# Methodological Issues in Examination of Fear of Hypoglycemia

Initial research on fear of hypoglycemia (FH) has focused on quantifying FH and predicting its impact on glycemic control (1–6; unpublished observations). Explanatory models have suggested that experience with hypoglycemia should increase fear (worry) and the behavior to avoid future hypoglycemia, thus jeopardizing metabolic control (1; unpublished observations). Currently, FH is related to the number and intensity of hypoglycemic episodes (2; unpublished observations), risk of having hypoglycemia (4), psychological symptoms (5; unpublished observations), and self-care activities to avoid hypoglycemia (3,6). Despite these promising results, no consistent linear relationship has been found between FH and glycemic control. A combination of factors may account for this.

Research on FH has exclusively used cross-sectional designs. This can create several problems, the most serious of which concerns the use of $HbA_1$. $HbA_1$ has been used predominantly as an outcome measure (dependent variable); however, it can also be conceptualized as a risk factor (independent variable) for hypoglycemia (unpublished observations). Unfortunately, the inability to separate factors predicting hypoglycemia from those functioning as dependent variables renders $HbA_1$ all but uninterpretable. $HbA_1$ also obscures the role of blood glucose (BG) as a risk factor by failing to reflect variability. This has resulted in individuals with stable BG levels (low risk of hypoglycemia) being grouped with individuals with labile BG (high risk) at the same level of $HbA_1$. The current use of cross-sectional designs and $HbA_1$ also assumes that FH is stable over several months. Whereas some research has associated FH with relatively enduring states, e.g., perceived stress and psychological symptomatology (unpublished observations), other research suggests that FH may be influenced by recent experience with hypoglycemia (2). If FH is state-like, then different research methodologies may be warranted. Self-reports, for example, should be limited to the recent past. Because of the infrequency of severe hypoglycemia, this would yield few data unless samples were large. A better strategy for examining FH would be to use prospective designs that follow subjects across time and multiple hypoglycemic episodes.

Measurement of conditions likely to precipitate FH has also been problematic, relying in most cases on retrospective reports of hypoglycemia. Along with the usual problems of memory failure and self-presentational biases, retrospective reports limit the examination of hypoglycemic events to global characteristics, e.g., number of episodes or degree of distress. Prospective examination of hypoglycemia would allow the expansion of the models to include detailed information on qualities and consequences of hypoglycemic episodes.

Early models of FH assumed a linear relationship between fear and later glycemic control. Fear was believed to be adaptive when low and maladaptive when high. Recent research suggests that FH is highest when risk of hypoglycemia is high (unpublished observations). High fear when risk of hypoglycemia is high may be adaptive, motivating appropriate behavior to avoid hypoglycemia. Low fear (denial) in the face of high risk suggests a maladaptive response and a decreased likelihood of appropriate action to avoid hypoglycemia. These examples argue that the appropriateness of fear should be defined, in part, by actual hypoglycemic risk. We decrease the likelihood of identifying an FH-BG relationship by ignoring risk.

To summarize, further exploration of FH should include the use of prospective research designs and an expanded model of FH that includes risk of hypoglycemia, qualities and consequences of episodes, specific measures of self-care, and differential (e.g., adaptive/maladaptive) responses to hypoglycemic experiences. By addressing these issues, we may gain a more accurate description of the psychological impact of hypoglycemia on self-care and glycemic control.

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# Insulin and Atheroma in IDDM

Stout's (1) review emphasized the positive correlation between hyperinsulinemia and obesity, lipid disturbances, hypertension, and vascular disease in patients without diabetes and with non-insulin-dependent dia-