from the perspective of the target group as indicated by the highly favourable responses obtained from the written evaluations, and from the perspective of the educator since reported intakes of energy, iron and calcium for the group were in need of improvement.

Sixty-five percent of the RWB students reported energy intakes below 1500 kcal per day. Most of the reported intakes of energy fell below recommendations for adolescent ballet dancers, and all but three had intakes which fell below the Canadian recommendations for energy for adolescent girls. The rate of dietary deficiency calculated for iron for this group of girls was 23.1%. The predicted prevalence of dietary deficiency of calcium was lower, at 16.9% without dietary supplements, and 7.7% when supplements were considered in the analysis.

The selection of body image satisfaction as a potentially influential factor affecting eating patterns as a topic for discussion in the program also proved to be appropriate, since a strong, linear ($r = 0.74$) correlationship was observed between body image dissatisfaction and eating practices questionnaire scores.

There was some evidence that nutrition knowledge increased over the program period, however the trend failed to reach statistical significance. No change in dietary quality scores was evident over the study period. Nor was an effect of residence observed for dietary quality score or for nutrient intakes.

The group of RWB students scored within the norms for all personality traits measured by the Jackson Personality Research Form. Change in nutrition knowledge over the experimental period was positively correlated with the trait 'order'. Change in dietary quality score was positively correlated with the trait 'harmavoidance' and negatively correlated with 'nurturance'.

The responses to an eating practices questionnaire showed that over half (56.5%) of the RWB student sample was found to have excessive concern with eating or unstable eating patterns. Most (84.6%) of these students were between 16 and 17 years of age. EPQ scores were negatively and weakly correlated with the traits 'affiliation', 'play', 'dominance' and 'desirability'.

Over two thirds (69.6%) of the students reported dissatisfaction with the size of their bodies. All of these students indicated a desire to be at least 10% smaller.

Nutrition knowledge and dietary quality scores were not found to differ significantly across age group. The scores for each of these variables were consistently low for all ages. Body size dissatisfaction scores were significantly lower for the younger students as were eating practices test scores.

6.2 CONCLUSIONS

The energy intakes reported in the dietary records indicate that many of these students often consumed limited amounts of food, and the low dietary quality scores indicate that even those with higher intakes of energy were not often selecting foods of higher nutritional value. For the most part, students consumed adequate amounts of protein and calcium, but intakes of iron were of concern for some of the students. The consumption of milk and milk products should be reinforced as it is apparent from this investigation that foods from this group were selected often. The inclusion of iron- rich foods in the diet and the selection of combinations of foods at mealtime which enhance the absorption of iron should be encouraged to increase intakes of iron among this group.

The eating patterns questionnnaire is not a diagnostic tool for anorexia nervosa or for bulimia. However, it does provide information regarding the general, overall eating patterns of the students with emphasis on the incidence of overeating (perceived or real), and the extent to which the student feels discomfort or unhappiness about her eating patterns. From this perspective, it is clear that the RWB students do on occasion eat more food than is indicated on the dietary records but there is no way of determining the contribution of this behaviour to nutritional status. In addition, it is evident that many of the students feel uncomfortable about these unstable eating patterns.

The low energy intakes and unstable eating patterns are of concern since these two factors place the students at risk for the physiological

sequelae of fasting, disturbed growth patterns, delayed menarche, amenorrhea, delayed skeletal development, decreased bone densities, and an increased rate of musculo- skeletal injuries.

The limited food intakes and unstable eating patterns appear to be partially symptomatic of an intensely felt dissatisfaction with body size which becomes exaggerated soon after the latter phases of the pubertal growth spurt. The source of much of this dissatisfaction comes from within the student although it is reinforced by outside factors such as the physical appearance of peers and professional dancers, and the example and expectations of the dance instructors.

It appears that many of the students become caught up in the dismal spiral effect of food restriction, gorging, and further food restriction only to find that the way they feel about their bodies does not improve.

6.3 RECOMMENDATIONS FOR NUTRITION EDUCATION PROGRAMS FOR PROFESSIONAL DIVISION BALLET STUDENTS

More education is needed, not only about nutrition and weight control, but about body image, self concept and the role that the opinions of other people play in the development of these factors. There is a need to reach the students before and during puberty to provide guidance in the development of healthful eating habits before extreme body dissatisfaction occurs. Since privacy is a crucial concern for the students, this education program must be presented to the students without the staff present. The program must be ongoing to be effective and it must be scheduled to accommodate the full schedules of the students.

The nutrition component of the education program should include discussion of energy balance, the physiological cost of fasting and very low intakes of food (including fatigue and increased susceptibility to injury), food selection for the highest nutritional value, and low calorie meal planning. In addition, because the students have a great deal of interest in this area, it is essential that all queries about health and nutrition be taken seriously and answered as completely as possible.

It is important that the staff also receive education about nutrition, weight control, and the deleterious effects of insisting upon very low body weights while the students are still growing. It is also necessary for the success of this program that the staff visibly support the program.

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Appendix A

DATA GATHERING INSTRUMENTS

Nutrition Knowledge Questionnaire

Some statements concerning nutrition are given below. Please indicate whether you think the statement is true or false. DO NOT GUESS. If you do not know the answer, circle the 'don't know' response.

T= True F= False DK= 'don't know'

T F DK 1. Healthy, active children require some concentrated sweets, such as candy, for energy needs.

T F DK 2. The body does not use synthetic nutrients as efficiently as natural nutrients in food.

T F DK 3. More calories are expended per minute of activity in centre floor exercises than in barre exercises.

T F DK 4. An equivalent weight of carbohydrates and protein have approximately the same caloric value.

T= True F= False DK='don't know'

T F DK 5. A reducing diet should not contain bread or potatoes.

T F DK 6. Protein is the primary source of muscular energy used in movement.

T F DK 7. Eating fruits or vegetables which are high in vitamin C with meals or snacks containing iron improves iron absorption from these foods.

T F DK 8. Potatoes, strawberries and canteloupe are good sources of vitamin C.

T F DK 9. Increasing protein in the diet is necessary in order to increase muscle mass of the body.

T F DK 10. Carbohydrates are not as easily and rapidly digested as proteins and fats.

T F DK 11. There is a maximum amount (40 mg per kilogram body weight) of aspartame or NutraSweet, found in diet soft drinks, that should not be exceeded on a daily basis.

T F DK 12. Tea, coffee and cola are good sources of fluid for between classes.

T F DK 13. Organically grown fruits and vegetables are more nutritious than those grown with chemical fertilizers.

T F DK 14. Acidic foods, such as grapefruit, are of special value in reducing diets because they burn body fat.

T= True F= False DK='don't know'

T F DK 15. Green, leafy and yellow vegetables are important because they are good sources of vitamin A.

T F DK 16. Even in a busy day of dance classes, a dancer needs fit meal- times into her schedule.

T F DK 17. To prepare for sweat losses, one should drink fluids before each class.

T F DK 18. Carbohydrate rich foods, such as bread, rice or pasta, provide few nutrients besides calories.

T F DK 19. An excess of certain vitamins can be harmful to the body.

T F DK 20. Physically active people may require higher sodium and iron intakes than those who are less active.

T F DK 21. A high fat meal, which is slowly digested should be avoided before a strenuous dance class or performance.

T F DK 22. It is necessary to eat a wide variety of foods from day to day to stay healthy.

T F DK 23. Skipping meals is justifiable if you need to lose weight quickly.

T F DK 24. Combining legumes (beans) with cereals provides good quality dietary protein (eg. peanut butter sandwich).

T= True F= False DK='don't know'

T F DK 25. Vitamin pills are not needed by most people to ensure good health if a well-balanced diet is consumed.

T F DK 26. Heavy meals should not be consumed within two to three hours of a strenuous dance class/performance.

T F DK 27. Sweets eaten just before class will not necessarily improve performance but will be used by the body to help replace energy used during that class.

T F DK 28. It may be necessary for dancers to take nutrient supplements if they restrict food intake for long periods of time.

T F DK 29. Milk is a good supplier of calcium and vitamin D for all age groups.

T F DK 30. A diet low in cholesterol and saturated fats may aid in the prevention of heart disease.

T F DK 31. Excess consumption of highly concentrated sugars over a short period of time can cause gastrointestinal dehydration, cramps, nausea, and stomach distention.

T F DK 32. Someone who consumes a food stated to possess remarkable powers could receive the psychological boost needed to perform better.

T= True F= False DK='don't know'

T F DK 33. A person with a high percentage of lean tissue (muscle and bone) could weigh more than someone who wears the same size clothes but has more fat tissue.

T F DK 34. Tea or coffee will decrease iron absorption from foods if taken within an hour of eating iron-containing foods.

Added to posttest nutrition knowledge questionnaire only

35. I attended (please check)

a) seminar one:May 20 ____yes ____no

b) seminar two:May 27 ____yes ____no

c) seminar three:May 30 ____yes ____no

THANK YOU!!!!

Some statements about how you feel about nutrition are provided below. Please indicate whether you agree, disagree or have no opinion.

A= Agree D= Disagree NP= No opinion

A D NP 35. The relationship of good eating habits to good health should be stressed to the dancer.

A D NP 36. Ballet instructors need to have good attitudes toward nutrition because of their close contact and influence upon dancers.

A D NP 37. What a dancer eats is only important if she is trying to lose weight.

A D NP 38. Learning facts about nutrition and practicing them is the best way to achieve favourable changes in food habits.

A D NP 39. Nutritional counselling would be important to a dancer who is trying to make weight changes (loss or gain).

A D NP 40. Food advertisements can be a reliable source of nutrition information.

A D NP 41. It is the responsibility of the dance instructors to stress good nutrition practices to their students.

A D NP 42. The type of food a dancer eats affects her physical performance.

Eating Patterns Questionnaire

This questionnaire is designed to determine the eating patterns of college students and is adapted for ballet students. We would like you to accurately record observations you have made about your own eating patterns.

We recognize that some people may find a few of the questions to be quite personal. For this reason, the questionnaire is designed so that all information will be treated confidentially, and you can feel free to record your answers honestly. There are no correct answers. We want you to mark each item so that it best describes you.

Please write any comments, suggestions, questions or criticisms at the end. Thank you for taking the time to complete this questionnaire.

Lynn Wilsack

Ruth Diamant

Department of Foods and Nutrition

University of Manitoba

Eating Patterns Questionnaire

Directions: For each statement please circle the number which most closely describes how frequently you do each behaviour.

Always	Often	Sometimes	Seldom	Never	
5	4	3	2	1	
100%	75%	50%	25%	0%	of the time.

1. I overeat the food I really like.	5	4	3	2	1
2. People are negative (cruel, hostile) to me because of my eating patterns.	5	4	3	2	1
3. I eat "everything in sight"	5	4	3	2	1
4. Food controls my life.	5	4	3	2	1
5. I accept responsibility for my eating habits.	5	4	3	2	1
6. I go on eating binges.	5	4	3	2	1
7. I feel powerless to control my eating habits.	5	4	3	2	1
8. I eat high calorie foods.	5	4	3	2	1
9. I eat well balanced meals.	5	4	3	2	1
10. My eating habits are influenced by other people.	5	4	3	2	1
11. Controlling my eating habits is a struggle.	5	4	3	2	1
12. I am able to decide how much and how often I eat.	5	4	3	2	1

	Always	Often	Sometimes	Seldom	Never
	5	4	3	2	1
13. I worry about my eating patterns.	5	4	3	2	1
14. I have good eating habits.	5	4	3	2	1
15. When I eat I feel like I'm stealing	5	4	3	2	1
16. I overeat on occasions when others are also overeating.	5	4	3	2	1
17. I go on eating sprees during which I feel I have little control.	5	4	3	2	1
18. I skip meals to lose weight.	5	4	3	2	1
19. My eating habits are influenced by my moods.	5	4	3	2	1
20. I think about my eating patterns.	5	4	3	2	1
21. I overeat on special occasions. (eg. Christmas, Thanksgiving)	5	4	3	2	1
22. I eat to dull or block out painful emotions.	5	4	3	2	1
23. I eat to the point of stuffing myself.	5	4	3	2	1
24. I take diuretics (water pills) after overeating.	5	4	3	2	1
25. I am self-conscious about my eating habits.	5	4	3	2	1
26. Other people have expressed concern about my eating habits.	5	4	3	2	1

	Always	Often	Sometimes	Seldom	Never
	5	4	3	2	1
27. I vomit after I stuff myself.	5	4	3	2	1
28. I sneak food.	5	4	3	2	1
29. I eat a limited variety of foods.	5	4	3	2	1
30. I give up self-control while eating.	5	4	3	2	1
31. I am a compulsive eater.	5	4	3	2	1
32. I eat a wide variety of foods.	5	4	3	2	1
33. I take laxatives after overeating.	5	4	3	2	1
34. I am in control of my eating habits.	5	4	3	2	1
35. I organize my life around eating.	5	4	3	2	1
37. I cause myself to vomit after overeating.	5	4	3	2	1
38. I sneak food when nobody will know.	5	4	3	2	1
39. I eat a slight excess of food on a regular and predictable basis.	5	4	3	2	1
40. I eat when I'm not hungry.	5	4	3	2	1
41. My eating patterns are in opposition to what I believe is right, allowable, or desirable.	5	4	3	2	1
42. My eating habits control my life.	5	4	3	2	1
43. I eat when I'm upset (angry, depressed, anxious etc.).	5	4	3	2	1
44. I overeat certain foods that I like and severely limit my intake of other foods.	5	4	3	2	1

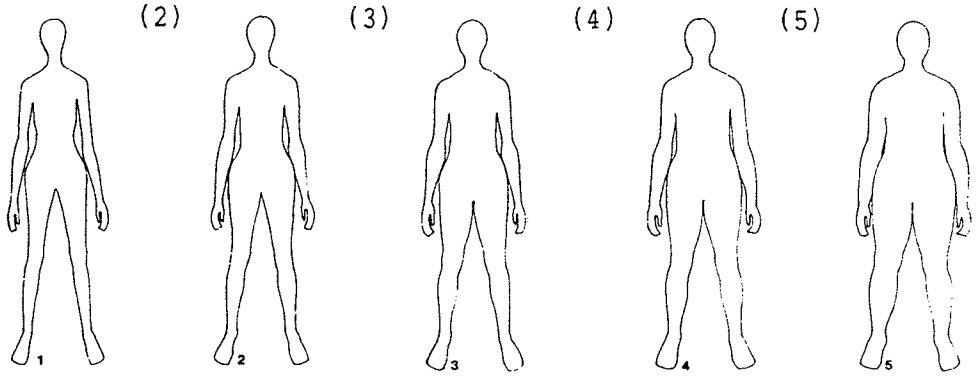
We would now like you to tell us some personal information. Please recall that all information is CONFIDENTIAL, and that your name can never be associated with any of your answers on this questionnaire.

45. Considering my height and body structure, I consider myself to be (check one):

____ very underweight
____ moderately underweight
____ not underweight or overweight
____ moderately overweight
____ very overweight

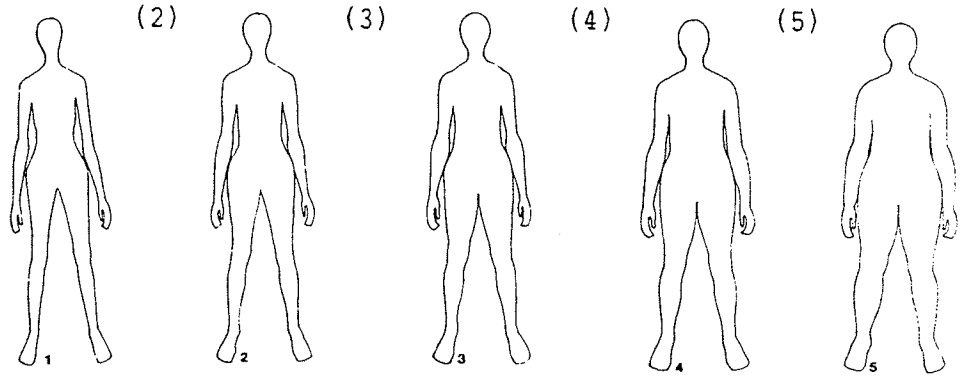
46. The body shape most similar to me is:

(1) (2) (3) (4) (5)

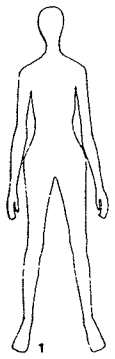
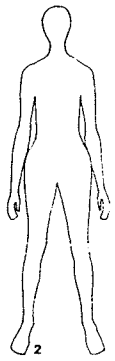
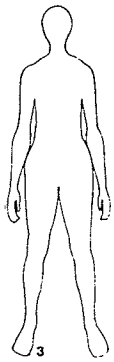
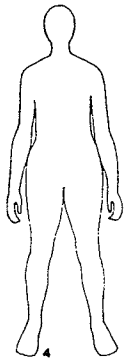
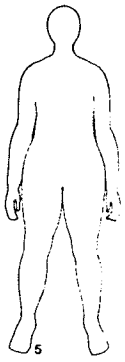


47. The body shape that I would most like to look like is:

(1) (2) (3) (4) (5)



48. The body shape that I think is best for a ballet dancer to be is:

(1)  (2)  (3)  (4)  (5) 

49. Considering my height and body structure, my dance teachers would probably consider me to be (check one):

____ very underweight
____ moderately underweight
____ not underweight or overweight
____ slightly overweight
____ very overweight

50. I determine how much I should weigh by consulting (check as many as apply):

a) height/weight charts

b) health professionals - eg. doctor

c) other persons - friends, dance instructors...

d) myself - ie. how my clothes fit, and look

e) other (please explain):_____

_____

51. I get my nutrition information from the following:

Rank from most important (1) to least important (5).

___ books, magazines, newspapers

___ health professional: dietitian, doctor, for example

___ dance instructors

___ friends, relatives

___ school

52. Are there other sources of nutrition information that you use?

___ no

___ yes

53. Please list these other sources.

_____

_____

_____

54. My age is _____ years.

55. I live at the YWCA. _____YES _____NO

56. My height is _____feet _____inches OR _____cm.

57. I weigh _____pounds OR _____kg.

58. Are you required to regulate your diet for a medical condition (eg. diabetes, ulcers, hypoglycemia, etc.)?

____NO

____YES, please specify:_____

Thank You

Written Instructions for Food Record

DIRECTIONS FOR FOOD RECORD

One of the purposes of this study is to determine the eating practices of adolescent ballet students. In order to achieve this, we are asking you to fill out three-day food records.

It is important that you record all foods and beverages- including drinks between classes (except water), evening snacks, etc.

Before you begin to record in this booklet, please read carefully the following directions, and examine carefully the sample shown below.

A new record sheet is to be used for each day.

Include the entire 24 hour period for each day- Thursday, Friday, and Saturday.

WRITE DOWN IN DETAIL ALL FOOD AND DRINK taken each day for the three days. Include everything eaten at home, residence, school, restaurants, or when visiting with friends. Record your entries as soon as possible after eating.

EAT AS YOU NORMALLY DO. Do not change your eating patterns during the days of your record.

NOTE: FOOD SOURCE = where the food was prepared. Please use the following code: H = home; R = residence; A = away (restaurant, ballet studios, etc.)

SAMPLE

DAY 1 CODE: 002

FOOD SOURCE	FOOD ITEM (PLUS ADDITIONS OR TOPPINGS)	AMOUNT	METHOD OF COOKING	DESCRIPTION: SIZE, BRAND NAME, FLAVOUR, ETC.
A	V-8 vegetable juice	280 ml		V-8
A	Turkey sandwich			
	- pita bread	1/2		100% whole wheat
	- turkey	2 slices		white meat, 4" by 2" x 1/2"
	- mustard	1 tsp.		yellow, prepared
	- tomato	3 slices		2" by 1/4" each
	- lettuce	1/2 cup		shredded iceburg
	- pickle	3 slices		sweet, 1" by 1/8" each
A	banana	1 med.		

Appendix B

PERSONALITY CHARACTERISTICS MEASURED BY JACKSON PERSONALITY RESEARCH FORM AA

Characteristic	Description of High Scorer
Abasement	Shows a high degree of humility, accepts blame and criticism even when not deserved, exposes himself to situations where he is in an inferior position, tends to be self-effacing.
Achievement	Aspires to accomplish difficult tasks; maintains high standards and is willing to work toward distant goals; responds positively to competition; willing to put forth effort to attain excellence.
Affiliation	Enjoys being with friends and people in general; accepts people readily; makes efforts to win friendships and maintain associations with people.
Aggression	Enjoys combat and argument; easily annoyed; sometimes willing to hurt people to get his way; may seek to get even with people whom he perceives as having harmed him.
Autonomy	Tries to break away from restraints, confinement, or restrictions of any kind; enjoys being unattached, free, not tied to people or obligations, may be rebellious when faced with constraints.
Change	Likes new and different experiences; dislikes routine and avoids it; may readily change opinions or values in different circumstances; adapts readily to changes in environment.
Cognitive Structure	Does not like ambiguity or uncertainty in information; wants all questions answered completely; desires to make decisions based upon definite knowledge, rather than upon guesses or probabilities.
Defendence	Readily suspects that people mean him harm; or are against him; ready to defend himself at all times; takes offense easily; does not

	accept criticism readily.
Dominance	Attempts to control his environment and to influence or direct other people; expresses opinions forcefully; enjoys the role of leader and may assume it spontaneously.
Endurance	Willing to work long hours; doesn't give up quickly on a problem; persevering, even in the face of great difficulty; patient and unrelenting in work habits.
Exhibition	Wants to be the centre of attention; enjoys having an audience; engages in behaviour which wins the notice of others; may enjoy being dramatic and witty.
Harmavoidance	Does not enjoy exciting activities, especially if danger is involved; avoids risk of bodily harm; seeks to maximize safety.
Impulsivity	Tends to act on the spur of the moment and without deliberation; gives vent readily to feelings and wishes; speaks freely; may be volatile in emotional expression.
Nurturance	Gives sympathy and comfort; assists others whenever possible; interested in caring for children, the disabled, or the infirm; offers a helping hand to those in need; readily performs favours for others.
Order	Concerned with keeping personal effects and surroundings neat and organized; dislikes clutter, confusion, lack of organization; interested in developing methods for keeping materials methodically organized.
Play	Does many things just for fun; spends a good deal of time participating in games, sports, social activities, and other amusements; enjoys jokes and funny stories; maintains a lighthearted, easy-going attitude toward life.
Sentience	Notices smells, sounds, sights, tastes and the way things feel; remembers these sensations and believes that they are an important part of life; is sensitive to many forms of experience; may maintain an essentially hedonistic or aesthetic view of life.
Social Recognition	Desires to be held in high esteem by acquaintances; concerned about reputation and what other people think of him; works for the approval and recognition of others.

Succorance	Frequently seeks the sympathy, protection, love, advice, and reassurance of other people; may feel insecure or helpless without such support; confides difficulties readily to a receptive person.
Understanding	Wants to understand many areas of knowledge; values synthesis of ideas, verifiable generalizations, logical thought, particularly when directed at satisfying intellectual curiosity.
Desirability	Describes self in terms judged as desirable; consciously or unconsciously, accurately or inaccurately, presents favourable picture of self in responses to personality statements.
Infrequency	Responds in implausible or pseudo-random manner possibly due to carelessness, poor comprehension, passive non-compliance, confusion, or gross deviation.

Appendix C

CORRESPONDENCE

April, 1986

Hi!

My name is Lynn Wilsack and I'm a master's student at the University of Manitoba in Foods and Nutrition. I will be doing a nutrition study with some of the students in the Professional Division of the RWB ballet school in a few weeks time. In order to prepare for this, I need to do a little practicing.

I have asked Jan Burden to help me find some ballet dancers in the General Division who may be interested in completing the questionnaires that I will be using for my study later on.

There are three questionnaires and a three day food record to be filled out. In total, this will take approximately 4 hours of your time. I will ask you to meet with me twice as a group (1 hour each time), and a few times individually (briefly). I will set up these meetings at times as convenient for you as possible.

I want you to know that I would very much appreciate your cooperation. To thank you, I have a gift for you. It's a 'Dancer's Notebook' filled with quotes and artwork of famous and not-so-famous dancers. It's quite beautiful and I hope you will like it as much as I do.

If you are interested in helping me out, please contact Jan Burden at the school, or myself at (evenings).

Thank you.

Pretest Consent Form

I agree to take part in completing the nutrition questionnaires, personality inventory and food record that are being pretested by Lynn Wilsack, Master's student in Foods and Nutrition at the University of Manitoba.

I am aware that all information from the questionnaires and records will be held confidentially and that I will not be identified by name with any of the results from these questionnaires.

Signature:_____

Date:_____

April, 1986

Hi!

My name is Lynn Wilsack. I'm a master's student in Foods and Nutrition at the University of Manitoba. I will be presenting a compact nutrition education program to all of the students in the professional division at the end of May as part of my master's thesis.

Last fall, I talked to a couple of groups of students in the professional division to determine some of the areas of interest with respect to nutrition. After these talks, I decided to centre the program around topics such as weight control using healthy eating practices because this appears to be a major concern to ballet dancers.

Also as part of my thesis, I will be evaluating the program's effectiveness. To do this, I will need about 50 female volunteers to complete 3 questionnaires (2 hours in total) before the program begins and one afterward (less than 1 hour) as well as a three day food record before and after the program (about 2 hours in total each time to complete).

The results of all of these questionnaires and records will be coded and held in confidence so that no names or identities will be used in any of the reports made about this study. It will be possible, however, at the end of the program to make an appointment with me to discuss privately your food records and answer any nutrition-related concerns you may have.

If you are interested in helping me out, please sign the attached form. If you have any questions at all about this program, please feel free to call me at (evenings) or (days).

CONSENT FORM

I agree to take part in the nutrition education program presented by Lynn Wilsack, Master's student in Foods and Nutrition at the University of Manitoba. I understand that this program will take place over a four week period.

I understand that I will be asked to complete a nutrition knowledge questionnaire and a three day food record before and after the program. In addition, I agree to complete an eating patterns questionnaire and the personality research form before the education program begins.

I am aware that all information from the questionnaires and records is confidential and will not be identified with me except by Lynn Wilsack and her advisor, Ruth Diamant.

Signature:_____

Date:_____

MEMO TO ALL PARTICIPANTS IN THE NUTRITION STUDY

FROM: Lynn Wilsack

Here's the revised list of the dates and times that we'll be meeting as well as a couple of reminders.

Reminders first

Start your food record on Thursday morning. Please.... read the instructions once again before your start.

PS. Include brand names wherever possible, and if you use lo-cal dressings, margarine, etc., include that as part of your description.

FRIDAY May 16 - We'll be at the RWB studios to quickly go over your first record with you. We'll be there around your class times to make it as convenient as possible for you. This should only take about 5 minutes. Please remember to bring your record book with you!!!

SATURDAY May 17 - We'll meet at 2:00 pm at room 2M71 at U of W. We'll collect your records at that time, so make sure you bring them with you. This meeting will take about an hour to do a questionnaire.

SUNDAY May 18 - Come to the YWCA residence anytime between 2 and 4 in the afternoon. We'll meet with you very briefly to go over your last record with you.

TUESDAY May 20, MONDAY May 26, FRIDAY May 30 : 7 pm at RWB Studios. These are the dates for the three seminars about nutrition. It is important that you come and give these a listen.

LAST GROUP MEETING!!! - MONDAY June 2 at 7 pm at 2M71 U of W. This will take a maximum of a half an hour. We'll hand out your next (and last) 3 day food record to complete. We'll update you then about when we'll be collecting your records.

PS Thanks for giving so much of your time to this project. It is very appreciated. And don't forget that if you want to talk to me (Lynn) after June 8, I'd be delighted.

To all new participants

This package contains a copy of 2 of the questionnaires that I am using for my study. If you want to participate but cannot make the group meeting times, fill these out as soon as possible (by Sat. May 17) and start the food record on Thursday morning. Seal your questionnaires in the envelope provided with your name on a separate piece of paper (I'll add your name to the code list in case you may want to discuss your food record with me after June 8).

Please read the memo about the rest of the meeting times and give me a call ( ) if you need to make alternate arrangements to do the next questionnaire (ie. you cannot make the Saturday meeting).

Read the instructions carefully for each of the questionnaires and the food record before you begin. The food record should be filled out from Thursday to Saturday this week.

THANKS

MEMO TO ALL TEACHERS, PROFESSIONAL DIVISION, RWB SCHOOL

FROM: LYNN WILSACK

As you likely already know, I am a master's student in Foods and Nutrition at the U of Manitoba. I'm going to be conducting three seminars about nutrition to the dancers in the professional division starting next week: May 20 at 7 pm, May 26 at 7 pm and May 30 at 7 pm. I would like to invite you to attend these sessions at this time.

It would be appreciated immensely also if you would be willing to evaluate the sessions with respect to the appropriateness of content and methods, as well as comment on the usefulness of this kind of information to young dancers.

I have included a copy of the nutrition knowledge test that I have given to the students participating in the study. If you are interested in finding out how you would fare on this test, just fill it out and give it to me at the first session next week and I'll check it for you. It could be fun!!!

I'd like to take this opportunity to thank you for all of your cooperation and assistance.

HELLO ONCE AGAIN!!!

You will be pleased to learn that this is the last task I will be asking of you for this study. This package contains a copy of the Nutrition Knowledge Questionnaire for you to fill out (on your own, PLEASE), as well as another 3 day food record.

Please hand in the questionnaire to the office as soon as possible after you have finished it, in the envelope provided (please seal it).

The food records are to be filled out like last time. DO keep in mind that the record is only as good (and as accurate) as the recorder allows it to be. Please include as much detail as you possibly can. This means amounts (in cups, ml, sizes, etc.) as well as descriptions. I will be in the studio on Friday to pick up Thursday's record, and I'll pick up the records for Friday and Saturday on Monday at the studio.

Please start the record whenever you start eating on Thursday June 12.

To show my appreciation for your efforts and support throughout this part of this study, I'd like to give each of you a gift. It's a book called "The Dancer's Notebook". It's quite beautiful and I hope you like it as much as I do.
I'll bring the books with me when I pick the last of the food records on Monday.

Thanks so much. See you soon!

Appendix D

SESSION TOPICS AND SOURCES OF HANDOUTS FOR LECTURE SERIES

Session One

Topics

Introduction to program, including objectives of educator
The components of health
Energy, energy use in ballet class
Aerobic activity
Water and dehydration
Why we eat: hunger, appetite, emotions, money,
  body image satisfaction
Why we choose the foods we do: nutrition knowledge,
  availability and preference
Evaluation of Session

Handouts

Source:	Title
Manitoba Egg Producers Marketing Board	Eggsercise
	Beyond Breakfast
Ontario Milk Marketing Board (OMMB)	The Eating Survey
Beef Information Centre and Agriculture Canada	Lookin' Good Feelin' Good with Beef: Nutrition Guide
Participaction	Taking off Fat: a measure of energy balance
	What is your body image?

Session Two

Topics

Review of Session One
What is nutrition?
The Six Categories of Nutrients
  Vitamins, minerals, water, fat, carbohydrate, and protein
Food selection: Canada's Food Guide
  Leader nutrients of each food group
  Classification of Foods according to nutrient content
  Fringe and core foods
Supplements vs. food sources of nutrients
Session Evaluation

Resources
OMMB nutrient graphs for small group activities

Handouts

Source:	Title
Manitoba Milk Producers Marketing Board (MMPMB) and OMMB	The Four Food Groups: Fringe and Core Foods (adapted for this program)
	Functions of the Four Food Groups
	Crossword Puzzle
	Function Worksheet
	Energy Values for Some Common Fast Foods
Health and Welfare Canada	Canada's Food Guide

Session Three

Topics

Review of Session Two
The roles in our health of calcium and iron
How to evaluate diet quickly for calcium and iron
Caffeine
Aspartame
Fluid Intake
Conclusion of program: Nutrition Guidelines for Young Dancers
Session Evaluation

Handouts

Source:	Title
MMPMB and OMMB	Scoring Sheet for my Food Record
	Osteoporosis: a young woman's preventive guide to the disease which strikes 1 in 4 women
	Calcium Calculator
	Calcium: Your Mini Sourcebook
Health and Welfare Canada	Nutrient Values of Some Common Foods
Developed by L. Wilsack for program	Vital Iron
	Caffeine
	Aspartame
	Evaluation Checksheet

VITAL IRON

Iron plays an essential role in the oxygen carrying systems which are involved in energy release for muscular movement.

It's part of hemoglobin - the component which carries around oxygen in the blood to all cells in the body.
It's also part of the cytochromes which are involved in the electron transport chain: our body's way of obtaining energy from the carbohydrate and fat we eat.

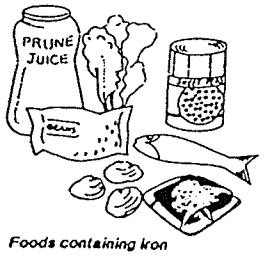
Athletes with low iron stores in their bodies have higher levels of lactate production when exercising. LACTATE is the chemical byproduct of too much anaerobic glycolysis when there's not enough oxygen getting to the exercising muscles. LACTATE causes muscle cramps and fatigue. IRON helps prevent this problem because it's part of hemoglobin and can carry oxygen to the exercising muscles.
Athletes can lose a large amount of iron through perspiration, making getting enough iron a special concern.

HOW CAN YOU GET ENOUGH IRON?

Choose foods that are good sources of iron every day.

Iron, like many minerals is poorly absorbed, and is affected by the kinds of foods that you eat together.
The iron found in eggs, fruits, vegetables, breads and cereals is called non-heme and is more poorly absorbed than iron from meat or fish.
But if you eat meat (one serving) in a meal you can improve the absorption of the non-heme iron considerably.
ALSO eating vitamin C with your meals improves absorption of non-heme iron from cereals, fruits and vegetables.
It's a good idea to eat a piece of fruit, or juice with your breakfast cereal in the morning.

Do you drink coffee or tea? When you drink these beverages within an hour of a meal, the absorption of iron goes DOWN (a lot).
Since getting enough iron is a priority for most young women, it's a good idea to plan to drink your tea or coffee between meals rather than with them.



Foods containing iron

Foods showing iron contents

Food	Serving Size
Oysters	½ c
Beef liver	3 oz
Bran flakes, enriched	½ c
Beef heart	3 oz
Chipped beef	3 oz
Lean beef roast	3 oz
Veal roast	3 oz
Hamburger	3 oz
Prune juice	½ c
Sardines	3 oz
Dried beans	½ c
Spinach	½ c
Lima beans	½ c
Ham	3 oz
Canned tuna	3 oz
Dandelion greens	½ c
Green peas	½ c
Leg of lamb	3 oz
Chicken, meat only	3 oz
Mustard greens	½ c
Strawberries	½ c
Egg	1
Tomato juice	½ c
Rice, enriched	½ c
Brussels sprouts	½ c
Dried apricots	4 halves
Winter squash	½ c
Whole-wheat bread	1 slice
Blackberries	½ c
Pumpkin	½ c
Canned salmon	3 oz
Cooked cereal	½ c
Blueberries	½ c
Spaghetti, enriched	½ c
Macaroni, enriched	½ c
Broccoli	½ c
Potato chips	15
Raspberries	½ c
Peanut butter	2 tbsp
White bread	1 slice
Dried fig	1
Muffin	1
Corn muffin	1
Applesauce	½ c
Cooked tomatoes	½ c
French-fried potatoes	8
Popcorn, no fat	3 c
Pear	1
Potato	1 small
Corn on cob	1 small

CAFFEINE

Caffeine is the only drug that can be found in some of the foods that we normally consume.

Studies on endurance athletes have found that a dose of caffeine of around 250 mg (about 2 cups of coffee) taken one hour before exercise helped keep the athletes going longer. It seems that caffeine helps the body use fat as a fuel in the aerobic glycolysis system that is used in exercise that lasts more than a matter of minutes.

BUT

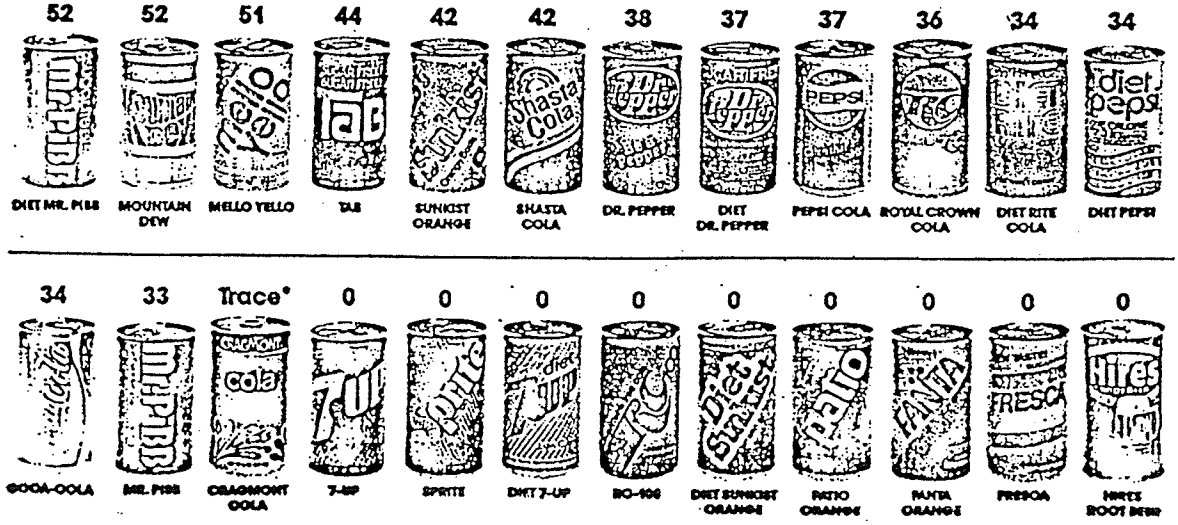
There is a down side to caffeine that dancers need to be aware of.

- many of us (especially young people) have a low tolerance to caffeine which can cause nervousness, 'the jitters', and stomach discomfort. Each of these effects will make that all-important controlled, smooth, fluid movement all that much more difficult.

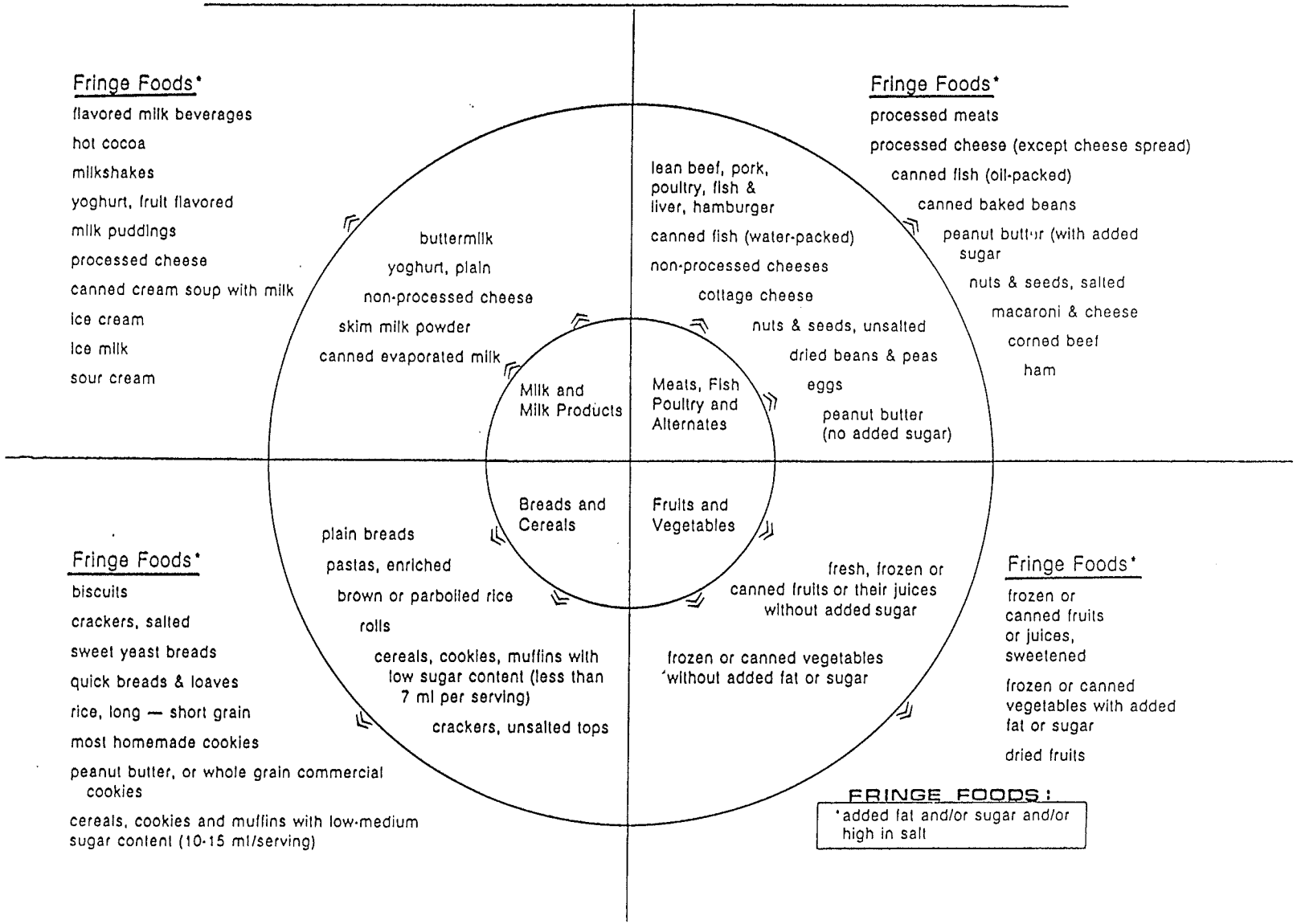
- caffeine is a diuretic, which means it promotes more frequent urination. This increases the possibility of dehydration and its accompanying symptoms: slower muscle response and fatigue which will decrease the quality of your dancing performance also.

Coffee (5 oz) contains about 53 mg for instant to 146 mg in drip.
Tea (5 oz) contains from 10 mg to 50 mg depending on brewing time: the longer the tea steeps, the more caffeine it will contain.
Iced tea in cans (355 ml) contains between 22 and 36 mg of caffeine.
Milk chocolate (1 oz) has about 6 mg.

You know that coffee and tea contain caffeine, but did you know that these soft drinks also have caffeine? Note that Mountain Dew no longer contains caffeine.



THE 4 FOOD GROUPS: FRINGE AND CORE FOODS



EVALUATION CHECK-SHEET

NOTE: STRONGLY AGREE= SA; AGREE= A; UNDECIDED= U; DISAGREE= D;
STRONGLY DISAGREE= SD

1. I learned something new about nutrition at today's session.
   SA A U D SD

2. The presentation was organized in a way that was easy to follow.
   SA A U D SD

3. The session lasted too long for one lecture.
   SA A U D SD

4. The information was presented in a way that was easy to understand.
   SA A U D SD

5. The information discussed today is useful to me as a dancer.
   SA A U D SD

6. The topics discussed today were interesting to me.
   SA A U D SD

7. The presentation used too much lecture.
   SA A U D SD

8. The presentation involved too many group and individual activities.
   SA A U D SD

9. The leader was easy to understand.
   SA A U D SD

10. The leader spoke a) loudly enough SA A U D SD
    b) at the right speed SA A U D SD

ANY COMMENTS, SUGGESTIONS, QUESTIONS YOU WOULD LIKE ANSWERED??