

## CONDITIONS REQUIRING SPECIAL CONSIDERATION IN PHYSICAL EDUCATION - DIABETES MELLITUS

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**Abstract:** *For some disorder, such as diabetes, the only special instructional arrangements that may be necessary are in physical education. When this occurs, special education funds can be used to support these services. Regardless of the funding amount or source, every effort should be made to insure that appropriate physical education experiences are provided for students with health impairments. The need for physical activity and benefits to be derived from these services will justify the expenditure of fund and energy.*

**Keywords:** *Diabetes mellitus, insulin, obesity, physical exercises program.*

### 1. Introduction

Diabetes mellitus, a disease in which the body exhibits an inability to properly use the starches and sugar that it ingests, is a major health problem that affects more than five million Americans (Leon, 1987)<sup>2</sup>. The prevalence of the disease is increasing, with some estimates suggesting that the number of people affected by this disorder will double every fifteen years. Diabetes is found in both children and adults with approximately two children affected for every eight adults. Historically diabetes has been divided into two types: juvenile and adult or maturity onset. Today the classification system receiving the most common use refers to these as Type I, or juvenile-onset diabetes and Type II, mature-onset diabetes. As the names imply, the Type I affects young individuals

normally before the age of twenty-four and the Type II is more common among those over the age of forty.

Type I individuals normally require insulin and are lean. In this type the pancreas lacks the ability to make sufficient amounts of insulin. Type I is the most difficult type to control and is sometimes referred to as brittle diabetes because those affected are susceptible to wide blood-glucose swings and insulin reactions. Type II diabetes, also known as non-insulin-dependent diabetes, generally occurs in later life in older, overweight individuals. Type II is different from Type I in that the pancreas produces insulin, but the body's cells lack receptor sites to receive the available insulin. Type II generally develops slowly and with symptoms so mild that it may be undetected for years (Duda, 1985).

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## 2. Cause

The cause of diabetes mellitus is known to be related to an improper supply of insulin, secreted by the islands of Langerhans in the pancreas and responsible for the break-down of sugar for utilization and storage by the body. This lack of proper function is not caused by an organic defect; consequently, medical investigation of its cause is being directed toward other possible causes, such as the factors that control the production of insulin in the pancreas. In the juvenile diabetes mellitus, considerable interest has focused on the likelihood that the disease may be inherited. Other explanations suggest that the cause may be due to a virus because some viruses are known to destroy pancreatic cells. Another factor may be related to the process of autoimmunity, when the body destroys its own cells in response to selected viruses

## 3. Treatment

Exercise is an essential component in the effective treatment of diabetes. Some of the advantages of a vigorous exercise program can be helpful in the following ways:

1. *Improved Diabetic Control.* Regular exercise decreases insulin requirements for individuals with insulin-dependent diabetes. Exercise training likewise reduces insulin secretion in response to a glucose challenge in non-insulin-dependent diabetic individuals.
2. *Skeletal Muscle Adaptations.* The effects of training on skeletal muscle can make significant contribution to the control of diabetes, as well as to the improvement of work capacity.
3. *Reduced Risk of Coronary Heart Disease.* Given the risk factors associated with the obese condition found in adult-onset diabetes, it appears logical that this population is more susceptible to coronary heart disease. An exercise program can be helpful in controlling weight and reducing associated risk factors.

4. *Increased Work Capacity and Endurance.* Similar to the nondiabetic population, diabetics benefit from exercise programs that improve work capacity.
5. *Psychosocial Benefits.* Individuals with diabetes, particularly those with Type I diabetes, benefit from the sense of well-being generated by exercise programs. Riley and Rosenbloom [4] state, "An important aspect of physical exercise is the "good" feeling, the increased self awareness, self assertiveness, and self confidence that accompanies physical fitness. These benefits are enormously valuable to young people whose self images are damaged by this serious chronic disorder. This aspect of physical exercise is as important in the therapy of insulin dependent diabetes as the metabolic improvement (1980, p.393)". Similar benefits have been noted in the adult-onset, Type II diabetic.

There are some exercise precautions that should be considered when working with diabetic students. The muscle site in which the student injects insulin is important because the absorption rate of working and nonworking muscles is very different. Some [5] have reported that the absorption rate of working muscle might be twice as fast as that of the non working muscles. Therefore, if the legs and arms are to be heavily used (such as in long-distance running), the preferred injection site might be the abdomen. This decision requires careful articulation with the youngster's physician. The amount of insulin required is also related to the amount and intensity of the exercise. If the exercise is intense and the insulin has already been injected, additional carbohydrates must be taken before and during exercise to avoid insulin reaction. If the diabetic is aware that a strenuous exercise program is planned, then the he or she can reduce the amount of insulin. The decision as to how much of an insulin reduction is possible is difficult to determine and will require a trial and error process. Knox [3] offers the following advice: "When activity is expected to be less than normal insulin is increased.

For greater than normal activity, prior ingestion of carbohydrates is advised. If exercise is strenuous and prolonged, hourly snacks should be taken (1975, p.389)".

Leon (1987) advises that the diabetics should not exercise alone and should make certain that a partner is aware of the possibility of a hypoglycemic response. Adequate fluid during and after exercise is also important to avoid dehydration.

In developing an exercise program for the diabetic it is important to emphasize activities that are interesting and enjoyable and utilize the large muscles of the body. Aerobic activities such as walking, jogging, bicycling, swimming, and cross-country skiing are particularly desirable. The intensity of the activity should be such that a desirable training effect can be achieved (70 percent of maximal heart rate). The intensity, frequency, and duration of each exercise session should be recorded so that food-intake and insulin can be adjusted accordingly.

There are some few activities that should be contraindicated for the diabetic student. These students need to be encouraged to be active and to learn early in life the important relationship between diet, medication, and exercise. Some have expressed concern that scuba diving may impose some risk to the diabetic. When question of possible limitations arise, the individualized education program planning process can be effectively utilized to insure that the input of all parties is received before imposing unnecessary restrictions.

#### 4. Program considerations

Diabetics are normal in appearance and motor function and so do not usually

experience the severe emotional problems that those with more obvious handicaps frequently have. Whenever unsatisfactory adjustment is found in those suffering from diabetes, the cause can usually be found in overprotection or overindulgence by the parents during childhood.

Many doctors emphasize the importance of muscular activity in the lives of diabetics. Exercise is important not only because it decreases the need for insulin but also because it contributes to general body health. Moreover, it helps to keep the body weight under control, an important problem with older diabetics, who have a tendency to obesity. Exercise also improves glucose tolerance even in the absence of insulin. The only concern associated with physical activity programs for the diabetic is that the individual must learn to regulate the amount of insulin required in relation to the amount of exercise. Most diabetics learn to make this adjustment easily, particularly if the intensity and duration of their exercise is monitored on a regular schedule. Some find it helpful to eat a snack prior to exercise and at regular intervals throughout the exercise period.

Other aspects of teaching diabetic students that school personnel, including physical education teachers, should consider include the following:

- a. Teachers should be aware that they have a diabetic student in their class. Pertinent information that should be obtained from the parents and provided to the teachers of diabetic students is presented in the sample form found in figure 1.

Child's name		Date
Name of parent or guardian	Address	Home/work phone
Alternate person to call in emergency	Relationship	Phone
Name of physician	Address	Phone
Signs and symptoms commonly exhibited prior to insulin reaction:		
Time of day reaction most likely to occur:		
Kind of sweets to be administered to reverse insulin shock:		

Fig. 1

- b. Diabetic individuals are expected to test their blood for the presence of sugar. Blood sugar testing is normally carried out four times per day: in the morning, before lunch, before dinner time, and at bedtime. Teachers should be prepared to assure the diabetic child that sufficient time and privacy will be provided to conduct the necessary tests. A positive recording, the presence of sugar, may also account for a mood change in the student. The teacher must be sensitive to this possibility and provide support when necessary.
- c. Efforts must be extended to assure other students that diabetes is not an infection disease. Explanations that the diabetic individuals are capable of participating fully in all of life's activities may also help others better understand this disorder.
- d. Teachers should have dextrose tablets, candy bars, or soft drinks available to them to administer in case a student experiences an insulin shock.
- e. Diabetics, when engaging in vigorous activity, will on occasion find it necessary to stop their activity to eat candy or sweets to compensate for their increased metabolic state, thus avoiding an insulin reaction. Fortunately, many diabetics recognize the early signs of a low glucose level. Teachers should reinforce a student's decision to stop his or her activity rather than to "though it out".
- f. The diabetic is particularly susceptible to infection and great care must be practiced to avoid cuts, abrasions, blisters, and fungus infection. The physical education teacher can help students monitor this important aspect of their health.
- g. Diabetics have excelled in every conceivable sport and activity. Many have achieved superstar status as professional athletes. For the young diabetic this means that the physical education program should be well rounded and include all of the same activities participated in by other students. The positive effects of

physical activity upon total health throughout life should be stressed as well as its unique value for the diabetic individual. The ultimate aim of the physical education experience is to foster within students who have diabetes an appreciation for the value of exercise as an important factor in the total treatment of diabetes.

## 5. Conclusions

The medical community has indicated that children with health impairments should be encouraged to participate in activity programs to the extent possible. There is a growing awareness that denying these youngsters the opportunity to participate in physical activity programs may interfere with their overall health as well as eliminate one of the important aspects of child development. All children deserve the opportunity to learn to play and exercise and participate in game, exercise, and sport activities with other children.

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