
The Effect of Moderate Glycemic Energy Bar Consumption on Blood Glucose and Mood in Dancers

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Dance class, rehearsal, and stage performance all entail periods of high-intensity intermittent physical activity (HIIT).¹ Therefore, dancers should ensure adequate energy reserves to perform their daily activities.² A variety of factors determine which type of fuel muscles utilize during exercise³ however, it has long been established that performing athletes use carbohydrate as a primary energy source more than those leading an inactive lifestyle.⁴

Ingesting quality carbohydrates is recommended as essential for dancers. Given that most dance classes take place in the morning, it has been suggested that dancers eat a well-balanced breakfast containing carbohydrates, fats, and protein as a means of fuelling this activity. The aim of this study was to determine the effect of a moderate glycemic index (MGI) energy bar (designed to break down gradually and help stabilize blood sugar levels) or fasting on dancers' blood sugar levels and their perceived pleasure-displeasure response during the first dance class of the day.

The glycemic index is a relative measure of how rapidly and how much a portion of food raises blood glucose (also called blood sugar) levels. Foods with higher index values (e.g. white bread) raise blood sugar more rapidly than foods with lower glycemic index values (e.g. lentils). The glycemic index number associated with a particular type of food indicates the food's effect on blood glucose level. A value of 100 represents an equivalent amount of pure glucose.

The World Health Organization (WHO) recommends at least 55% of total energy come from a variety of carbohydrate sources for optimum health,⁵ while for sporting populations the recommendation is 60%.⁶ From studies of dietary practices among elite and student dancers, and from the observations of dieticians, exercise physiologists, and sport nutritionists, the general consensus is that many dancers do not achieve the adequate nutrition needed for

optimal physical health and performance.⁷ Nutrition often takes a subordinate role when aesthetic principles become more important than energy balance.⁸ Dancers' demanding schedules, in addition to a potential lack of nutritional knowledge, may also prohibit them from maintaining an optimal dietary intake.⁹

In Western countries, between 3-34% of the population miss eating breakfast.¹⁰ Numerous factors can influence skipping breakfast, among them socioeconomic status,¹¹ perception of lack of enjoyable food choice,¹² economics,¹³ and misconceptions regarding what constitutes a healthy meal. In addition, skipping breakfast is more frequent among girls, older adolescents, and persons from low socioeconomic groups.¹⁴ Published research into the possible reasons for and prevalence of skipping breakfast in dance populations is scarce. However, research examining the energetic deficiencies in dancers' diet allows for the probability that breakfast skipping is prevalent in this group.⁵

Little research has been conducted experimentally on the effects of glycemic index in the dietary patterns of dancers; however, it has been suggested that this information would offer a guideline for nutritional planning in this population.² No known work has been published utilizing behavioral measures that reveal how a dancer feels as a result of dietary intervention. One way to assess affect is via psychological measurement. The Feeling Scale is a test that examines not "what" but gives context to "how" one feels as a result of exertion. The Feeling Scale has been used in sport and exercise psychology as a dichotomous measure of pleasure-displeasure.¹⁶ Using the glycemic index and feeling scale as forms of measurement, the aim of this study was to examine how carbohydrate consumption or fasting impacted blood sugar and its effect in pre-professional dancers.¹⁷

Methodology

Participants

Ten physically healthy female contemporary dance students volunteered to participate in this study. All participants were currently taking daily dance classes four to six times

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per week at least four hours per day and were injury free at the time of the study. Participants were excluded for contraindications such as chronic smoking, dieting, pre-existing gastrointestinal conditions, and medication or drugs known to influence fat or carbohydrate metabolism. All participants reported regular menses and none were knowingly pregnant.

**Procedure
Study Design**

On testing days, all the participants fasted the night before. Their blood sugar was tested before, during and after dancing. Their mood was tested before and after dancing. Some dancers did not eat and others ate an energy bar within 20 minutes of dancing. Everyone was allowed to drink water. The MGI bar contained approximately 47.3 g of carbohydrate, 2.1 g of fat, and 9.6 g of protein. The bar had to be consumed within 15 to 20 minutes dependent on dancer’s self-chosen warm-up. Blood sugar was measured using an Accu-chek Compact Plus® (Roche Diagnostics, Mannheim, Germany).

The Hardy and Rejeski *Feeling Scale* (FS)¹⁷ is an 11-point single-item bipolar rating scale ranging from -5 (very bad) to +5 (very good). Participants were asked to rate how they felt at that particular moment. FS has the advantage of most other self-report scales of being easily and quickly administered during exercise, thus turnover from test to return to class was minimal (±2 min per participant).

Dance Class

As the participants were already familiar with the contemporary dance class and instructor, no preliminary test or

acclimatization protocol was necessary. The students were observed in their normal class by the principal researcher on three occasions prior to testing. This gave information as to the pace and flow of the class in order to know the best timing to remove students from class.

Results

There were differences seen in blood sugar levels at baseline between both groups. However, statistical analysis revealed these results were not significant. Further, results revealed that the dancers who did not eat experienced a rise in their blood sugar rapidly from baseline to 30 min., with a momentary decline from the 30 min. to 60 min. time points, which are comparable to previous studies in athletes.¹⁸ In the carbohydrate trial, which included dancers who ate the energy bar, the rise from baseline to 30 min. was minimal, with a subsequent marginal decline in sugar levels from 30 min. to the final time point. Neither group’s blood sugar concentrations dropped below baseline measurements. Other studies confirm similar findings in which water, when compared with a high glycemic index meal, produced an increase in postprandial (after a meal) glycemic response.¹⁹ This means that there is a relationship between blood sugar levels and carbohydrate consumption (Fig. 1A).

The second aim of the present study was to examine whether skipping breakfast had an effect on dancers’ pleasure-displeasure state during class. Previous research has shown that blood sugar influences mood, with a low blood glucose congruent with a more negative mood.²⁰ Moreover, in studies with cognitively demanding tasks, as seen in the present study, falling levels of blood glucose have been associated with feeling less energetic.²¹ Within

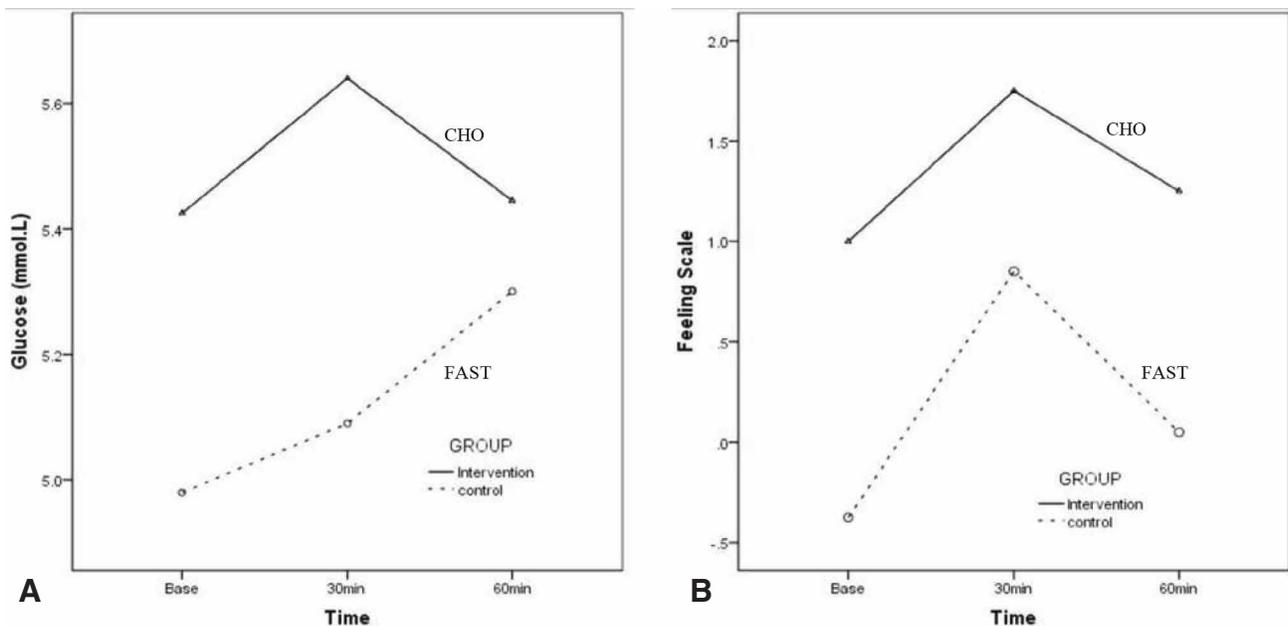


Figure 1 Mean glucose concentrations (A) and changes in pleasure-displeasure FS values (B) at rest (baseline) and at 30 min and 60 min of dance class after ingestion of an MGI energy bar (CHO, intervention group, solid line) or water (FAST, control group, dashed line). Reproduced from: Brown D, Wyon M. The effect of moderate glycemic energy bar consumption on blood glucose and mood in dancers. *Med Probl Perform Art.* 2014 Mar;29(1):27-31. With permission.

the present study, overall ratings of pleasure were higher in dancers who consumed the energy bar (Fig. 1B).

At baseline, the carbohydrate-eating group felt neither pleasure nor displeasure, while the fasting group felt displeasure. In both groups, pleasure ratings became more positive during the second time point (30 min), followed by a decline in pleasure for both trials towards the final time point (60 min). Our results are similar to those reported by Backhouse et al. who examined the influence of carbohydrate beverage ingestion on affect (pleasure-displeasure) and perceived exertion during a high-intensity intermittent soccer match.²²

Discussion

The main purpose of this study was to examine the effects of ingesting an energy bar on physiological parameters and pleasure-displeasure affect in a study implemented during an actual dance class. The ingestion of an energy bar compared with ingestion of water prior to dance class had a positive impact on blood sugar levels during the subsequent dance class. Exercise creates a powerful stimulus for blood sugar uptake into skeletal muscle when energy needs are met solely by reserves and the intestines are empty. Blood sugar can constitute 15 to 30% of the energy requirement of the working muscle during moderate exercise and upwards of 40% during high intensity events.²³ Research has shown that carbohydrate ingestion prior to exercise with either low or high glycemic index foods maintained higher blood sugar concentrations²⁴ and decreased plasma (blood) lactate concentrations during exercise or post exercise.²⁵ Others have indicated a rapid increase in hyperinsulinemia (high blood insulin levels), with increased glucose uptake and decreased free fatty acids availability as a possible cause.²⁶

Wyon et al.²⁷ have shown that that the center portion of a dance class is an intermittent form of exercise that does not place significant stress on the aerobic system. Thus in class, high-intensity intermittent physical activity, or blasts of explosive exercise interspersed with periods of much less intense effort, conceivably occurs only in the final stages of class via center, across the floor, and jumping combination.

Conclusion

Although often suggested among colleagues in dance medicine and science, there has been little scientific evidence published to support meal manipulation within a dance population, with select food items for this single purpose. This study established that manipulating the student dancers' diet towards food items rich in complex carbohydrates contributed to the overall impact of blood sugar levels. The current research thus corroborates the current tenet that choice of macronutrient intake—in this case, carbohydrates, confers a discernible effect on blood glucose levels.

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