

**Attachment security as a predictor of blood glucose control in adolescents with Type 1  
Diabetes, when the roles of additional psychological factors are considered.**

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**2009**

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## Acknowledgements

Thank you to friends, family and colleagues for all of your support and encouragement over the two years taken to undertake this research.

Thanks to Matthias, Emily and Ion for your academic pearls of wisdom and clinical knowledge, which helped to steer my research in the right direction.

Special thanks to Mum, for your patient proof reading, and to Dad for sharing your good humoured take on matters of confusion (!). Thank you to Sam for reminding me that life exists outside of thesis and for your continued support.

## Abstract

**Introduction:** Key studies have found an association between attachment style and poor diabetes outcomes in the adult diabetic populations. Specifically insecure attachment has been found to predict elevated glycated haemoglobin levels (HbA1c). Further studies have indicated that substance use and mental health difficulties also influence HbA1c. These factors have been looked at individually making it difficult to directly assess the overall effect of attachment on HbA1c and the potential mediating effects of substance use and mental health. The adolescent population has not been considered in studies examining these relationships. This study compares attachment security, level of substance use, interpersonal problems, anxiety and depression in relation to their role in blood glucose control in an adolescent population with Type 1 diabetes.

**Method:** A quantitative, cross sectional, questionnaire design was employed to examine the role of the aforementioned factors in relation to HbA1c level. The target population included all patients aged 14 years to 18 years, inclusive, who attended for review at Diabetes Clinics across Lothian. Participants had a diagnosis of Type 1 Diabetes for at least one year and no additional diagnoses of mental health disorder or other chronic condition. At the clinic patients were approached and asked to complete a set of self report questionnaires.

Measures of attachment were adapted versions of the Relationship Questionnaire (RQ) and the Relationship Scales Questionnaire (RSQ). Interpersonal problems were assessed using the short version of the Inventory of Interpersonal Problems (IIP-32). The Hospital Anxiety and Depression Scale (HADS) assessed levels of anxiety and depression. The Adolescent Substance Abuse Subtle Screening Inventory- A2 (SASSI-A2) was used to measure substance use. Blood glucose levels (HbA1c%) were obtained from clinic staff. A total of 88 participants returned completed questionnaires (response rate 79.3%).

**Results:** When all correlations between predictors and HbA1c were examined, a negative correlation was found between attachment and HbA1c level. A positive correlation was found between anxiety and HbA1c level. Multiple regression analyses examined the relationship between attachment security and HbA1c before analysing additional predictors in the same model. No significant relationships emerged however the multiple regression model was not a significant fit for the data. Path Analysis considered all relationships between variables simultaneously while also providing information on how the model fits the data. Attachment security directly related to HbA1c levels when the contributions of gender, interpersonal problems and substance use were considered. Anxiety and depression did not predict HbA1c nor did they contribute to any other relationships with HbA1c. Interpersonal problems had a direct relationship with HbA1c when the contribution of substance use and attachment were considered.

**Conclusion:** Attachment predicts HbA1c. The nature of this relationship is further understood when the contribution of additional psychological variables are considered. Methodological issues, clinical implications and directions for future research are discussed.

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## **1.0 Introduction**

### **1.1 Aim of Current Study**

The aim of this study is to examine the relationship between attachment style and glycaemic control and the potential mediating effects of mental health difficulty and substance use. In addition, the relationship between glycaemic control and substance use, anxiety and depression will be examined. While these factors have been studied individually, this is the first study to comprehensively test the predictive role of attachment, mental health and substance use in an adolescent Type 1 diabetic population.

### **1.2 Rationale**

Ciechanowski, Hirsch and Katon (2002) conducted a postal survey assessing attachment style, depression and diabetes knowledge in 276 adults with Type 1 diabetes. They found a strong association between insecure attachment style and higher glycated haemoglobin (HbA1c) levels, indicating poor glycaemic control. A later survey with over 4 000 adult diabetes patients measuring attachment style, diabetes self care, depression and patient-provider relationship similarly reported that attachment style in adults was significantly associated with diabetes self-management and outcomes including general diet, exercise, glucose testing, foot care, smoking status and HbA1c (Ciechanowski *et al.*, 2004).

The association between attachment and diabetes outcomes can be considered from different perspectives. The nature of an insecure attachment style can often lead to avoidant or over involved ways of relating to others. In the context of health care provision, these maladaptive ways of relating can impact upon the way in which patients engage with services, for example missed appointments, and also the way in which service providers respond to patients. Similarly, the role of attachment in affect regulation and distress tolerance can impact upon an individual's ability to communicate need and his or her capacity to engage appropriately. The cumulative effect of these difficulties can result in inefficient relationships with health care providers which then lead to poor adherence to treatment and recommendations for diabetes care, and ultimately poor blood glucose control and complex health problems.

To date, no published studies have investigated the relationship between attachment style and diabetes health outcomes in an adolescent population. If what we know about adult attachment style and diabetes outcomes applies similarly to adolescents, then screening adolescents' attachment style at the point of diagnosis of diabetes may highlight those individuals most at risk of poor diabetes self-care and complex health problems. It is, therefore, important to research this area further as a greater understanding of the relationship between attachment style and health in adolescents with diabetes can be used to inform clinical practice, specifically in terms of engagement, and thus improve health outcomes.

Drug and alcohol misuse can have an impact upon an individual's ability to adequately control blood glucose, in addition to affecting blood glucose levels

directly. Lee and colleagues (2005) discuss several cases of young adults with Type 1 diabetes who misuse drugs and, or, alcohol. This paper discusses the various dangerous and potentially fatal metabolic problems that can result from substance misuse in the diabetic population, including diabetic coma, brain damage and in some cases death. Any knowledge pertaining to the adolescent diabetic population's vulnerability to substance abuse or dependence and the effect it has on capacity for adequate glycaemic control, along with the direct impact on blood glucose, can be used effectively in the future to educate this group on the increased risk to their health.

Low mood and anxiety can also impact upon an individual's level of functioning (Clark, 1989; Fennell, 1989). Within the diabetic population, depressed individuals may be less motivated to make the lifestyle changes necessary to control diabetes and to engage in services. Similarly, those anxious individuals may become avoidant of diabetes self care issues and the relevant services. As a result, it is likely that effective blood glucose control will be reduced and that individuals may become more at risk of associated health complications. Further research in this area is necessary to investigate the impact of affective and anxiety related difficulties on an individual's ability to adequately control diabetes, with a view to highlighting those individuals at greater risk of metabolic complications.

Diabetes outcomes include maintaining a healthy diet, complying with medication regimens, engaging with health care services, following exercise recommendations and taking responsibility for monitoring blood glucose levels. These activities impact upon blood glucose measures directly, thus blood glucose levels (HbA1c) indicate

high or low levels of self care activity. This study will examine the role of psychological factors in relation to diabetes outcomes, specifically HbA1c. It is hoped that findings will inform practice in terms of educating and engaging this population with a view to increasing levels of diabetes self care and decreasing levels of ill health and diabetic complications.

### **1.3 Diabetes**

#### **1.3.1 Definition and Prevalence**

The World Health Organisation (WHO; 2008) describes diabetes as a long term condition whereby the body does not produce enough insulin (Type 1 diabetes) or uses the insulin produced ineffectively (Type 2 diabetes). Insulin maintains blood sugar levels in the body, thus insulin deficiency can lead to hyperglycaemia defined as raised blood glucose levels (WHO, 2008). It has been suggested that hyperglycaemia can affect mood and co-ordination (Martin *et al.*, 2006) and cognitive performance (Cox *et al.*, 2005). Hypoglycaemia is the condition that arises when blood glucose is too low and can also lead to cognitive dysfunction (Ryan *et al.*, 1993) and even death (DiLiberti & Lorenz, 2001; Weston & Gill, 1999). Type 1 diabetes is most likely to have its onset in childhood and treatment requires daily administration of insulin. Type 2 diabetes is the most common type of diabetes across the entire diabetic population and generally occurs in adults. This is largely attributed to inactivity and being overweight (WHO, 2008). Treatment can involve oral medication but most often encourages diet and exercise regimes that balance blood glucose at a more healthy level.



Haemoglobin A1c (HbA1c; also referred to as glycated haemoglobin) forms when glucose attaches permanently to red blood cells at some point over the cell's four month life span. HbA1c provides an immediate measurement of the levels of glucose in the blood, and thus glycaemic control (Rewers *et al.*, 2007), by producing an average blood glucose reading, in the form of a percentage, from the previous four to twelve weeks. Each child and adolescent with diabetes should have a minimum of one HbA1c reading taken per year, and preferably between three and six readings per year (Rewers *et al.*, 2007).

Children and adolescents with diabetes are recommended to maintain their long-term HbA1c level at less than 7.5%. Children and adolescents whose blood glucose is consistently at an HbA1c level of more than 9.0- 9.5% are at high risk of health complications and require intervention (National Collaborating Centre for Women's and Children's Health, 2004; NICE Guidance, 2004; Rewers *et al.*, 2007).

In order to maintain a safe and healthy blood glucose level, diabetic patients are recommended to manage certain aspects of their lifestyle in specific ways. This is sometimes referred to as diabetes self care. Ahmed and colleagues' (2006) review of the literature has defined self care behaviours as appointment keeping, following the recommended frequency of blood glucose self monitoring, exercise, diet and medication adherence. Glycaemic control can be improved by adhering to a balanced diet of carbohydrates, protein and fat. Five portions of fruit and vegetables should be included and some routine in terms of snacks and meal times should be introduced.

Exercise should be balanced carefully with diet and insulin dosage, and blood glucose self monitoring should be encouraged before and after exercise (NICE Guidance, 2004).

Diabetes has been clearly linked with many additional physical health problems. If poorly controlled, diabetes can lead to blindness, damage to the nerves in feet and hands, limb amputation, kidney failure, heart disease, stroke and death (WHO, 2008). Some studies suggest that adults with Type 2 Diabetes are at a higher risk than the general population of coronary heart disease (Solomon *et al.*, 2000). In 2005, between one and three million people worldwide died from diabetes related ill health. The World Health Organisation goes on to warn that diabetic fatality will increase in the next ten years by more than fifty percent if changes are not made to individual, organisational and societal management of the disease (WHO, 2008).

Currently the UK has a diabetic population of 2.3 million (3.66%) which is expected to rise to over four million in 2025 (Smallwood, 2008, p.4). The US based National Institute of Health (2005) estimated prevalence of diabetes amongst those aged twenty and under to be 0.22%. When the child and adolescent population in England was examined, 209 out of 100,000 young people aged between zero and seventeen years were found to have diabetes (Haines & Kramer, 2009). The same study suggests that of the two types, Type 1 diabetes is more prevalent in young people, at ninety seven percent of the diabetic population. A small percentage (1.5%) of children and young people who have diabetes have a diagnosis of Type 2 diabetes as a result of obesity. Recent research in the UK examining both Type 1 and Type 2 Diabetes has shown evidence of a significant increase in prescribing anti-diabetic drugs to children aged 0-

18 years between 1998 and 2005 (Hsla *et al.*, 2008). Insulin use in children had nearly doubled while oral anti-diabetic drug use had increased by eight times the level reported in 1998. This suggests a rapid increase in the prevalence of Type 1 and Type 2 Diabetes in children and adolescents in the UK.

### **1.3.2 Implications within Healthcare Services**

A recent review carried out by Diabetes UK (Smallwood, 2008) reports that an estimated ten percent of all National Health Service (NHS) expenditure is on diabetes related care. This equates to around one million pounds per hour (Department of Health, 2006 as cited in Smallwood, 2008). Much of this expenditure is on alleviating medical conditions incurred as a result of poor glycaemic control and poor attempts at self care, such as end stage renal failure, blindness and amputation. This expenditure also includes increased outpatient appointments and increased rates of hospital admission for those diabetics experiencing medical complications. Regardless of the cause of admission, people with diabetes are twice as likely to be admitted to hospital and stay longer than fellow inpatients (National Diabetes Support Team, 2008 as cited in Smallwood, 2008). Saunders and colleagues (2004) looked specifically at Type 1 diabetic intravenous drug users (IVDA-DM) and found that they were admitted to hospital more frequently than non diabetic intravenous drug using controls. The same study found that the IVDA-DM group had a higher mortality and a higher rate of diabetic complication than the control groups, reflected in higher levels of inpatient care.

With the predicted increase in diabetes in the UK, it is becoming increasingly important to raise awareness of the potentially devastating complications of diabetes and the importance of diabetes self care, with a view to minimising NHS expenditure. Given that the primary responsibility for managing diabetes lies with the patient (Ciechanowski *et al.*, 2001), it is also important for healthcare providers to engage well with those individuals in order to improve diabetes self care, improve quality of health and thus reduce the cost to the individual and to society.

## **1.4 Attachment**

“Attachment styles are patterns of expectations, needs, affect regulation strategies and social behaviour”. This section will expand upon these words from Haggerty and colleagues (2009, p.1).

### **1.4.1 Defining Attachment**

Attachment theory (Bowlby, 1978b) holds that an infant develops a unique bond with the main caregiver in early infancy. The nature of this bond is based on the level and consistency with which the infant is cared for. The process of attachment behaviour elicits the close proximity of the caregiver, particularly when threat induces distress in that infant, which is thought to be an evolutionary adaptation to increase the infant’s likelihood of survival (Ainsworth, 1989). Such behaviours include both verbal and non-verbal gestures, such as crying and clinging to the caregiver as a method of gaining his or her attention. While providing protection against threat, the attachment figure also provides that infant with a safe base from which he or she can explore his

or her world independently, simultaneously providing that infant with a template for coping with stress and uncertainty (Bowlby, 1978b).

As patterns of behaviour are established and responses carefully monitored by the infant, the infant develops internal 'working models' (Bowlby, 1978b) as a way of understanding future events and relationships and to guide social behaviour (Allen *et al.*, 1996). These internal working models of attachment importantly provide the individual with an understanding of themselves, in terms of whether or not they are likely to elicit caregiving in others, and an understanding of others, in terms of whether the attachment figure is consistently an individual who can be relied upon to meet one's needs (Bowlby, 1978b). There is a certain predictive value to these working models which help guide behaviour and emotion regulation, such as anxiety, in new situations.

Ainsworth (1989) notes that these models are subject to the effects of developmental, genetic and environmental factors. For example, as the infant develops a sense of object permanence (Piaget, 1954), in other words an understanding that the caregiver continues to exist even when they cannot be seen, heard or touched, one will observe the emergence of separation distress when the caregiver leaves (Ainsworth, 1989). As the child develops further speech and motor skills, he or she is better able to communicate his or her desires to the caregiver thus introducing an additional layer to the expectation that needs may, or may not, be met. Further influences outwith this dyad must be considered, for example additional caregivers and the basic provision of food and shelter may impact upon the development of an understanding of the world.

The development of the 'strange situation' research method (Ainsworth *et al.*, 1978) provided the means to research the effect of infant experiences of consistent and inconsistent care giving at different points on the spectrum of nurturing and neglecting. From this study were coined the following categorical terms for attachment; 'secure', 'anxious/ambivalent' and 'avoidant', the latter two terms often being referred to as 'insecure' attachment styles. Ainsworth (1989) wrote that it is through development of a stable, mutual understanding with the caregiver that secure attachments are formed. Indicators of secure attachments include an infant's ability to tolerate separation with minimal distress and a confidence in exploring his or her immediate world. Insecure-avoidant attachment styles are thought to develop through overly rejecting or harsh relationships with the main caregiver. This style is characterised by a fear, and thus avoidance, of proximity and a developing sense of self sufficiency (Hazan & Shaver, 1987). Insecure- anxious/ambivalent attachment styles develop through inconsistent experiences of caregiving incorporating both positive and negative experiences. This style is characterised by a preoccupation with maintaining a relationship in an 'almost painfully exciting struggle' (Hazan & Shaver, 1987, p.513).

Secure attachment usefully serves as a template for guiding future interpretations and interactions in a fashion that endorses a sense of 'self' deserving of care from reliable 'others'. This template also provides a basis for effective emotion regulation and stress tolerance. A securely attached individual will have had experience of anxieties being contained but not smothered, and their self esteem and sense of worthiness being reinforced. In the context of an emergent ability to tolerate moderate distress based on the experience of distress as 'manageable' (Mikulincer & Florian, 1998), the

integration of these experiences act as a buffer against negative appraisals of interpersonal difficulties and stressors. As a result, future stressful life events may elicit some anxiety and affect, however the secure individual successfully regulates this emotion on the understanding that they have the inner resilience and external containment required to tolerate adversity.

For those individuals with an insecure attachment style, this protective buffer is attenuated by negative attributions towards the self and, or, others borne out of early experiences of caregiving. For ‘anxious-ambivalent’ individuals anxieties and distress were responded to inconsistently. Such individuals proceed to react to distress with strong and often disproportionate emotion, possibly rooted in an overwhelming sense of helplessness and a perception that support is transient and intermittent (Mikulincer & Florian, 1988). These individuals are likely to have difficulty in regulating their own anxieties, and thus distress, as it has become difficult to determine how, or if, that distress will be contained by others. This ambivalence around others’ responses may concurrently exacerbate distress, as the inner conflict between pursuing the containment that is occasionally offered and cutting off all attempts of care elicitation for fear of rejection continues.

For those individuals who have never had their distress soothed, ‘avoidant’ individuals, distress becomes a state to be avoided. These individuals are likely to have a strong sense that others are not to be relied upon and can be threatening or unreliable, particularly if one expresses weakness. Therein develops a fear of feeling or expressing emotion. It is adaptive for those individuals to overtly flatten affect and deny distress, given that the alternative is to have that need ignored and a sense of

unworthiness compounded or instantiated (Fraley et al., 1998). However, ‘avoidant’ persons may also continue an anxious struggle with an inner emotional pain, rooted in the desire for containment (Mikulincer & Florian, 1998). Theoretically, this would lead to a reduced tolerance for distress and huge anxiety around any increase in expression of these dampened emotions.

#### **1.4.2 Attachment processes in adolescence**

Allen and colleagues (1996) argued that Bowlby’s (1978a) theory of internal working models can be used to understand psychosocial functioning across the life span. Similarly, Hazan and Shaver (1987) highlighted the importance of the content of internal working models in terms of the continuity they provide between early and later emotions and interactions, applying Ainsworth’s (1978) attachment model to adults.

While adolescents may go on to develop significant attachments to important others, for example in romantic relationships, it is postulated that the internalised working models developed as an infant exert an enduring influence over future interpersonal relations and experiences of stress (Ainsworth, 1989). Hamilton’s (2000) research demonstrates the consistency of infant attachment assessed at 12 months old into adolescence as the same individuals were followed up aged seventeen to nineteen years old. Stability of attachment classification across time was 77% and infant attachment was found to be a good predictor of adolescent attachment. It is noteworthy that this study assessed attachment stability with reference to a specific attachment figure at each time point. It is not clear whether attachment style remains



stable over time with reference to significant others. Earlier research also found highly significant correlations between the security of attachment as an infant to mother and the security of attachment five years later to mother ( $r = .76$ ). This study also assessed attachment to a specific other and found that these five and six year olds also demonstrated stability in attachment style with fathers across time (Main *et al.*, 1985).

Allen and colleagues (1996) draw parallels between secure attachment in infancy and the ability of an adult to consolidate and interpret experiences through abstract reasoning, using predetermined internal working models, which develop a sense of ‘integration...coherence, autonomy, or security’ (Allen *et al.*, 1996, p.254). They go on to write that adults who lack this security may go on to demonstrate an impaired ability to engage in meaningful relationships and integrate the meaning of future social interactions. Thus models and patterns of understanding based in infant experience are shown to have a long standing influence through adolescence and into adulthood (Hazan & Shaver, 1987).

As detailed, Bowlby’s internal working models (1978b) provide an infant with a rule for understanding the self and a rule for understanding others. The following describes how infant attachment styles can be pervasive into adolescence and early adulthood using the framework of a two dimensional ‘self’ and ‘other’ model. Through use of self report and interview, Bartholomew and Horowitz (1991) examined the possibility of a four category model of attachment based on the intersection of two dimensions. This model incorporates a positive or negative sense

of self in combination with a positive or negative view of others. This prototypic theory of attachment is replicated in Figure 1.1.

|                            |                    |  |  |
|----------------------------|--------------------|--|--|
|                            |                    | MODEL OF SELF (Dependence)   |  |
|                            |                    | POSITIVE<br>(low)  | NEGATIVE<br>(High)   |
| MODEL OF OTHER (Avoidance) | POSITIVE<br>(low)  | CELL 1<br><b>SECURE</b><br>Comfortable with intimacy and autonomy          | CELL 2<br><b>PREOCCUPIED</b><br>Preoccupied with relationships       |
|                            | NEGATIVE<br>(High) | CELL 4<br><b>DISMISSING</b><br>Dismissing of intimacy<br>Counter-dependent | CELL 3<br><b>FEARFUL</b><br>Fearful of intimacy<br>Socially avoidant |

Figure 1.1 Model of Adult Attachment (Bartholomew & Horowitz, 1991, p.227).

Those individuals with a secure style of relating to others as an infant develop internal working models which combine a positive sense of self with a positive sense of others (Bartholomew & Horowitz, 1991). These individuals feel valued and deserving of care and respect and view others as non judgemental and receptive to their emotional and practical needs. This is based on early experiences of responsive and consistent care giving. Such people report relatively low distress, yet seek support appropriately (Kobak & Sceery, 1988; Mikulincer & Florian, 1998).

The infant attachment style ‘insecure-ambivalent/anxious’ is analogous to the adult attachment style that is termed ‘preoccupied’ (Bartholomew & Horowitz, 1991; Main & Goldwyn, 1985, as cited in Kobak & Sceery, 1988). Bartholomew and Horowitz (1991) describe how these individuals combine a negative sense of self, for example

unworthiness, with a positive view of others. Others are necessary for this individual to feel valued. Individuals with a preoccupied style of relating have an over activated attachment behaviour system, which constantly seeks reassurance and close relations with others based on an experience of inconsistent caregiving (Ciechanowski & Katon, 2006). Research has found that preoccupied individuals rate themselves as less socially able than secure individuals and report more symptoms of emotional distress than both secure and dismissing individuals (Kobak & Sceery, 1988). Such people become hypervigilant towards distress and continue to ruminate over negative appraisals and associated affect, while monitoring the presence of caregivers from whom they hope to elicit proximity. This is referred to as hyperactivation of attachment behaviours (Haggerty, 2009). Mikulincer and Orbach (1995) hypothesise that ‘anxious-ambivalent’ individuals are not able to distance their ‘self’ from these processes, nor can they repress negative emotion. These individuals find it difficult to prevent isolated experiences of distress from pervading all other aspects of their life and their communication. Preoccupied individuals instil a high level of faith in others to alleviate reported distress and continue to experience low self belief, which in turn supports the two dimensional ‘self’/ ‘other’ model.

Adult attachment style of the ‘fearful-avoidant’ type (Bartholomew & Horowitz, 1991), which is paralleled with infant ‘insecure-avoidant’ attachment, is developed through a negative sense of self, based on overly harsh or critical parenting (Ciechanowski & Katon, 2006) and a negative view of others, in terms of others being ‘untrustworthy and rejecting’ (Bartholomew & Horowitz, 1991, p.227). An individual fitting this prototype avoids close relationships with others as a protective strategy against what they anticipate will be rejection of their unworthy self. In terms of affect

regulation, an insecure-avoidant type of attachment will be reflected in minimising the acknowledgment of distress and its source, while inhibiting overt symptoms of distress (Kobak & Sceery, 1988; Main *et al.*, 1985). This outward display of resilience and autonomy is accompanied by an underlying sense of anxiety (Mikulincer & Florian, 1998).

The prototype that Bartholomew and Horowitz (1991) introduce is referred to as 'dismissive-avoidant'. This style is characterised by a positive sense of self and a negative sense of others. These individuals avoid intimacy, based on an early experience of emotionally unresponsive parenting, and develop an over inflated sense of self sufficiency as a way of protecting the self from rejection. Bartholomew and Horowitz (1991) acknowledge that this prototype may parallel Hazen and Shaver's (1987) 'avoidant style' but principally note that it does not have an equivalent in the three category model. The difference between a 'dismissing' positive sense of self and a 'secure' positive sense of self is the development of that sense of self (shown in Figure 1). The 'secure' self is derived from a belief and evidence that others will help and therefore that one is worthy of help. The 'dismissive' self is derived from evidence that others do not provide support and protection and that one has no alternative but to take care of one's self. Thus the positive self, in the context of a dismissing attachment style, emerges from a defensive source (Turan *et al.*, 2003). Findings indicate that those individuals with a dismissing attachment style perceived less support from others than the secure and preoccupied groups (Kobak & Sceery, 1988). This again supports the two dimensional 'self'/'other' model as those with a dismissive attachment style of relating do not rate 'others' as a positive source of support.

As with the 'fearful-avoidant' attachment style, dismissive individuals inhibit overt symptoms of distress and covert cognitions pertaining to distress, whilst avoiding further appraisal of the distressing stimuli. This is referred to as a 'deactivated attachment strategy' (Haggerty, 2009). It feels safer to remain self-reliant than to risk being emotionally exploited by untrustworthy others. This theory is supported by Rholes and colleagues' (1998) findings that avoidant individuals do not seek support when distressed and instead turn away from their attachment figure to distraction in a 'world of objects'.

Shaver and Hazan (1993) later agree that this two-dimensional prototypic model provides a good framework for their original theory. Brennan and colleagues (2000) show that the two dimensions developed in Bartholomew and Horowitz's (1991) model are essentially assessing the same dimensions used by Ainsworth's Strange Situation which are dimensions of anxiety and avoidance. In addition, Ciechanowski and colleagues (Ciechanowski & Katon, 2006; Ciechanowski, Walker *et al.*, 2002) report that, while it is possible to determine the degree to which an individual is defined by each of the four attachment styles by using dimensional models, it can be helpful in clinical work and research to determine the dominant attachment style.

In adolescence, insecure attachments are evidenced as being associated with substance use, behavioural difficulties, interpersonal problems with family and friends (Elgar *et al.*, 2003) and contact with health services (Ciechanowski & Katon, 2006). There are also links between insecure attachment style and mental and physical health difficulties (Ciechanowski, Hirsch *et al.*, 2002; Straus & Kantor, 1994; Turan *et al.*, 2003). Many of these findings can be understood when one considers the

developmental tasks that adolescents face, and the effect attachment style may have upon these.

Adolescence can be considered a period of increased exposure to stress as developmental transitional processes are inevitable. These transitions include the move from small, supportive educational establishments into larger, perhaps less supportive arenas such as High School or College; moving away from the family home to live independently; or transitioning from school child to 'worker'.

Attachment is particularly relevant in the task of transition as the very nature of transition generally requires a bold move from a small, safe and nurturing relationship, be that with an institution or an individual, to larger and often 'unknown' environments, where support has not yet been secured.

While it is not a given that transitions in adolescence will be difficult and distressing, Harrop and Trower (2001) write that 'for a significant minority adolescence is very distressing.' (p.244). When one considers transition as an external stressor, one can expect ingrained attachment behaviours to be elicited at this time. Based on internal working models, insecurely attached adolescents may go on to negatively appraise themselves and, or, others during these stressful times.

For example, consider the adolescent who successfully forges an identity independent of his or her parents who must in turn replace these attachments within their peer group. Poor attachments to the primary care giver as a child, resulting in a negative view of the 'self', are likely to impede this process. He or she may feel inadequate and believe his, or her, 'self' to be unworthy of such friendships. Further more, there may

exist the perception that ‘others’ are not to be trusted. This adolescent becomes isolated and lacks the social support that would prove protective against mental health problems during stressful transitions (Carr, 2006, p.74). Further more, the poor emotion regulation associated with insecure attachment style may also contribute to the development of mental ill health over the course of these developmental tasks. Therefore the developmental task of ‘transition’, in its various guises, can be influenced by attachment style.

The effect of adolescent attachment style specifically on interpersonal problems, substance use mental health and physical health will be discussed in the following sections.

### **1.4.3 Attachment and Interpersonal Problems**

Benjamin (1974) draws parallels between interpersonal behaviours and attachment behaviours in that their origin can be traced back to early experiences of others’ behaviour towards that individual. Horowitz (1996) writes that interpersonal problems occur when individuals continue to use unhelpful ways of relating to others initially developed as a means of maintaining a “psychological tie to an earlier attachment figure.” (p. 284). Haggerty and colleagues (2009) describe how interpersonal problems can be understood as a product of the dissonance between an individual’s anxiety around the consequences of seeking support and the innate desire to express support seeking behaviour. Therefore an individual’s attachment style as an experience of their interpersonal learning history will inevitably dictate behaviours

that conflict with an individual's transient need and desire, resulting in a presentation of interpersonal problems.

Horowitz' (1979) analysis of qualitative data derived from psychotherapy initial assessment interviews produced three dimensions underlying interpersonal problems. The first dimension addressed the degree to which an individual was cognitively and emotionally involved with others, described as 'degree of psychological involvement'. Behaviours high on this dimension included feeling sensitive to rejection, jealous and being more easily influenced or 'compliant' than others. Behaviours low on this dimension included the ability to feel pleasure and to enjoy oneself in the absence of guilt, to feel disconnected and 'independent'. Horowitz' (1979) second dimension reflects the degree to which an individual is involved with another in terms of a spectrum of 'friendly' to 'hostile' involvement. Behaviours associated with this dimension included intimacy and socialising, along with shyness and neediness, while behaviours low on this dimension were of an aggressive, angry and critical nature. The third dimension was an individual's intention to control others. Behaviours endorsing this dimension reflected assertiveness and manipulation, while those behaviours drawing upon closeness and love, but also irresponsibility, were low on this dimension. This model was later considered by Horowitz (1996) using only the second and third dimensions, referred to as 'affiliation' and 'dominance' respectively. This model is reflected in a measurement of interpersonal problems, the Inventory of Interpersonal Problems (IIP; Horowitz *et al.*, 1988). The eight constructs of this scale fit into an overarching two dimensional model of 'cold' to 'nurturant' and 'autocratic' to 'subassertive', which is analogous to the aforementioned 'affiliation' and 'dominance'. Horowitz (1996) describes the



combination of these two dimensions as creating a 'warm' versus 'cold' interpersonal space.

When one considers the 'self' 'other' model of attachment (Bartholomew & Horowitz, 1991), those individuals with a negative sense of others may actively avoid closeness with others and feel unable to surrender any element of control over their life. Such people may present with 'cold' and 'autocratic' interpersonal styles (Horowitz, 1996). If one extends this theory, one may hypothesise that those individuals with a positive sense of others and a negative sense of self may present as self sacrificing, 'nurturant' and overly accommodating, 'subassertive'. Those individuals with a positive sense of self and a negative sense of others may appear aloof and selfish, perhaps relating to the 'cold' or 'autocratic' interpersonal styles. These senses of 'self' and 'others' will inevitably dictate the level at which an individual is prepared to invest in or interact with another. When the behaviour of seeking support when distressed is considered, one can understand how internalised working models dictating expectations around 'self' and 'other' may conflict with the emotional state of distress and the resulting desire for comfort.

Bartholomew and Horowitz (1991) looked at the relationship between self reported subscale scores on the Inventory of Interpersonal Problems (Horowitz *et al.*, 1988) and each attachment style based on their four category prototypic model, incorporating 'self' and 'other' dimensions. For 'secure' attachment style, modest positive, significant correlations were shown with 'overly expressive' and 'autocratic' scales and a negative correlation with 'cold' and 'introverted' scales. 'Dismissing' attachment style showed high positive correlations with the 'cold' subscale and

negative correlations with 'nurturant', 'expressive', 'subassertive' and 'exploitable' scales. Those endorsing a 'preoccupied' attachment style showed positive correlations with the 'overly expressive' scale and scores negatively correlated with the 'cold' scale. Attachment scores for the 'fearful' group correlated positively with 'lack of assertiveness' and 'social inhibition', while scores on 'autocratic', 'competitive' and 'expressive' scales were negatively correlated.

Later work by Horowitz (1996) linked a general 'warmness' of interpersonal style with a secure attachment. People with dismissing attachment style appeared to have elevated scores within the 'cold' styles of interpersonal relating. Those with a fearful attachment style appeared to demonstrate a more subassertive style of relating. Those with a preoccupied attachment endorsed a 'warm' dominance. Haggerty and colleagues (2009) similarly found highly significant correlations between each of the four attachment styles and constructs within the IIP. These studies support the hypothesis that interpersonal problems and attachment share a theoretical basis

The perception of interpersonal problems can be understood as a product of enacting maladaptive behaviour dictated by internalised models. Although often emotionally painful, these behaviours act as a defence against others and the 'self' which lead that individual to repeat enactment. Essentially, interpersonal problems arise when an individual recreates the behaviour they found most protective in the context of early maladaptive attachments in later interpersonal relationships (Horowitz *et al.*, 1993). When insecurely attached individuals experience the innate and evolutionarily driven desire to activate adaptive attachment behaviours, often in the context of an inner emotional pain that craves containment, this behaviour is over-ridden by internal

working models which dictate quite a different way of interacting and expressing emotion (Fraley *et al*, 1998). The resulting incongruent behaviour leads to an experience of interpersonal problems, as the individual recognises that the desired behaviour is quite different to the actual behaviour or interaction conveyed, or longed for.

#### **1.4.4 Attachment and Health**

##### **1.4.4.1 Attachment and General Health**

Hunter and Maunder (2001) considered the role of attachment in patients with a physical illness. The attachment system is activated under such conditions when the individual perceives that they are under threat of ill health or perhaps fatality. Using Hazan and Shaver's (1987) attachment theory, they describe the presentation of individuals with each attachment style. This 'secure' individual has a positive view of how others will care for them in this situation of threat. Care will be good enough and carers will be trustworthy. The positive view of the self allows this person to communicate his or her needs confidently and appropriately. In particular, distress can be communicated and received in a mutually acceptable manner. These securely attached patients "are not difficult to help" (Hunter & Maunder, 2001, p.179).

For the 'insecure-anxious/ambivalent' patient, 'preoccupied', he or she has a negative view of the self and thus a lack of confidence in his, or her, ability to cope with the illness (Hunter & Maunder, 2001; Maunder & Hunter, 2001). A positive view of others facilitates help seeking behaviour and a feeling of containment on the

elicitation of care. However, in the context of internal working models which suggest that care can be inconsistent yet necessary for survival, this individual will not remain reassured in the absence of medical personnel and may resort to inventive ways of maintaining a constant distress signal with a view to securing constant support (Groves, 1978). Distress may thus be communicated without regard for its impact upon the carer and desperation can lead the carer to avoid, thus perpetuating the vicious cycle of behaviours from the anxious patient who fears abandonment.

Hunter and Maunder (2001) also looked at the ‘insecure-avoidant’ patient. They described this patient as having a positive sense of self in terms of ‘self reliance’ and negative sense of others’ ability to support, which is analogous to the ‘dismissing’ attachment style. During periods of illness, this individual is untrusting of others’ ability to care adequately and fully for them, predicting that they will be ‘let down’. This becomes apparent in the individual’s under reporting of symptoms and needs and their inability to understand another’s concern. This ingrained sense of independence leads to poor communication of often urgent needs and a rejection of important advice or treatments that would cause this individual to feel less in control. Riggs and colleagues (2002) found a similar reluctance in this group of individuals to seek support and psychotherapy when compared to others. This is perhaps a result of the perception that others will be unable to offer adequate support and that the individual should therefore avoid disclosing personal distress.

Ciechanowski and colleagues (Ciechanowski, Walker *et al.*, 2002) looked at attachment style, symptom reporting and primary care utilisation and cost, in a sample of over seven hundred female medical patients. It was found that those participants

with a preoccupied or fearful attachment style had the highest level of symptom reporting. This fits with attachment theory, which suggests these individuals have a sense of low self worth and resulting poor perception of their ability to cope. Those participants with a preoccupied attachment demonstrated the highest use of primary care services and incurred the highest costs compared to those with a fearful attachment, who had the lowest rates of use. With reference to Hunter and Maunder's (2001) review, the preoccupied group once again demonstrated excessive use of health care services as a method of ensuring consistent reassurance and satisfying the negative view of self model which postulates that the self can not cope. The fearful group, however, who have a negative sense of self *and* others seemed to deliberately avoid using services where possible. This reinforces the idea that one is not worthy of care and attention and that it is potentially damaging to engage with a service when they will inevitably turn out to be untrustworthy. Riggs and colleagues' (2002) research, which found that attachment style affected support seeking, supports the theory that attachment based ways of relating to services have an impact upon an individual's engagement and maintenance of good health. The following section details health issues with specific reference to diabetes.

#### **1.4.4.2 Attachment and Diabetes**

The health behaviours of patients who have diabetes can also be understood in the context of attachment theory. This area has been researched extensively (Ciechanowski *et al.*, 2004; Ciechanowski *et al.*, 2001; Ciechanowski, Hirsch *et al.*, 2002; Ciechanowski & Katon 2006; Ciechanowski, Russo, Katon, Simon *et al.*, 2006; Ciechanowski, Russo, Katon, Von Korff *et al.*, 2006; Dashiff *et al.*, 2006; Turan, *et*

*al.*, 2003). In an adult diabetic population, 44.2 % of patients were classed within secure attachment style, 38.5% as dismissing, 7.9% as preoccupied and 12.1% as fearful (Ciechanowski *et al.*, 2004). Later work by Ciechanowski and colleagues (Ciechanowski, Russo, Katon, Simon *et al.*, 2006) found comparable rates of attachment style in the adult diabetic population; 43.9% for secure, 35.8% for dismissing, 8.1% for preoccupied and 12.2% for fearful attachment style.

Research looking at diabetic patients' perceptions of health care (Ciechanowski & Katon, 2006) demonstrated the difficulties of individuals with dismissive and fearful attachment styles in engaging services. These individuals reported experiencing relationships with health care providers as 'hierarchical'. Patients with a fearful attachment style experienced a sense of rejection and those of a dismissive style experienced a sense of being controlled. This study may go some way to explaining the findings that those diabetic patients with a dismissing attachment style showed lower adherence to the diabetes care regimen, poorer glycaemic control, poorer adjustment to the disease and an increased use of unhelpful coping strategies (Ciechanowski, Hirsch *et al.*, 2002; Turan *et al.*, 2003). Perhaps these individuals 'opt-out' of a system whereby they feel that they have to relinquish their sense of control.

Ciechanowski and colleagues (2001) also found that individuals with a dismissing attachment style, in the context of what that patient rated as poor 'patient-provider communication', showed poor adherence to the diabetes treatment regimen. This was reflected in poor glucose control. Similarly, those with a fearful attachment style showed poor adjustment to diagnosis and low injection adherence (Turan *et al.*,

2003). Maharaj and colleagues (2004) report that adolescent girls show an inverse relationship between experience of emotional closeness in the context of mother-daughter relationships, i.e. secure attachment, and blood glucose. If one can assume that the more avoidant attachment styles lead individuals to suppress functional attachment behaviour under conditions of stress, then it follows that these individuals will not engage with health care services and will thus struggle to understand and manage their illness. Turan and colleagues (2003) consider these behaviours to be functions of very different ways of coping due to the different sense of self the two avoidant attachment styles hold. When coping styles were examined, the 'fearful' individuals were more likely to see themselves as helpless and unable to cope with the illness. The dismissing individuals also demonstrated this style of coping and, in addition, were more likely to distract themselves away from diabetes management related issues. Thus both types of individual become avoidant in terms of managing their diabetes (Turan *et al.*, 2003).

And so it is clear that the attachment relationship between adolescents and their caregiver at this time of transition has an impact on a future sense of self efficacy and thus their ability to manage their diabetes. These adolescents may also struggle to engage health care services as a result of a mistrust of others and, or, a negative sense of the self. It follows that if a young adolescent is unable to care sufficiently for their diabetes that complications and further ill health may occur.

### **1.4.4.3 Implications of Attachment and Diabetes for Healthcare Service**

#### **Provision and Utilisation**

Evidence clearly links certain attachment styles with over and under use of health care services. The cost of caring for patients with diabetes varies depending on the level of engagement. It could also be argued that the cost of service provision is also influenced by attachment style. Those diabetic patients who demonstrate avoidant patterns of engagement with services are likely to have an impact upon service use and subsequent provision. Such individuals may display either a dismissive or fearful attachment way of relating. They are likely to deny distress and to cope with emotional discomfort by avoiding the stress stimuli, in this case that may be diabetes services and treatment recommendations. While these patients avoid engagement with services, perhaps counterbalancing the overuse by other patients, the consequences of poorly managed diabetes may then go unnoticed and without advice or attention. Therefore, these individuals are far more likely to develop serious complications that go on to require complicated procedures and extended hospital stays. The following study by Ciechanowski and colleagues would support this hypothesis.

Ciechanowski and colleagues argue that, as a result of difficulties in trusting others and balancing the anxieties around relinquishing control with interpersonal styles that support psychological distancing and independence, those patients with fearful or dismissive attachment styles are more likely to miss appointments (Ciechanowski, Russo, Katon, Simon *et al.*, 2006). For those individuals, the distress associated with putting trust in others is intolerable and it feels safer to avoid these interactions, which in this case includes avoiding service engagement. In 1998, the House of Lords



reported a loss of around £360 million to the NHS as a result of outpatients missing appointments with health care professionals (as cited in Stone *et al.*, 1999, p.114). Stone and colleagues (1999) write that the average cost of one missed outpatient appointment between 1996 and 1997 was £61. Thus it is feasible that patients with an avoidant style of relating not only cause themselves immeasurable harm but also incur huge costs to the NHS in doing so. As discussed, those patients with diabetes, who have developed a preoccupied attachment style, may incur additional and unnecessary cost as a result of their persistent need to feel supported. Therefore, an insecure attachment style may be associated with increased health care costs, a reduction in individual need being met and, in some cases, increased cost to individual quality of health.

Ciechanowski and Katon (2006) discuss the 1997 American Hospital Association study which highlighted the shortfalls of patient engagement satisfaction across the US and which provided the platform for the highly regarded report, the *Institute of Medicine Crossing the Quality Chasm* (2001, as cited in Ciechanowski & Katon, 2006, p.3076). This report identified that important changes had been made to health care provision but that further change was required to shift the public perception of health care experiences. In a study of US patients with diabetes nearly a decade later, the consensus, regardless of attachment style, was that the health care system felt 'rushed, impersonal and fragmented' (Ciechanowski & Katon, 2006, p.3076).

Given that the physical and emotional needs of an unwell patient are often acute and that it is often only the health care provider who can meet these needs, it is understandable that patient anxieties may run high. This highly charged situation in

which the patient suddenly needs protected can understandably resonate with early childhood experiences of needing practical and emotional support, especially if the health care system, in being fragmented, distant in its decision making and inconsistent in its response, re-enacts what was once a rejecting or emotionally cold attachment. How these needs were, or were not, met as a child will undoubtedly influence how the adolescent or adult copes with the re-enactment of this attachment being played out with the healthcare provider. Therefore service providers would benefit from physical health treatment plans and recommendations tailored to meet the psychological need of individuals.

Possible solutions include patient centred care focussing on relationship style as an efficient way of improving patient care and engagement, as recommended by Ciechanowski and colleagues (Ciechanowski, Russo, Katon, Von Korff *et al.*, 2006). This solution is supported with evidence that diabetic patients with an ‘independent relationship style’, derived from attachment measures and analogous to ‘dismissive’ and ‘fearful’ attachment style, are found to benefit in terms of severity of depression and satisfaction with services from a collaborative approach that takes the patient’s lead in mode of engagement (Ciechanowski, Russo, Katon, Von Korff *et al.*, 2006).

## **1.5 Substance Use in Adolescents**

### **1.5.1 Prevalence**

A study of over three thousand university students, from ten universities across the United Kingdom, found that 11% did not drink alcohol, while 61% of males and 48%

of females drank more than the recommended weekly amount. Furthermore 15% of drinkers exceeded the threshold defined as ‘hazardous drinking’ and 28% of drinkers admitted to binge drinking (Webb *et al.*, 1996, p.922).

Studies of adolescent drinking behaviours across the United States and the Netherlands indicate varied rates of alcohol consumption amongst the different age groups (Kwakman *et al.*, 1988, Treno *et al.*, 2008, Monitoring the Future, MTF, 2005). When adolescents were surveyed, 10 % to 19.7% of thirteen and fourteen year olds (in California and across the United States respectively) had consumed alcohol in the last 30 days in compared to 19.6% to 35.4% of fifteen year olds and 27.5% to 35.2% of sixteen year olds (Treno *et al.*, 2008, Monitoring the Future (MTF), 2005). Across these age groups, 13 to 16 years, use of alcohol in the last 30 days was 28.1% in American adolescents (Johnston *et al.*, 2008). A further study of adolescents aged 16- 19 years in the American mid west found that alcohol had been used at least once by 77.6%, with 51.2% of adolescents drinking between 3 and 6 times (Kostelecky, 2005).

Slightly more than a third (36%) of sixteen to nineteen year olds report having used marijuana at least once, and a quarter of them admit having used other illicit drugs during the same time period when the same mid western American adolescents were surveyed (Kostelecky, 2005). In 2008, 14.6% of school children across the United states, aged 13 to 18, had used ‘any illicit drug’ in the last 30 days. When asked specifically about cannabis use, the figure was 12.5% (Johnston *et al.*, 2008).

A longitudinal study in Australia found that alcohol use was more prevalent than cannabis use in the adolescent and young adult population (Patton *et al.*, 2007). Of those adolescents meeting criteria for 'high risk use' (daily), more than half were using alcohol alone, compared to a maximum of 11% using both alcohol and cannabis and a maximum of 33 % using cannabis only. However, on analysing data from adolescents across Europe, Kuntsche and Jordan (2006) found cannabis use in schools to be higher and more problematic than alcohol use, reporting that 33.4% of students had arrived at school under the influence of cannabis and 17% had used cannabis or other illicit drugs in the school. This compared to 4.1% of students who came to school drunk and 13.2% who had used alcohol on school premises. While findings on prevalence are varied and sometimes contradictory, the fact remains that many adolescents are known to use and sometimes abuse substances.

### **1.5.2 Risk and Changing Rates of Use**

Ashton and Kamali (1995) saw rates of drug and alcohol use rise among university students over a ten year period. Similarly, in the context of social change, researchers in Poland saw alcohol use increase between 1988 and 2004 across five cohorts of fifteen year olds, in particular in young females (Okuliz-Kozaryn & Borucka, 2007). Compared to 1988, by 2004 the percentage of 'heavy' (in this case frequent) drinkers had increased from 21% to 25% and 'light drinkers' (those who had not drunk alcohol in the last 30 days and who had never drunk more than 60g of pure alcohol on one occasion) fell from 55% to 34%. Furthermore, 'alcohol abusers' (less frequent users of alcohol in higher volumes and of a higher alcohol content, sometimes referred to as 'binge' drinkers) rose from 11% of fifteen year olds in 1988, where only

wine was consumed, to 18% of fifteen year olds in 2004, of which nearly three quarters met criteria for beer, wine or vodka 'abuse'.

Johnston and colleagues (2008) reviewed the findings of the longitudinal Monitoring the Future (MTF) data set. They write that cohorts of children in grades 8, 10 and 12 at school, i.e. aged 13 to 18 years, showed a gradual decrease in the use of lifetime (i.e. at least once in their life) illicit drug use, excluding cannabis, from 43% in 1981 to 25% in 1992 (Johnston *et al.*, 2008). From the early nineties until 2001 this figure slowly increased but has since fallen to its previous rate of 25% in 2008. Illicit drug use, including the use of cannabis, shows a similar trend from 1981 to 2008 but in higher proportions. The figure of 66% for lifetime use of illicit drugs including cannabis in 1981 fell to 47% in 2008.

A 2003 study, specifically assessing self reported symptoms, found that 19.4% of fifteen year olds in the West of Scotland have a substance abuse or substance dependence disorder (West *et al.*, 2003).

These studies demonstrate the ease with which substance use can increase and decrease depending on the current social, political and economic environment. Thus it can be expected that the current reported rates of substance use amongst adolescents have every potential to grow.

### 1.5.3 Substance Use and Diabetes Control

Aarons and colleagues (1999) found that adolescents who abuse alcohol both for a brief and extended period are likely to go on and have a higher number of, and for females more severe, health difficulties. This in its own right is concerning, however, when those adolescents already suffer from a chronic illness the implications are worse yet. The complex and demanding management of diabetes has previously been outlined, alongside the potential health related complications that may arise in the context of poor metabolic control. While the role of attachment in diabetes metabolic control has been considered, it is also important to acknowledge the potential impact of substance use on diabetes.

Ahmed and colleagues (2006) reported that around half of adults with diabetes consume alcohol. It was found that adolescents with diabetes had consumed significantly less alcohol and tobacco in the month prior to assessment when compared to the non diabetic control group ( $p < .01$ ) (Martinez-Aguayo *et al.*, 2007). They also showed significantly lower lifespan use of illicit drugs. Frey and colleagues (1997) support the finding that adolescents with diabetes have lower levels of substance use, while Kovacs and colleagues (1997) found that diabetic substance use is around a third that of their non diabetic adolescent peers.

Gold and Gladstein (1993) similarly noted lower overall frequency of drug and alcohol use in the diabetic adolescent population when compared to the general adolescent population, however of those studied almost a quarter demonstrated risky drinking behaviour considered dangerous for adolescents with diabetes. Martinez-

Aguayo and colleagues (2007) report that the lower rate of substance use in adolescents with diabetes is only significant in early adolescence, during grades 8, 9 and 10, and that levels of use between the two groups are comparable in the 11th and 12th grade adolescent cohorts.

Research suggests an inverse relationship between level of alcohol consumption and adherence to recommended diabetes self-care behaviours (diet, exercise, blood glucose self monitoring, medication adherence, smoking, HbA1c testing) (Ahmed *et al.*, 2006). These reductions in diabetes self care could be attributed to the effect of alcohol on the body in terms of the short term cognitive impairment. In particular, alcohol use affects those systems that facilitate awareness and speed of response. One study found that small amounts of alcohol, amounting to a level just above the legal limit for driving in the UK (20-25 mmol/l), impede a patient's ability to detect hypoglycaemia (Kerr *et al.*, 1990). Later research warns against the cumulative effect of alcohol and hypoglycaemia for diabetic patients which reduces short term cognitive performance and thus has implications for dangerous vocations such as machine operation and driving (Cheyne *et al.*, 2004).

Further research shows evidence for the effect of alcohol on the physiology of diabetes. Small amounts of alcohol increase the likelihood of hypoglycaemia the following day if taken with an evening meal (Turner *et al.*, 2001). It has also been suggested that alcohol can attenuate the release of essential hormones in response to hypoglycaemia (Kerr *et al.*, 2007), thus potentially impeding the recovery of metabolic control following a hypoglycaemic episode. However these authors acknowledge additional processes which may offset this potential difficulty and it is

important to note a previous study whereby results counter these findings (Kerr *et al.*, 1990). For example, Howard and colleagues' (2004) review of the literature found no effect of moderate alcohol intake on blood glucose control. Similarly, when HbA1c levels were measured in the diabetic population, Wakabayashi and colleagues (2002) found no differences between alcohol abstainers, light drinkers and heavy drinkers.

In terms of drug misuse, those diabetic adults with a diagnosis of intravenous drug abuse showed higher HbA1c levels than diabetic controls with no history of intravenous drug abuse (Saunders *et al.*, 2004). These adults also had increased vascular complications, peripheral nerve damage, renal complications and eye disease. Lee and colleagues (2005) found similar patterns on reviewing several cases of young men with diabetes who presented with metabolic complications in the context of substance abuse.

#### **1.5.4 Substance Use and Attachment**

Flores (2001) describes addiction as an 'attachment disorder'. He argues that poor attachments result from the deprived and vulnerable 'self' and substance abuse acts as a form of 'self-repair', masking that vulnerable 'self' and attenuating the associated anxieties. Substance use may also serve to act as an external emotion regulator for those individuals whose attachment representations do not incorporate an inner model of regulation.

Buist and colleagues (2004) found that adolescents with a poor quality parental attachment are more likely to display aggressive and delinquent externalising



behaviours, which may well include excessive substance use. Van der Vorst and colleagues (2006) report an inverse relationship between quality of parental attachment and problematic drinking behaviour. They note, however, that the effect is small and so results should be interpreted with caution. Kostecky (2005) and Parker and Benson (2004) report a similar inverse relationship between parental attachment and adolescent substance use, while earlier research found that insecurely attached adolescent males reported more substance abuse difficulties (Elgar *et al.*, 2003). Allen and colleagues (1996) reported the association between insecure attachment style, in particular a dismissing style, and the use of hard drugs in early adulthood.

Further studies have found that children and adolescents who experienced neglectful, punishing or enmeshed parenting were more likely to suffer from severe substance abuse difficulties in adulthood (Suchman *et al.*, 2006, Tosserani *et al.*, 2000, Straus & Kantor, 1994). Tosserani and colleagues (2000) also note that this type of ‘authoritarian and controlling’ way of relating to offspring decreases autonomy, increases dependency and increases family conflict. These factors are all influential in the development of substance use disorders (Tosserani *et al.*, 2000). Such early experiences of trauma and neglect are likely to be reflected in insecure attachment styles. Given the difficulties associated with emotion regulation and distress tolerance in this population (Mikulincer & Florian, 1998), they become a group vulnerable to maladaptive coping behaviours which can include substance abuse. The overuse of substances can be hypothesised to act as a tool for numbing the inner pain and abandonment experienced through a pervasive mistrust of others and, in some cases, a hatred of the self (Kwakman *et al.*, 1988). Substance use thus acts as a method of avoiding the distressing stimuli. In addition, the chemical experience can contribute to

the creation of a temporary persona, one that appears confident, self-assured and engaging. Thus substance use can be hypothesised to mask the anxieties an individual experiences (Goodwin *et al.*, 2004).

Looking at specific types of attachment, adolescents with an anxious (preoccupied) type of attachment reported that use of alcohol was to facilitate social contact (Kwakman *et al.*, 1988). These individuals are likely to have a mistrust of others, alongside a desire to be close to others, as a result of inconsistent experiences of care giving and resultant low self esteem. They may feel that alcohol inhibits the anxiety which prevents them from forming the relationships that they feel they need in order to be valued. It is also possible that adolescents with a poor sense of 'self' are more likely to associate with a dysfunctional peer group who may encourage substance use.

Rosenstein and Horowitz (1996) found that adolescents with a 'dismissing' attachment style were almost twice as likely to have a substance abuse disorder than those with other attachment styles. This can be understood in terms of the coping style of those with a dismissive attachment which involves denying or minimising distress through fear of rejection. One can deduce that use of substances allows that individual an 'escape' through which they can avoid confronting emotion. Furthermore, some substances are known to have the temporary effect of boosting self confidence and a sense of invincibility, which would parallel the way in which those with a dismissing style prefer to think of themselves.

Research to the contrary suggests that alcohol abusing male adolescents score more highly on maternal emotional warmth when compared to their non alcohol abusing

counterparts (Koposov *et al.*, 2005). However, the authors relate this difference to an overcompensation of mothers of delinquent young men in the context of absent or uncaring fathers. Overbeek and colleagues (2004) similarly found no relationship between parental attachment and substance abuse in young adults. Given these discrepancies, Van der Vorst and colleagues (2006) recommend further investigation of the relationship between substance use and attachment style.

### **1.5.5 Substance Use; Implications for Healthcare Provision in the context of diabetes and attachment style**

‘Hard’ drug use in the general adolescent population was shown to predict higher health service use and physical health problems when the same adolescents were observed four years later as young adults (Newcomb & Bentler, 1987). Saunders and colleagues (2004) looked at this relationship between drug use and health service contact in diabetic young adults. Those adults with diabetes, but who also had concurrent diagnosis of intravenous drug use, had poorer HbA1c measures and a significantly higher number of inpatient days per year in both acute and critical care beds when compared to those with diabetes who did not abuse substances.

Furthermore, the group with both diabetes and a substance abuse diagnosis had a significantly higher number of inpatient days per year when compared to those patients with a substance abuse diagnosis and no diagnosis of diabetes. Based on figures for 2001, Saunders and colleagues estimated the average inpatient admission cost for patients who both have diabetes and use intravenous drugs to be over seven thousand pounds per patient, compared to £230 for patients with a sole diagnosis of diabetes and £775 for patients with a sole diagnosis of substance abuse (2004). This

study suggests that the already increased rate of complication, frequency of hospital admission and cost of inpatient care in the diabetic population is inflated significantly by substance misuse in Type 1 diabetics.

Many of the studies discussed previously also highlight the dangers of alcohol consumption and its effect on long term diabetes self care and short term awareness of complications (Cheyne *et al.*, 2004, Kerr *et al.*, 1990). Worryingly, further research suggests that diabetic adolescents grossly underestimate the effect substance use has on their metabolic control, with 67% stating that alcohol never affected diabetes control. These adolescents were considered to be in denial (Gold & Gladstein, 1993).

Recalling the findings that substance users and diabetic substance users suffer from increased physical health complications and, thus, utilise health services to a greater degree (Newcomb & Bentler, 1987; Saunders *et al.*, 2004), it is plausible that the adolescent diabetic population may have similar experiences. This is especially probable when one considers the prevalence of substance use in the adolescent diabetic population, the inaccurate perception these young people have of the impact of substance use on diabetes, and the likelihood of medical complications when metabolic control is affected by substance use.

The association between heavy substance use and mortality in the diabetic population (Lee *et al.*, 2005, 1997; Saunders *et al.*, 2004) would suggest that it will perhaps be necessary to coordinate wide reaching health promotion around what is a safe level of alcohol consumption. Similarly, the practical implications of the cumulative effect of alcohol and hypoglycaemia on cognitive performance should be warned of (Cheyne *et*

*al.*, 2004) since dangerous practice could result in serious accidents. While this may be costly in the short term it would be hoped that the long term improvement in quality of life and consequent reduction in use of health care would reduce future costs. However, considering that findings are variable, a further cost to consider is the need to carry out further research into the effects of alcohol on metabolic control, in particular looking at the impact of more severe alcohol use (Howard *et al.*, 2004).

There is also the suggestion that those patients with diabetes, who also misuse substances, are less likely to engage in diabetes outpatient support, due to having no fixed accommodation, being non-contactable or to being under legal jurisdiction at the time of engagement (Saunders *et al.*, 2004). Thus, the social implications of substance misuse produce further difficulties in engaging and educating an already extremely vulnerable group. It is recommended that a highly trained skill mix be provided as part of the diabetes review service, with a view to offering substance abuse counselling, earlier detection of substance related metabolic complications and increasing access to diabetes education (Lee *et al.*, 2005). While this would inevitably come at a cost, the question raised is how much of a long term saving would such services create, both in terms of finances but more importantly in terms of health and mortality. There seems little consensus on the effects of alcohol on diabetes and very little research on other substance use and its effect on blood glucose control. In particular, adolescents are rarely studied in this context. Therefore, in order to inform practice and health care provision, further research is required.

## **1.6 Mental Health in Adolescents**

### **1.6.1 Prevalence of anxiety and depression**

Amongst a non-clinical population of 248 adolescents, aged between twelve and sixteen years, prevalence of ‘probable’ depression was 2% while prevalence rate of ‘possible’ depression was 13%, as measured on the Hospital Anxiety and Depression Scale (White *et al.*, 1999). However, studies have estimated depression to be present in as few as 0.9% (Emerson, 2003) and as many as 26.6% of adolescents (Bomba & Modrzejewska, 2008). Emerson (2003) assessed over ten thousand children aged five to fifteen years and used International Classification of Disorders-10<sup>th</sup> revision (ICD-10) (WHO, 1992) to diagnose psychiatric disorder including depression. Bomba and Modrzejewska (2008) looked at an initial sample of 1,727 thirteen year olds across three years. These participants were surveyed using the Krakow Depression Inventory (KID). Prevalence of depression was at its highest when the cohort was aged 15 years, at 26.6%. Many additional studies report levels of depression between these upper and lower limits (Breton *et al.*, 1999, Costello *et al.*, 2003, Ford *et al.*, 2003, Garrison *et al.*, 1991, Leung *et al.*, 2008, Nguyen *et al.*, 2005, Roberts *et al.*, 1991, West *et al.*, 2003). However participants in these studies range from ages five to twenty four years, assessment measures of depression differ and severity of depression differs in reporting. Thus prevalence rates may not be comparable.

Anxiety disorders in young people aged 5 to 24 years have estimated prevalence rates as low as 3.1% (Breton *et al.*, 1999) and as high as 9.2% (West *et al.*, 2003). Breton and colleagues (1999) assessed 2,400 Canadian children aged six to fourteen years

using information from child, parent and teacher to diagnose mental health disorders based on the third and revised edition of the Diagnostic and Statistical Manual of mental disorders (DSM-III-R; American Psychiatric Association, 1987). West and colleagues (2003) asked 1, 860 Scottish fifteen year olds to complete a self-administered computerised tool which produces diagnoses based on the fourth edition of DSM- IV. Once again many additional studies report prevalence of anxiety between these upper and lower limits (Costello *et al.*, 2003, Emerson, 2003, Ford *et al.*, 2003, Leung *et al.*, 2008, Nguyen *et al.*, 2005). As with depression studies, the age range and type and severity of anxiety disorder differ in reporting across various studies along with the measures used.

Increased prevalence of psychiatric disorder is also correlated with age (Ford *et al.*, 2003; Nguyen *et al.*, 2005). Diagnosis of 'any depressive disorder' in a large non clinical population of adolescents, aged five to fifteen years, has been estimated at just under one percent but increases significantly to around 2.5% when adolescents aged thirteen to fifteen years are looked at separately (Ford *et al.*, 2003). Costello and colleagues' (2003) prevalence rates for depression across the age range nine to sixteen years peaked at 3.7% among fifteen year olds. Amongst children aged five to fifteen years, the prevalence of any anxiety disorder has been estimated to be 3.77%.

However, when over two and a half thousand adolescents aged thirteen to fifteen years were considered separately the prevalence of anxiety disorders rose significantly to just over five percent of the population (Ford *et al.*, 2003). Female adolescents and young adults show higher rates of any anxiety and any depressive disorder than males (Costello *et al.*, 2003, Nguyen *et al.*, 2005, Romano *et al.*, 2001, West *et al.*, 2003).

They also show a one percent increase in prevalence of comorbid anxiety and depression (Costello *et al.*, 2003).

In terms of comorbidity, the 1999 British Child and Adolescent Mental Health Survey which sampled over ten thousand British children found that, of the 9.5% children and adolescents aged five to fifteen years with a mental health diagnosis, 22% had two diagnoses (Ford *et al.*, 2003). This is comparable to West and colleagues' (2003) finding that 25% of 15 year olds with anxiety also had a second diagnosis. It is frequently found in the literature that adolescents have a comorbid diagnosis of anxiety and depression (Arcelus & Vostanis, 2005, Costello *et al.*, 2003, Ford *et al.*, 2003, West *et al.*, 2003). Between 27% and just under 29% of those adolescents with an anxiety disorder also have a diagnosis of a depressive disorder (Costello *et al.*, 2003, Ford *et al.*, 2003).

Many of the authors of the studies discussed acknowledge the differences in prevalence of diagnosis reported and discuss limitations in generalising findings as a result of method, measures and cut-offs used to determine diagnosis (Arcelus & Vostanis, 2005, Katon *et al.*, 2007, Leung *et al.*, 2008), missing data and limited age range (Ford *et al.*, 2003) and cross-cultural differences (Leung *et al.*, 2008).

Therefore, in the general population of adolescents reported rates of depression and anxiety vary. However, with some estimates of depression and anxiety prevalence rates as high as 26.6% and 9.2% respectively, along with the indication that prevalence increases over adolescence, it is important to consider the impact that mental health difficulties may have on diabetes metabolic control.



## 1.6.2 Mental Health and Diabetes Control

The experience of developing a life long condition that requires considerable management at the risk of ill health, organ failure and even death must be considered in terms of the relationship this has with mental health and wellbeing. Adolescents with a chronic illness such as asthma show rates of co-morbid anxiety and depressive disorder two times higher than that of the healthy control group (Katon *et al.*, 2007; Vila *et al.*, 1998). The relationship between diabetes and mental health should thus be considered in the context of the chronicity of the disease and potential associated health complications.

Anxiety and depression are the most common mental health issues amongst diabetic patients and have been diagnosed up to six times more frequently than in the general population (Lustman *et al.*, 1986; Petrak *et al.*, 2003). The prevalence of depressive disorder varies. Adults with diabetes showed rates of major depressive illness of more than double that of the general population (Gavard *et al.*, 1993; Petrak *et al.*, 2003) while the rate of ‘any’ depressive disorder was just over 1% higher amongst the diabetic population (Petrak *et al.*, 2003). The same study found that ‘any’ anxiety disorder was 1.8% lower than the control group rates, although at a rate of 7.7% it is nonetheless a concern. Further longitudinal research has found that cumulatively up to 53% of adolescents with a new diagnosis of diabetes have a diagnosable psychiatric disorder, of which around 27% are a depressive disorder (Kovacs *et al.*, 1995; Kovacs *et al.*, 1997). Just over 18% of adolescents in the sample developed an anxiety disorder and co-morbidity of mental health diagnosis was estimated at 26.1% (Kovacs *et al.*, 1997).

Previous research has shown mental health to be linked to other health outcomes in diabetic populations. Adults with a recent psychiatric diagnosis, of which anxiety and depression were the most common, were shown to have significantly poorer HbA1c levels than those with no mental health history. The same group reported a higher number of diabetes symptoms, for example thirst and fatigue (Lustman *et al.*, 1986). A comprehensive review of the literature reported a significant relationship between depression and poor blood glucose control resulting in hyperglycaemia (Lustman *et al.*, 2000). Furthermore, the length of depressive episode in adolescence has been found to be associated with later retinopathy (Kovacs *et al.*, 1995). Lloyd and colleagues (1992) found that adults with depression were more likely to suffer from metabolic complications such as retinopathy, vascular disease, nerve damage and kidney disease than those not showing depressive symptoms. A higher level of depression symptomatology was also associated with a higher number of metabolic complications (Lloyd *et al.*, 1992).

Across studies, the conclusions around the relationship between mental ill health and blood glucose control vary. For example, if depression were seen to predict poor diabetes outcomes, one could argue that a pre-existing depression presenting as low motivation, fatigue and poor sense of self worth may lead to difficulties in engaging or feeling worthy of engagement with diabetes services. This would increase vulnerability to, and thus risk of, diabetes associated health complications due to a lack of adequate advice and medical treatment. Similarly, those with a pre-existing anxiety disorder may fear trusting in others or acknowledging the severity of the illness, which would again make access to medical care difficult and more likely to be

avoided. Furthermore, Petrak and colleagues (2003) indicate a further potential causal relationship between depression and Type 2 diabetes. Given that depression is more likely to lead to isolation, inactivity and sometimes over eating, depressed individuals become at risk of developing Type 2 diabetes.

Alternatively, if anxiety or depression were to be predicted by diabetic complication or diagnosis, one could hypothesise that these individuals are reacting to a source of stress in a maladaptive fashion, perhaps ingrained in poor interpersonal relating and, or, insecure attachment style. In other words, mental health difficulties can arise as a result of poor adjustment to diagnosis and the ongoing negative or anxious cognitive appraisal of symptoms of the illness (Petrak *et al.*, 2003). In addition, a causal relationship between diabetes diagnosis and depression could be explained in terms of the physical symptoms of diabetes creating a cycle of fatigue and inactivity. These factors alone can precipitate depression, which perpetuates as the symptoms of depression are potentiated by the physical symptoms of diabetes (Lustman *et al.*, 1986).

Additional studies acknowledge that the directionality is not known in terms of whether it is metabolic complications that go on to cause mental health difficulties or whether it is mental ill health that hinders blood glucose control and thus causes dangerous health complications (Lloyd *et al.*, 1992, Lustman *et al.*, 2000). Therefore future longitudinal research is required to establish the direction of causality. Regardless of the direction of the causal relationship, it is clear that mentally unwell diabetics are at risk of serious ill health.

### **1.6.3 Mental Health and Attachment**

Affect regulation has been described as emotional fluctuations guided by internal working models of attachment (Cole-Detke & Kobak, 1996, Kobak & Sceery 1988). Kobak and Sceery (1988) go on to explain that secure attachment leads to the development of rules which permit distress and support seeking, as is discussed in section 1.4.2. Insecurely attached individuals find it difficult to regulate emotion and often cope with distress in maladaptive manner. Avoidant attachment styles inhibit acknowledgment of distress or actively avoid expressing distress and thus support seeking, while anxious/ambivalent attachments lead to rules whereby distress is clearly and disproportionately expressed and consolation is sought with fervour. These styles somewhat parallel self-isolating seen in depression and hypervigilance and catastrophic cognitive distortions seen in anxiety.

Allen and colleagues (1996) described how negative senses of self and, or, others founded in attachment models can lead to increased isolation, cognitive distortions and maladaptive relationships. These factors are all well established contributing factors and recognisable symptoms in depression and anxiety. Furthermore, Allen and colleagues' (1996) research has found that acute mental ill health warranting hospital admission in adolescents is linked to insecure attachment styles in adulthood. One could hypothesise that the absence of a secure state of mind can create a susceptibility to mental ill health as the individual struggles to understand experiences in a non biased way. This bias is based in internal models of 'self' and 'other'.

Recalling Bartholomew and Horowitz's (1991) conception that insecure attachment styles incorporate negative senses of the self and, or, others, it is understandable that there would be associations between insecure attachment and mental health. To expand, a negative perception of the self may lead to cognitions around worthlessness, hopelessness and a general personalising, negative style of cognitively appraising situations. This may then present as symptoms of depression, such as low self esteem and isolation. A negative perception of others may lead to cognitions around mistrust, fear of emotional hurt and a catastrophic interpretation of situations. This would perhaps manifest as anxiety symptomatology, for example hypervigilance, increased autonomic arousal and avoidance of feared experiences.

When attachment style is specifically considered, it is likely that those of a dismissive style of attachment may find it difficult to experience and acknowledge distress. However, their very strong sense of self may act as a protective factor against depression. Many themes of depression require a perception of the self as unworthy or unlovable. Similarly, those preoccupied individuals may be less likely to experience difficulties in regulating emotion in the context of supportive and consistent networks, since the positive sense of others validates the self and allows the self to feel worthy and wanted in that moment. However those preoccupied individuals who suffer a loss in support or a difficulty in engaging support, as a result of their intrusive style in doing so, are more likely to experience distress as intolerable and uncontained while these relationships are being sought, which may present as depression or anxiety. Finally, those fearful individuals are likely to continue to undervalue their self and fear exploitation and hurt by others. Once again, if these conditions are uninterrupted through maintaining a safe distance from others, these individuals are less likely to

experience anxiety around relationships and distress as a result of avoiding appraisal of the self in a relationship. However, if others attempt to engage this individual, they are likely to experience distress at the prospect of having these ‘self’ and ‘others’ beliefs confirmed. This distress may present as anxiety around relationships and a depressed view of the self.

When the evidence is reviewed, lower levels of negative affect and higher self-esteem and positive affect are observed in individuals with a secure attachment style (Armitage & Harris, 2006). Those with a secure attachment style also show significantly more ‘ego-resiliency’ than individuals with an avoidant or ambivalent attachment (Kobak & Sceery, 1988). Good quality parental attachments, in the context of high parental support and monitoring, are associated with higher self esteem (Parker & Benson, 2002).

Adolescents and young adults with a poor quality attachment to parents, in the context of experiencing uncaring and intrusive parenting, are shown to have a higher level of internalising behaviour which includes self isolating, anxiety and depression (Buist *et al.*, 2004 Overbeek *et al.*, 2004). Women with unhealthy experiences of being parented, and therefore insecure attachment styles, have been found to be more likely to suffer from ‘psychological maladjustment’, which includes a history of severe depression or anxiety (Suchman *et al.*, 2006). Similarly, research has found an association between depression and suicidal ideation and early experiences of punitive parenting (Straus & Kantor, 1994).

Individuals with an insecure attachment style show the highest levels of negative affect (Armitage & Harris, 2006). Rosenstein and Horowitz (1996) found that adolescents with a preoccupied attachment style were more likely to have an affective disorder and self reported avoidant and anxious traits, while the same group is also rated by others as being significantly more anxious than other attachment styles (Kobak & Sceery, 1988). Depressive disorder has also been associated with insecure attachment styles characterised by a lack of support (Bifulco *et al.*, 2003). And so it is clear that, although mental health and insecure attachment stand alone in many respects, including theoretically and in reality, there appears to be a degree of shared aetiology and presentation, particularly regarding emotion regulation and internal working models of 'self' and 'others'.

#### **1.6.4 Mental Health; Implications for Healthcare Provision in the context of diabetes and attachment.**

Low mood, as a package of low self worth and self actualisation, is likely to have an impact on an individual's ability to engage in services. One must firstly feel worthy of such services and secondly feel capable of engaging. One study examining diabetic patients found a positive association between 'unworthiness' and depressive symptoms and a negative association between 'ability to rely on others' and depressive symptoms (Ciechanowski *et al.*, 2005). Earlier discussions point to the predictive relationship of mood to poor glycaemic control (Lloyd *et al.*, 1992). Stewart and colleagues' (2005) review of the literature suggests that those depressed individuals are more likely to experience diabetic complications. Ciechanowski and colleagues (Ciechanowski, Russo, Katon, Simon *et al.*, 2006) found that depressed

mood mediated the inverse relationship between attachment security and number of missed appointments in patients with diabetes; those individuals with depression missed more appointments.

Thus it is likely that mood will affect a patient's short and long term outcomes in terms of metabolic control if it is directly affecting their ability to engage in supportive services. These diabetic patients at risk of mental health problems are therefore at risk of becoming seriously ill and thus will continue to require more intensive intervention from health services.

### **1.7 Summary: The impact of attachment, interpersonal problems, mental health and substance use upon HbA1c.**

The focus of this study is on exploring the relationship between blood glucose control, as an outcome of diabetes self care, and attachment security. However, the additional impact of interpersonal problems bedded in attachment theory, mental health and substance use upon diabetes outcomes have been highlighted, alongside the complex interactions between these predictors.

To summarise, the model of attachment adhered to in this study postulates that individuals integrate the meaning of future interpersonal interactions and experiences on the basis of internal working models, developed as an infant, that serve as templates of how to understand the 'self' and 'others' (Bartholomew & Horowitz, 1991). Embroiled in this interpersonal way of relating and understanding are learned methods of coping with distress and regulating emotion (Bowlby, 1978b). An



individual develops a learned way of communicating or repressing emotion, in particular distress, depending on the make up of internal working models and the concurrent memories of how distress was managed as an infant.

The theory that interpersonal problems arise as a result of the dissonance between desired and actual ways of interpersonally relating draws on attachment theory, in terms of emotional experience, biological predisposition to display attachment behaviours and internalised rules for viewing the 'self' and 'others' (Horowitz *et al.*, 1993). Individuals who experience what they perceive are difficulties in doing 'too much of' or 'not enough of' a specific behaviour are likely to have strong desires to execute these interactions and behaviours, often ingrained in a biologically determined attachment activation. They, however, report a difficulty in doing so as a result of preconceived beliefs around how others may respond to the 'self' if they follow through. These perceptions are liable to elicit a more extreme interaction or behaviour, somewhere on the 'affiliation' and 'dominance' dimensions, that protects the individual from exploitation by others and the associated distress (Horowitz, 1996). However, this has the effect of leaving that individual frustrated or distressed at being unable to conduct themselves in the desired manner, which leads to the feeling that they are doing 'too much' or 'not enough' of the desired interaction.

It follows then that depression and anxiety may well be a bi-product of interpersonal problems, in terms of the negative appraisals of feeling unfulfilled or the anxiety experienced at the prospect of engaging in a fashion that feels incongruent. Similarly, when one considers attachment style in terms of distress intolerance and poor emotion regulation, the links with mental health become apparent. In terms of attachment

founded beliefs around self and others, those individuals with biased views of the self and others may struggle to make healthy appraisals of interactions and experiences, which again highlights the overlap with mental health difficulties for which negative cognitions are a key component (Allen *et al.*, 1996).

Substance use similarly relates to attachment, interpersonal problems and mental health difficulties (Goodwin *et al.*, 2004). Perhaps individuals with mental health problems or poor affect regulation in the context of poor attachment seek to attenuate or avoid these feelings by misusing substances. Attributions made around interpersonal problems may similarly promote substance misuse as an avoidance of the pain. Alternatively, perhaps substance misuse creates interpersonal problems as these individuals find themselves acting ‘out of character’ under the influence, mixing with dysfunctional peer groups and often creating further social problems. Substance misuse can also create scenarios that are likely precipitants to mental health difficulties, such as a sedentary, isolated lifestyle, or involvement in highly dangerous social situations. Such scenarios would contribute to the onset of a depressive or anxiety disorder.

With respect to diabetes management, motivation to adhere to treatment recommendations may impact upon blood glucose control which can be affected by excessive substance use and low mood (Ahmed *et al.*, 2006; Lustman *et al.*, 1986). A difficulty engaging with health care services appropriately and effectively may be impacted upon by maladaptive engagement style, which can be a product of interpersonal problems, substance misuse, mental health difficulty and attachment style (Ciechanowski, Russo, Katon, Simon *et al.*, 2006; Horowitz *et al.*, 1993;

Saunders *et al.*, 2004). Anxiety around ill health as a stress stimulus may also cause difficulties in engaging with services for those with mental health difficulties (Petrak *et al.*, 2003) or those whose attachment style incorporates low tolerance of distress and resultant avoidance (Mikulincer & Florian, 1998).

This summarises only a few hypothesised links between blood glucose control and attachment style, interpersonal problems in the context of attachment, substance misuse, anxiety and depression. The literature indicates a great many direct, indirect and combined influences of the key predictors on HbA1c. This study seeks to explore the exact nature of those relationships.

## **1.8 Hypotheses**

### **1.8.1 Primary Hypothesis**

There will be a negative association between attachment security and HbA1c levels in adolescents with Type 1 diabetes.

### **1.8.2 Secondary Hypothesis**

The relationship between attachment style and HbA1c level will be influenced by the comparative predictive values of substance use and self reported depression and anxiety.

## **2.0 Method**

### **2.1 Design**

This study can be considered a non-experimental, cross sectional, questionnaire design (Coolican, 1999).

### **2.2 Power Analysis**

While no research has looked specifically at adolescent attachment style and HbA1c levels, there exist studies that have looked at adult attachment style and HbA1c level. Previous research looking at adult attachment style and HbA1c level has found significant relationships between the two variables would predict a medium effect size in further research (Ciechanowski, Hirsch *et. al.*, 2002; Ciechanowski *et. al.*, 2004). In order to detect a medium effect size (.15; Cohen, 1992) using four predictors (attachment score, anxiety score, depression score and substance use score), an alpha level of .05 and power of .8, Cohen (1992) suggests a sample size of 84 for multiple regression analyses. A formal sample size calculation was carried out using 'GPOWER' Version 2, a statistical package used to calculate sample size (Faul & Erdfelder, 1992). This calculation, based on the same criteria, indicates that a sample size of 85 is required for multiple regression analysis. Finally, using Green's (1991) calculation where  $N = 50 + 8m$  (where m is number of predictor variables) the suggested sample size is 82. The upper limit for suggested sample size was chosen. For this study a minimum sample of  $N = 85$  is required.

For covariance modelling using exploratory path analysis, to be underpowered is essentially to find that the model does not fit the data when it does explain the relationships between variables. Therefore, in small samples one runs danger of not finding a model with sufficient explanatory power, which would be reflected in inadequate ‘goodness of fit’ statistics. In order to avoid running an underpowered path analysis one must have a sufficient sample size. The statistics produced allow the researcher to comment on whether or not the model fits the data and thus whether or not sample size was adequate. These statistics are discussed in more detail in section 3.5.2.

### **2.3 Participants**

The target population consisted of all adolescent diabetic patients aged 14 years to 18 years, inclusive, who attend for regular review at Diabetes Clinics across East, Mid and West Lothian. Participants were required to have had a diagnosis of Type 1 Diabetes for at least one year. This would exclude new attendees who may not be comfortable or familiar with the Clinic environment, those patients who are in the early stages of learning how to manage their blood-glucose control and those who may still be in the ‘partial remission’ stage whereby HbA1c remains within normal ranges with little or no intervention required (Collaborating Centre for Women’s and Children’s Health, 2004). Participants were excluded if they had a pre-existing mental health diagnosis<sup>1</sup> or an additional chronic illness, in the event that these conditions would affect participants’ responses on the questionnaires. Furthermore, based on

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<sup>1</sup> This exclusion criterion was introduced to avoid any response bias, as a result of mental health diagnosis, skewing the data. However, it should be highlighted that the nature of excluding all participants with a pre-existing mental health diagnosis also carries the potential to skew data. In the current study one participant was excluded under this criterion.

Section 2 (4) of the Age of Legal Capacity (Scotland) Act 1991, participants under the age of 16 years were required to be deemed to have the capacity to understand the nature and possible consequences of participation in the study by the Consultant in charge of their care (Office of Public Sector Information, 1991). This was checked by seeking information from the consultant in charge on the day of the clinic.

## **2.4 Measures**

### **2.4.1. Demographics**

Patients' date of birth was obtained from patient notes in order to calculate each participant's exact age in years and months at the time of completing the questionnaires. The sex of each participant and date of diabetes diagnosis was noted.

### **2.4.2 Blood Glucose level**

HbA1c, average blood glucose level over the previous four to twelve weeks (Rewers *et al.*, 2007), taken on the day of the clinic was obtained from the Diabetes Specialist nurse on the day of the clinic or during the following week. HbA1c is the measure of choice when studying diabetes metabolic control and has been shown to accurately predict diabetic complications (Rewers *et al.*, 2007; The Diabetes Control and Complications Trial Research Group, 1994). A healthy HbA1c level in children and adolescents is below 7.5% while an HbA1c level of more than 9.0- 9.5% indicates high risk of metabolic complications (Rewers *et al.*, 2007; National Collaborating Centre for Women's and Children's Health, 2004; NICE Guidance, 2004). It is

possible for diabetic patients to have an HbA1c of less than 5.0%, indicating a high risk of hypoglycaemia and thus hospitalisation (Islets of Hope web site, accessed October 2009; Williams *et al.*, 2009). Such low readings are considered as dangerous and are treated with as much concern as HbA1c levels above 9.0%. However, given that the lowest HbA1c level of any participant in the current study was 6.5%, which is considered a healthy level (NICE Guidance, 2004), the HbA1c readings are treated as a linear scale in the current study.

### **2.4.3 Mental Health Diagnosis**

While it was important that those participants with pre-existing mental health diagnoses were excluded from the study, it was felt that asking participants directly in an open clinic was an unethical way of obtaining this information. Therefore, a slip of paper with two questions regarding current mental health status and current use of mental health services was included at the beginning of the questionnaire pack.

### **2.4.4 Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)**

This 14 item questionnaire, using a four point rating scale, was designed to assess the level of anxiety and depression in adult populations. Seven multiple choice questions relate to each disorder and allow the researcher to categorise participants' level of anxiety and depression severity into 'normal', 'mild', 'moderate' and 'severe'. The recommended cut-offs for use with adolescents are seven and ten for depression and nine and twelve for anxiety (White *et al.*, 1999).

This self-report screening scale, originally developed by Zigmond and Snaith (1983) for adults, has been recognised as suitable for adolescents aged twelve to seventeen years (Calsbeek *et al.*, 2006, White *et al.*, 1999). The HADS is also widely used in healthcare settings as the omission of specific symptoms, which may relate to physical health and not to emotional disorder, avoids ambiguity in classifying disorder (Jorngarden *et al.*, 2006).

Zigmond and Snaith (1983), on developing the HADS for use with adults, found the internal consistency of items for depression and anxiety ranged from .60 to .30 ( $p < .02$ ) and .76 to .41 ( $p < .01$ ) respectively. Reported severity of symptoms assessed using the HADS and psychiatric ratings, produced by the researchers following face to face interview with each patient, were found to be significantly correlated (depression  $r = .70$ ,  $p < .001$ , anxiety  $r = .74$ ,  $p < .001$ ; Zigmond & Snaith, 1983, p.365). The HADS is thus considered to be a valid and reliable assessment of mood disorder presence and severity.

Berard and Ahmed (1995) found little evidence to support the use of this scale with adolescents. However, White and colleagues (1999) attribute this to the higher cut-off scores used in Berard and Ahmed's study, which reduce sensitivity. They go on to recommend the use of lower cut-offs in a clinical population of adolescents in order to reduce the likelihood of false negatives.

White and colleagues' (1999) study suggested good test-retest reliability (anxiety  $r = .74$ ,  $p < .001$ ; depression  $r = .62$ ,  $p < .001$ ) of the HADS used within the adolescent population (White *et al.*, 1999, p.452). They report evidence of validity based on the



findings that the HADS discriminates between adolescents with and without anxiety and depression diagnoses. Furthermore, the adolescent population showed no difficulties in understanding the scale and completed the assessment to the satisfaction of the researchers (White *et al.*, 1999).

#### **2.4.5 Adolescent Substance Abuse Subtle Screening Inventory-A2 (SASSI-A2)**

##### **Miller and Lazowski (2001)**

The SASSI-A2 is an updated version of the Adolescent SASSI, developed by Miller and first published in 1990. The purpose of the tool is to identify adolescents between the ages of 12 and 18 years who are likely to have a substance misuse disorder to some degree. The SASSI-A2 was developed to increase the discriminative accuracy and usefulness of the original version and includes an additional 45 items (Miller & Lazowski, 2001). The SASSI-A2 incorporates 72 ‘true’ or ‘false’ items assessing substance misuse which are transformed to produce nine different scales. Twenty eight multiple choice questions assess frequency of substance use experiences. An additional six questions assess current and historical substance use, along with demographic characteristics.

The ‘Family-Friends Risk’ (FRISK) scale indicates the degree to which the individual is part of a system, both family and social, that is likely to enable and encourage substance misuse. ‘Attitudes’ (ATT) questions assess attitudes and beliefs that condone substance use. The ‘Symptoms’ (SYM) scale provides a measure of the symptoms as a consequence of substance misuse and indicate out of control usage.

‘Obvious Attributes’ (OAT) items indicate the individual’s level of awareness of their substance misuse while ‘Subtle Attributes’ (SAT) identifies young people who lack insight into the dangers of substance misuse and have difficulty in recognising which behaviours are problematic. High ‘Defensiveness’ (DEF) scores indicate an individual’s avoidance of admitting their own limitations and difficulties. Low scores are likely to be indicative of low self esteem and self deprecating attitudes. The ‘Supplemental Addiction Measure’ (SAM) was included as a measure of behaviours and attitudes indicative of the type of lifestyle associated with substance misuse. Scores on the ‘Correctional’ (COR) scale indicate a risk of involvement in legal and judicial systems. Higher scores on all scales indicate endorsement of what that scale measures (Miller & Lazowski, 2001). Finally, the ‘Face Valid Alcohol’ (FVA) and ‘Face Valid Other Drugs’ (FVO) scales. Each scale indicates the level to which the young person uses alcohol and other drugs and the degree to which they acknowledge the consequences of substance use. The combination of these two scales will be used as a direct measure of substance use in this study.

The raw scores for each question are transformed to produce nine scales which subsequently classify adolescents into high or low probability of substance use or substance abuse disorder via a decision rule. Substance abuse and substance dependence disorders were defined using DSM-IV criteria. In addition, it is suggested that clinical inferences can be made for those individuals endorsing scales with scores higher than 85% of the normative population on the following scales; FVA, FVOD, FRISK, ATT, SYM, OAT, SAT, DEF and COR. Those individuals scoring below the 15<sup>th</sup> percentile on the DEF are also of clinical interest, as such scores suggest low self esteem and self deprecating attitudes (Lazowski & Miller, 2001).

Lazowski and Miller (2001) administered the SASSI-A2 to 2,326 adolescents, 63% of whom were from juvenile detention centres or treatment settings. Just over half the participants were also assessed to produce a DSM-IV diagnosis. In assessing the validity of the measure, analysis showed that the updated SASSI-A2 decision rule accurately identifies 94% of adolescents with a substance abuse and substance dependence disorder (Lazowski & Miller, 2001, p.1), compared to the original Adolescent SASSI which accurately identifies 83% of individuals with a substance dependence (Miller & Lazowski, 2001, p.3). Furthermore, the SASSI-A2 was shown to have high test-retest reliability as 94% of decision rule results did not change over the course of ten days (Lazowski & Miller, 2001, p.1). Demographic factors including gender, ethnicity, age, education and employment did not affect the accuracy of classification.

#### **2.4.6 Measures of attachment**

Given the brief and easy to administer nature of the Adolescent Relationship Questionnaire (A-RQ), described below, this measure was chosen as the primary measure of attachment on which key analyses would be performed. While there is much evidence to support the use of the RQ in research, the psychometric properties of the RQ have occasionally been brought into question, as is discussed below in section 2.4.6.1. Therefore to add validity to this measure a further two measures were to be given to a sub sample of the population (n=50) in order to add to the value of the A-RQ. These are an adapted version of the Relationship Scales Questionnaire (RSQ) and the Inventory of Interpersonal Problems short form (IIP-32) which are described

below. The sub sample would therefore complete a set of five questionnaires (the three primary measures plus the two validating measures) while the remainder of the sample would complete only the three primary measures.

#### **2.4.6.1 Relationship Questionnaire (RQ; Bartholomew and Horowitz, 1991; adapted for adolescents by Scharfe, 2009a)**

The RQ, developed by Bartholomew and Horowitz (1991), extended Hazan and Shaver's (1987) model to include a fourth category of attachment (dismissive attachment). The questionnaire measures 'secure', 'fearful', 'preoccupied' and 'dismissing' attachment styles in terms of the degree to which each style applies to the individual and what that individual perceives is their dominant attachment style.

Scharfe (2009a) adapted the RQ for use with adolescents, A-RQ, which is freely available online. The A-RQ and RQ differ only in word choice in order to make the concepts more accessible to the adolescent population (Appendix i). Using data obtained from the RQ, Matsuoka and colleagues (2006) compute Total Attachment Score (TAS) as follows:  $TAS = (\text{secure score}) - (\text{fearful score}) - (\text{preoccupied score}) - (\text{dismissing score})$  with higher scores indicating "a more secure attachment style" (Matsuoka *et al.*, 2006, p.25).

The RQ has been used effectively in many studies (e.g. Allen *et al.*, 2001; Troisi *et al.*, 2001) including studies of young adults and adolescents (Broberg *et al.*, 2001; Matsuoka *et al.*, 2006; Scharfe & Eldredge, 2001).

While the reliability of the RQ has been questioned in both adolescent and adult populations (Leak & Parsons, 2001; Pielage *et al.*, 2006), Scharfe and Bartholomew (1994) have shown the Relationship Questionnaire to have moderate test-retest stability over 8 months when used with young adults.

Bartholomew and Horowitz (1991) report the RQ to have good reliability while Griffin and Bartholomew (1994) report acceptable validity. Further studies have found that the RQ has a modest agreement of classification of attachment style with the George and colleagues' Adult Attachment Scale (1985, as cited in Steele & Steele, 2008; Allen *et al.*, 2001; Griffin & Bartholomew, 1994) and high concurrent validity with the Vulnerable Attachment Style Questionnaire (Bifulco *et al.*, 2003). The A-RQ can therefore be deemed a useful and psychometrically sound measure of attachment in adolescent populations.

#### **2.4.6.2 Relationship Scales Questionnaire (RSQ; Griffin and Bartholomew, 1994; adapted by Scharfe, 2009b, for adolescents)**

The RSQ, developed by Griffin and Bartholomew (1994), is a 30 item questionnaire containing 17 items which are direct measures of specific attachment style. The Adolescent -RSQ (A-RSQ) includes only the 17 attachment related items and is a self report measure of attachment style for adolescents. Scharfe (2009b) adapted the RSQ to produce the A-RSQ which is freely available online. The items included in the A-RSQ differ only very subtly in simpler word choice from the same items in the RSQ (Appendix ii). Each of the 17 items corresponds with one or more attachment style. Five items relate to 'secure', four to 'fearful', four to 'preoccupied' and five to

‘dismissing’ and one item corresponds with two attachment styles. Participants answer each question using a likert scale from one to seven. Griffin and Bartholomew (1994) recommend that the RSQ should be used as a continuous measure of each attachment style. This is computed by taking the mean score of the items that represent each attachment style. The A-RSQ can similarly produce continuous measures of each attachment style using this method.

Griffin and Bartholomew (1994) demonstrate the sound convergent validity of the RSQ when compared with interview ratings, however, they go on to describe variable internal consistency in the RSQ attachment scores and attribute this to the combination of the ‘self’ and ‘other’ dimensions within calculations.

Kurdek (2002) found that the RSQ produces ‘psychometrically sound scores of attachment style’ (p.831). Scharfe and Eldredge (2001) have successfully used the RSQ with older adolescents, while other studies have found the RSQ useful for young adult populations (Ognibebe & Collins, 1998; Scharfe & Bartholomew, 1994).

#### **2.4.6.3 Short form of the Inventory of Interpersonal Problems (IIP-32; Barkham *et al.*, 1996)**

This 32 item self report questionnaire was developed as a short form of the 127 item Inventory of Interpersonal Problems (IIP; Horowitz *et al.*, 1988). Analysis of the original measure revealed six factors (Horowitz *et al.*, 1988, p.887), from which Barkham and colleagues (1996) extracted eight factors in the development of their shorter instrument. These factors translate into eight scales when scoring the raw data;

‘domineering/controlling’, ‘vindictive/self-centred’, ‘cold/distant’, ‘socially inhibited’, ‘non-assertive’, ‘overly accommodating’, ‘self-sacrificing’ and ‘intrusive/needy’. The IIP was designed to assess difficulties within interpersonal relationships in terms of what individuals find ‘too hard’ or that they do ‘too much’ (Barkham *et al.*, 1996), which is reflected in higher or lower scores in each scale.

Over the course of three studies (Barkham *et al.*, 1996) the IIP-32 was found to have high reliability ( $\alpha=.90$ ) and confirmatory analysis of the new instrument replicated the IIP-32 structure well. The IIP-32 is comparable to the 127 item IIP and is considered “brief, easy to administer and score, assesses a range of problems and is sensitive to change.” (Barkham *et al.*, 1996, p.34). Also noteworthy is its efficacy in differentiating between general and clinical populations.

#### **2.4.6.4 RSQ and RQ**

While the RQ and RSQ scores can be summed and analysed as a composite score (Ognibene & Collins, 1998; Scharfe & Eldredge, 2001) it is also of use to look at the correlations between each scale as a method of examining the concurrent validity. In Ognibene and Collins’ (1998) study, the correlations between the corresponding attachment ratings of the RQ and RSQ ranged from .54 to .72 (p.330). Scharfe and Elredge (2001) also combined the two scales and found reliabilities as follows: secure,  $\alpha= .70$ , fearful,  $\alpha= .77$ , preoccupied,  $\alpha= .75$ , dismissing,  $\alpha= .45$  (p.299). Thus the RSQ is seen to validate the RQ.

#### **2.4.6.5 IIP-32 and RQ**

Scores derived from the IIP have been shown to correlate with attachment scale scores derived from the previously discussed prototypic model (Bartholomew & Horowitz, 1991). Thus significant correlations between the RQ individual attachment scores, based on the prototypic model, and the IIP-32 scale scores can validate the use of the RQ as a stand alone measure of attachment. Similarly Haggerty and colleagues (2009) used the total raw score of the IIP-64 items as a variable which correlated with participants' individual attachment style ratings on the RQ, specifically 'secure' and 'fearful'.

#### **2.5 Questionnaire Packs**

Questionnaires were presented in the same order to all participants. Participants completing the longer set of questionnaires were presented with a question regarding mental health status, the A-RQ, the A-RSQ, the IIP-32, the HADS and the SASSI-A2. Participants completing the shorter set of questionnaires were presented with the question regarding mental health status, A-RQ, the HADS and the SASSI-A2.

#### **2.6 Ethics**

Ethical approval was gained on the 23rd of May 2008 (Appendix iii) following application to the Lothian panel of the National Research Ethics Committee. Local approval was also agreed upon by the Lothian Research and Development Offices.



Participants were required to provide written consent to taking part in the study along with confirmation that the conditions were understood. Participants were informed that they could withdraw from the study at any point and that it would not affect medical and legal rights or concurrent treatment. Equally, participants were informed that participation would not affect concurrent treatment. Participants were guaranteed anonymity of all written responses to the questions.

In accordance with Child Protection guidelines (Office of Public Sector Information, 1991), participants were informed that, should they wish to discuss any sensitive issues arising as a result of the process of completing questionnaires, the researcher would be duty bound to report any issues that give her cause for concern over that patient or another child's emotional and, or, physical well-being. Thus, confidentiality would not be guaranteed for any discussion with the researcher.

## **2.7 Procedure**

At least three weeks prior to each patient's Diabetes Review Clinic, a brief letter outlining the fact that patients will be approached by the researcher in the clinic (Appendix iv) and a patient information sheet (Appendix v) were sent to prospective participants. For those patients under the age of 16 years, a parent information sheet was also sent to patients' parents or guardian (Appendix vi).

Patients attended one of four hospital based outpatient clinics in Lothian. For those participants under the age of 16 years, advice from the lead Consultant was sought to ascertain whether or not the individual was deemed capable of understanding the

reason for the study and any implications, and therefore whether or not they should be considered for participation. On arrival at the clinic, patients meeting the criteria for participation and previously in receipt of the patient information were approached by the researcher and given the patient information sheet for review. No discrimination was made between male and female patients, all eligible patients were approached. Patients were given time to ask any questions, clarify any points and consider participation. On agreement to participate all patients were asked to complete a consent form (Appendix vii). Participants were informed that all information provided in the questionnaires would be kept completely anonymous. They were then given the questionnaire pack to complete in the time before and after their clinic appointment.

Where possible, participants were offered the 'five measure' questionnaire pack in order to ensure that a subsample of 50 completed this pack. However, for those participants who indicated that they had limited time, or who were seen towards the end of the clinic, the 'three measure' questionnaire pack was administered.

Participants were given the option of completing the pack in the waiting room or at a desk in a quiet room to the side of the waiting room. At all times participants were encouraged to ask the researcher for help with completing the questionnaires should there be any difficulties. They were also asked to complete the questionnaires without help from any parent or guardian who may be present to avoid a bias in socially desirable responses.

On completion of all questionnaires, participants were gifted with a music voucher to the value of five pounds sterling as a token of appreciation for participation. Each

completed questionnaire was assigned an identification number which could not be traced back to the individual and which was used to distinguish each questionnaire pack completed. Consent forms containing patient names and anonymous completed questionnaires were kept in a locked filing cabinet, in a locked room in a hospital psychology department. No identifying information was included on the computer database. As detailed in the patient information sheets, all participants were given the option of requesting a copy of the study's findings.

## **2.8 Statistical Analysis**

Questionnaires were scored by the researcher and data entered into the Statistical Package for the Social Sciences (SPSS) Version 14.0 for Windows for analyses. Descriptive data were generated for all variables and assumptions of normality were checked for predictor variables using exploratory techniques. Non normally distributed data were transformed using log and square root functions.

Multiple regression was planned to explain the variance between the main hypothesised predictor and HbA1c, and the relative and incremental contribution of additional predictors to this variance.

In order to further test the relationship between the key predictors and HbA1c, along with the relationship between individual predictors, path analysis in the form of structural equation modelling was used. The EQS structural equation modelling (SEM) programme (Bentler, 1995) was used to build the model.

## **3.0 Results**

### **3.1 Participants**

Eight out of a possible thirteen clinics offered across four geographical areas were attended by the researcher. Figure 3.1 details a flow chart of participants in the study and reasons for dropout. Of all participants approached, the response rate, in terms of completed packs returned, was 79.3%.

Data were analysed for the remaining 86 participants, of whom 50 completed the pack of five measures and 36 completed the pack of three measures. 46 males and 40 females took part, average age 15.9 years and 16.3 years respectively. Age for the total sample was an average of 16.1 years, ranging from 14.4 years to 18.0 years (sd=1.1 yrs). Mean duration of diabetes diagnosis was 6.3 years (sd=4.0) ranging from 1.1 years to 18.4 years (one patient was exposed to diabetes in utero). All patients in the remaining sample of participants had a diagnosis of Type 1 diabetes.

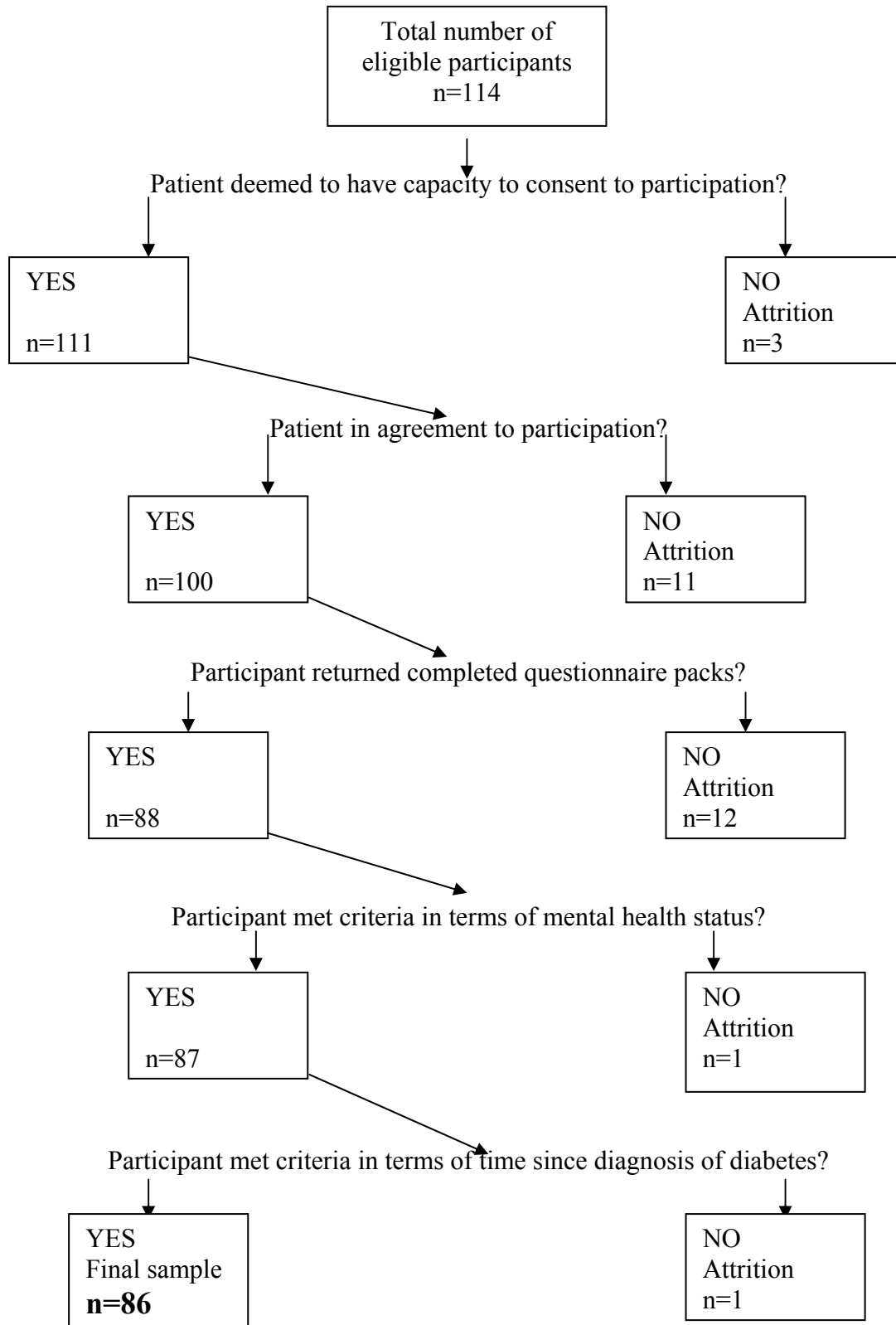


Fig. 3.1 Flowchart showing participant attrition

## **3.2 Analysis**

Initial descriptive statistics provide information around the distribution of data for each predictor and include mean scores and standard deviations. Correlational analysis was carried out to examine the relationship between attachment security (as measured by A-RQ) and blood glucose control (as measured by HbA1c). Multiple regression and path analysis were conducted to explore how the additional predictors may mediate this relationship.

### **3.2.1 Missing data analysis**

Just under 0.5% of HADS and IIP-32 items had been omitted by the total sample. 2.1% of all possible data from the following scales of the SASSI-A2 was missing; FRISK (family and friends at risk), ATT (attitudes), SYM (symptoms), OAT (obvious attributes), SAT (subtle attributes), DEF (defensiveness), SAM (supplemental addiction measure), COR (correctional). 5.4% of items on the A-RQ had been omitted and 10.5% of participants had neglected to circle the style that most relates to them. No data on the A-RSQ were missing, all demographics were gathered and all HbA1c levels were obtained.

The 'Missing Value Analysis' imputation for the above missing items was completed, using the SPSS programme (Field, 2005). For the 9 individuals who had omitted to circle the style that reflected dominant attachment style, the highest rated attachment style for 8 of the participants was taken as their dominant attachment style. For the one remaining participant, dominant attachment style could not be determined as the

two highest rated scales were rated as equal. Thus, one item remains 'missing' for dominant attachment style.

Items for eight of the SASSI-A2 subscales were on one side of the questionnaire and items relating only to the FVOD and FVA items were on the back of the questionnaire. 21 participants failed to complete this entire side of the questionnaire resulting in 23.9% of FVOD and FVA data missing. Given the large amount of missing data, in conjunction with the fact that for 21 participants there was not one single item completed on each of the scales, missing data analysis could not be completed with maximum likelihood estimates or regression imputation for the SASSI-A2.

### **3.3 Descriptive Statistics**

#### **3.3.1 Tests of Normality**

All variables were analysed to examine whether data is distributed in a pattern that is significantly different from a normal distribution. For those samples where  $n \leq 50$ , the Shapiro-Wilk test of normality was used. For those samples where  $n > 50$  the Kolmogorov-Smirnov test was used, as recommended by Field (2005). Z scores of skewness and kurtosis, calculated by dividing skewness and kurtosis values by their error (Field, 2005), were also produced. Data with a z score of greater than  $\pm 1.96$  are deemed to be distributed in a pattern significantly different from a normal distribution. Any data found not to be significantly different to the normal

distribution, based on both z scores *or* the normality statistic, were deemed to have a normal distribution.

Normality results for the data used to determine the reliability of the A-RQ (i.e. the scale scores on the A-RQ, A-RSQ and IIP-32, along with the total attachment scores) are presented in Tables 3.1 and 3.2. Table 3.1 makes use of the Kolmogorov-Smirnov statistic for  $n > 50$ , Table 3.2 makes use of the Shapiro-Wilk statistic.

**Table 3.1 - Normality statistics of attachment measures-  $n > 50$**

| Variable                | Kolmogorov-Smirnov statistic (p value) | Skewness z score | Kurtosis z score |
|-------------------------|--|------------------|------------------|
| A-RQ secure rating      | D (86) = 0.21<br>( $p < .001$ )        | -4.38            | 2.24             |
| A-RQ fearful rating     | D (86) = 0.26<br>( $p < .001$ )        | 5.29             | 1.42**           |
| A-RQ preoccupied rating | D (86) = 0.22<br>( $p < .001$ )        | 4.66             | 1.20**           |
| A-RQ dismissing rating  | D (86) = 0.22<br>( $p < .001$ )        | 5.28             | 2.35             |
| A-RQ TAS                | D (86) = 0.18<br>( $p < .001$ )        | 3.90             | 0.80**           |

\* ns = not significant at  $p < .05$     \*\* within the limits of z score  $\pm 1.96$



**Table 3.2 - Normality of attachment measures- n ≤ 50**

| Variable                            | Shapiro-Wilk<br>statistic (p value) | Skewness z<br>score | Kurtosis z<br>score |
|-------------------------------------|-------------------------------------|---------------------|---------------------|
| A-RSQ average secure rating         | W (50) = 0.98 (ns)*                 | 0.26**              | -1.13**             |
| A-RSQ average fearful rating        | W (50) = 0.95<br>(p<.05)            | 1.51**              | -0.78**             |
| A-RSQ average dismissing<br>rating  | W (50) = 0.97 (ns)*                 | 0.91**              | -0.86**             |
| A-RSQ average preoccupied<br>rating | W (50) = 0.96 (ns)*                 | 1.46**              | -0.57**             |
| A-RSQ TAS                           | W (50) = 0.97 (ns)*                 | -1.41**             | -0.32**             |
| IIP-32 Domineering/Controlling      | W (50) = 0.98 (ns)*                 | -1.60**             | 0.97**              |
| IIP-32 Vindictive/Self-centred      | W (50) = 0.96 (ns)*                 | -0.78**             | 0.96**              |
| IIP-32 Cold/Distant                 | W (50) = 0.92<br>(p<.01)            | 2.51                | 1.62**              |
| IIP-32 Socially Inhibited           | W (50) = 0.96 (ns)*                 | 0.47**              | 2.10                |
| IIP-32 Nonassertive                 | W (50) = 0.95<br>(p<.05)            | -1.33**             | 4.01                |
| IIP-32 Overly Accommodating         | W (50) = 0.98 (ns)*                 | -0.95**             | 0.14**              |
| IIP-32 Self-Sacrificing             | W (50) = 0.97 (ns)*                 | -1.54**             | 1.46**              |
| IIP-32 Intrusive/Needy              | W (50) = 0.94<br>(p<.05)            | -2.96               | 2.18                |
| IIP-32 Total Raw Score              | W (50) = 0.94<br>(p<.05)            | 2.02                | -0.30**             |

\* ns = not significant at p<.05    \*\* within the limits of z score +/- 1.96

Based on examination of both normality statistics and z scores on skewness and kurtosis, data for each of the A-RQ scales, Total Attachment Score, IIP-32 scores on Cold/Distant, Nonassertive and Intrusive/Needy scales and IIP-32 total raw score were considered to be non normally distributed and were transformed for analyses from this point on. Log transformation ( $\log(\text{variable})$ ) was used for A-RQ secure, dismissing and total attachment scale scores and the IIP-32 Total Raw score and Cold/Distant score data. Square root transformation ( $\sqrt{\text{variable}}$ ) was used for the IIP-32 Intrusive/Needy score data. These transformations were successful based on either non significant z scores or a non significant normality statistic. A table of the normality statistics and normality plots for these transformed data are available in Appendix ix.

When data for the A-RQ preoccupied and fearful scales and the IIP-32 Nonassertive scale were transformed using the square root, log and reciprocal ( $1/\text{variable}$ ) functions, transformations were not successful. Transformations skewed the data further (according the z scores and normality statistics). These three scales are thus analysed in their non transformed state. The remaining sixteen scales are analysed in their transformed state.

Normality results for the six key variables are reported in Table 3.3.

**Table 3.3– Normality tests of key variables**

| Variable                         | Kolmogorov-Smirnov statistic (p value) | Skewness z score | Kurtosis z score |
|----------------------------------|--|------------------|------------------|
| HbA1c(n=86)                      | D (86)= 0.13 (p=.001)                  | 2.88             | 0.11**           |
| HADS anxiety scores (n=86)       | D (86)= 0.14 (p<.001)                  | 2.67             | -0.20**          |
| HADS depression scores (n=86)    | D (86)= 0.17 (p<.001)                  | 10.10            | 23.00            |
| TAS on A-RQ (n=86)               | D (86) = 0.18 (p<.001)                 | 3.90             | 0.80**           |
| IIP Total Raw Score (n=50)       | D (50)= 0.12 (ns)*†                    | 2.02             | -0.30**          |
| SASSI-A2 FVA+FVOD % score (n=65) | D(65)= 0.25 (p<.001)                   | 4.85             | 2.40             |

\* ns = not significant at p<.05    \*\* within the limits of z score +/- 1.96

† Given sample size of 50, Shapiro Wilk (50) = 0.94, p<.05.

Normality plots for these key variables are found in Appendix x (a). As with previously, based on examination of both z scores and normality statistics, data for the HbA1c, HADS anxiety, HADS depression, TAS on A-RQ, IIP Total Raw Score and FVA+FVOD % score were considered to be non normally distributed and were transformed for analyses from this point on. Log transformation was used for HbA1c and HADS depression data. Square root transformation was used for FVA+FVOD% and HADS anxiety data. IIP-32 Total Raw score and TAS on A-RQ transformations had previously been carried out. Transformation was found to be successful based on either non significant z scores or a non significant Kolmogorov-Smirnov value. A

table of the normality statistics and normality plots for these transformed data are available in Appendix x (b).

All key variables can be considered normally distributed, thus parametric analyses is used in the current study. Attachment measure data, used only to validate the A-RQ, is also analysed using parametric methods in the current study.

### 3.3.2 Diabetes HbA1c

**Table 3.4 - HbA1c % by gender**

|                  | % Patients<br>HbA1c > 7.50% | HbA1c%      |         |         |
|------------------|-----------------------------|-------------|---------|---------|
|                  |                             | Mean (sd)   | Minimum | Maximum |
| Male<br>(N=46)   | 84.78<br>(N=39)             | 9.18 (1.78) | 6.50    | 14.00   |
| Female<br>(N=40) | 95.00<br>(N=38)             | 9.90 (1.80) | 7.00    | 14.60   |
| Total<br>(N=86)  | 89.53<br>(N=77)             | 9.52 (1.81) | 6.50    | 14.60   |

HbA1c levels ranged from 6.5 % to 14.6% with mean levels of 9.52%. Given that an HbA1c level in children and adolescents below 7.5% is considered healthy (Rewers *et al.*, 2007; National Collaborating Centre for Women’s and Children’s Health, 2004; NICE Guidance, 2004), in the current study 89.5% of patients were considered not to be within the ranges of healthy glycaemic control.

### 3.3.3 Attachment Style

#### 3.3.3.1 A-RQ

The percentage of participants endorsing a specific attachment style is tabulated below (Table 3.5). A continuous score of attachment using the total attachment score (TAS) is also provided from analysis of the A-RQ. As discussed previously, TAS= (secure score)- (fearful score)- (preoccupied score)- (dismissing score) with higher scores indicating “a more secure attachment style” (Matsuoka *et al.*, 2006, p.25).

79.1% of participants identified secure attachment style as their dominant attachment style. As would be expected, the mean TAS for all those endorsing a secure attachment style as their dominant style was highest (0.13). 7.0% of participants identified fearful attachment as their dominant style. This group scored the second highest mean TAS at -6.50. 8.1% of the sample described themselves as being predominantly of a preoccupied attachment style, compared to 4.7% who predominantly identified with a dismissing attachment style. Both these groups of participants had low mean TAS of -10.43 and -10.00 respectively, indicating relatively low attachment security.

**Table 3.5 - A-RQ Attachment Style Classification and TAS**

|                            | % Participants endorsing each style as dominant attachment style (frequency) | Mean TAS (sd) |
|----------------------------|--|---------------|
| Secure Classification      | 79.10 (68)   | 0.13 (2.63)   |
| Preoccupied Classification | 8.10 (7)   | -10.43 (2.70) |
| Fearful Classification     | 7.00 (6)   | -6.50 (2.81)  |
| Dismissing Classification  | 4.70 (4)   | -10.00 (2.16) |
| Total Sample               | 98.80* (85)  | -1.68 (4.52)  |

\* 1 participant omitted a response on this item and was thus unable to be classified

Therefore, the majority of participants identified themselves as securely attached, as was reflected in high TAS. The minority of participants rated their dominant attachment style as dismissing, which was supported by low mean TAS in this group indicating low attachment security.

### **3.3.3.2 A-RQ Validity**

Before examining the relationship between attachment (as measured by the A-RQ) and HbA1c, the validity of the A-RQ was tested by examining correlations between the validating measures. To justify the use of the A-RQ in its own right, the A-RSQ

and IIP-32 were administered to 50 out of 86 participants in order to ascertain convergent validity of corresponding scales

### **3.3.3.2.1 A-RQ and A-RSQ**

Each of the individual items on the A-RSQ relates to a specific attachment style. The score for each attachment style was calculated and then averaged to provide a mean rating for each attachment style, with a maximum score being 7. This provided a dimensional score for each type of attachment style, as opposed to specifying a single, dominant attachment style category.

Pearson's correlation coefficient was used to examine the relationship between the individual rating for each attachment style on the A-RQ and the individual mean rating for each attachment style on the A-RSQ. The results were as follows: 'Secure' attachment style  $r = .63$  ( $p < .001$ ), 'Fearful' attachment style  $r = .45$  ( $p < .005$ ); 'Preoccupied' attachment style  $r = .33$  ( $p < .05$ ); 'Dismissing' attachment style  $r = .28$  ( $p = .05$ ) (All two-tailed). Pearson's correlation coefficient for A-RQ TAS and A-RSQ TAS was  $.73$  ( $p < .001$ ). These correlations indicated significant relationships between the shared constructs of the A-RQ and A-RSQ, thus providing evidence on the validity of the A-RQ. The use of the A-RQ as a stand alone attachment measure based on Bartholomew and Horowitz's prototypic model was supported (1991).

### **3.3.3.2.2 A-RQ and IIP-32**

To test the validity of the A-RQ attachment measure, Pearson's correlation coefficients for each attachment style and each IIP-32 scale score were calculated, all two tailed. 'Secure' attachment style scores correlated with the 'intrusive/needy' scale scores ( $r = -.31, p < .05$ ) and self-sacrificing scale scores ( $r = -.32, p < .05$ ). 'Fearful' attachment scores correlated with the 'intrusive/needy' scale scores ( $r = .41, p = .001$ ) and the total raw score on the IIP-32 ( $r = .35, p < .05$ ). 'Dismissing' attachment scores correlated with 'overly accommodating' scale scores ( $r = .37, p < .01$ ). TAS correlated with 'intrusive/needy' scale scores ( $r = -.28, p < .05$ ). When total raw score on the IIP-32 was correlated with TAS on A-RQ Pearson's correlation coefficient was  $-.39$  ( $p = .005$ ).

Despite findings from previous literature, no further significant relationships existed between the 8 scale scores and the 4 attachment style scores. Therefore, the IIP-32 appears to measure a different set of constructs to the A-RQ. IIP-32 was intended to support validation of the A-RQ. However, given the preliminary findings that the IIP-32 and A-RQ do not appear to measure the same constructs, the IIP-32 is herein analysed as a separate independent variable.

### **3.3.4 Interpersonal Problems**

Each item on the IIP-32 relates to one of eight scales of interpersonal problems, with each scale drawing on four different items. 50 participants completed the IIP-32.

Mean scores, out of 16, on the IIP-32 for each scale are detailed in Table 3.6.



**Table 3.6 – Mean raw score for each IIP-32 Scale**

| IIP Scale               | Mean Raw Score (sd) |
|-------------------------|---------------------|
| Domineering/Controlling | 2.52 (sd=2.62)      |
| Vindictive/Self-centred | 2.48 (sd=2.73)      |
| Cold/Distant            | 2.06 (sd=2.44)      |
| Socially Inhibited      | 2.64 (sd=3.00)      |
| Nonassertive            | 5.08 (sd= 3.89)     |
| Overly Accommodating    | 5.02 (sd=3.51)      |
| Self-Sacrificing        | 5.18 (sd=3.93)      |
| Intrusive/Needy         | 3.58 (sd=3.65)      |
| Total Raw Score*        | 28.56 (sd=12.96)    |

\*minimum total raw score=9, maximum total raw score=60.

Participants scored highest on the ‘Self-Sacrificing’ scale with similar high scores on the ‘overly accommodating’ and ‘non assertive’ scales. Lowest scores were seen on the ‘cold/distant’ scale.

### **3.3.5 Anxiety and Depression**

Table 3.7 shows mean scores and standard deviations for participants’ anxiety and depression raw scores. Overall, participants reported a higher level of anxiety symptoms than depressive symptoms. Females endorsed both anxiety and depression symptoms to a greater degree, and the distribution of scores was also wider than for males. Mann Whitney test showed that the difference between male and female

anxiety ratings was significant ( $U = 514.5, p < .001$ ). For depression, the difference was not significant ( $p > .05$ ).

**Table 3.7 – Anxiety and Depression Scores by gender**

|                  | Mean<br>Anxiety Score (sd) | Mean<br>Depression Score (sd) |
|------------------|----------------------------|-------------------------------|
| Male<br>(N=46)   | 4.75 (2.46)                | 2.54 (1.82)                   |
| Female<br>(N=40) | 7.57 (3.96)                | 2.85 (3.17)                   |
| Total<br>(N=86)  | 6.06 (3.53)                | 2.69 (2.53)                   |

Table 3.8 provides information on ‘probable’ and ‘possible’ anxiety and depression diagnosis. For the depression items, total scores of 7-9 indicate ‘possible’ depression and scores of 10 and above indicate ‘probable’ depression. For the anxiety items, total scores of 9-11 indicate ‘possible emotional disorder’ and scores of 12 and above indicate ‘probable emotional disorder’ (White *et al.*, 1999).

Over 15% of participants were identified as having a ‘probable’ anxiety diagnosis and 1.2% as having a ‘probable’ depressive illness, as measured by the HADS. A further 9.3% of patients fell into the category of ‘possible’ anxiety, compared to 2.3% who fell into the category of ‘possible’ depression. When mental health was examined, adolescents in this study reported higher levels of anxiety than depression.

**Table 3.8 – Percentage of Participants scoring above ‘cut-offs’ for Anxiety and Depression**

| Based on cut-off scores recommended by White <i>et al.</i> (1999) | % of patients (n) |            |
|---|-------------------|------------|
|   | Anxiety           | Depression |
| ‘possible’ diagnosis of   | 15.12 (13)        | 1.16 (1)   |
| ‘probable’ diagnosis of   | 9.30 (8)          | 2.33 (2)   |

### 3.3.6 Substance use

Of the 59 participants who answered the question relating to onset of substance use, 1.7% of participants first tried drugs or alcohol when aged under twelve years, 6.8 % at age 12 years, 18.6 % at age 13 years, 23.7% at age 14 years, 20.3% at age 15 years, 1.7% at age 16 years while 27.1% had never tried drugs or alcohol. Of the 59 participants who answered the item regarding frequency of use, 1.7% reported using substances about twice a week, 11.9% about once a week, 27.1% between one and three times per month, 13.6% less than once a month and 45 % did not use regularly. The majority of those individuals meeting the criteria for ‘regular use’, 15.3%, started doing so at age 16, while 2 participants (3.4%) indicated that they had been using drugs and alcohol regularly since the age of 12 and 13.

The SASSI-A2 includes a ‘decision rule’ whereby participants’ scores on specific scales and combinations of scales are used to classify participants in terms of likelihood of substance use disorder (see Table 3.9).

**Table 3.9- SASSI-A2 decision rule probability of substance misuse disorder (n=64)**

| Probability of Substance Use Disorder   | % (n) Participants meeting the criteria probability |
|---|---|
| ‘low probability of having a Substance Abuse or Substance Dependence Disorder’  | 29.10 (25)  |
| ‘low probability of having a Substance Abuse or Substance Dependence Disorder but consider further assessment’                          | 30.20 (26)  |
| ‘high probability of having a Substance Abuse or Substance Dependence Disorder, with Substance Abuse Disorder being more probable’      | 5.80 (5)  |
| ‘high probability of having a Substance Abuse or Substance Dependence Disorder, with Substance Dependence Disorder being more probable’ | 9.30 (8)  |

22 participants (25.6%) failed to complete the SASSI-A2 questionnaire sufficiently, specifically on items relating to the ‘Face Valid Alcohol’ (FVA) and ‘Face Valid Other Drugs’ (FVOD) scales, rendering the above classification (Table 3.6) impossible for those 22 participants.

Over half the sample met the criteria for ‘low probability’ of substance use disorder, around half of whom would require further assessment to clarify this probability

according to the SASSI-A2 decision rule. 15.1% of participants met criteria for ‘high probability’ of substance use disorder, with a little over one third being more likely to have a ‘substance abuse disorder’ and the remainder more likely to have a ‘substance dependence disorder’.

Miller and Lazowski (2001) suggest further exploration of those participants scoring above the 85<sup>th</sup> percentile of each individual scale based on the normative sample.

Scores falling above this cut off are considered to be of clinical value. Participants scoring above the 85<sup>th</sup> percentile did so on the ‘correctional behaviour’ (19.0%) and ‘defensiveness’ (31.0%) scales. No patients scored above the 85<sup>th</sup> percentile on direct measures of drug and alcohol use (FVA and FVOD).

### **3.4 Preliminary Analysis**

#### **3.4.1 Diabetes Control and Attachment as measured by A-RQ**

The relationship between attachment and diabetes control was analysed by computing a one tailed Pearson’s Correlation Coefficient for HbA1c and TAS on A-RQ (n=86). For this relationship,  $r = -.19$  ( $p < .05$ ). This indicated an inverse relationship between attachment security and HbA1c level.

### **3.4.2 Diabetes control and Depression and Anxiety**

Pearson's  $r$  correlation of anxiety score and HbA1c revealed a medium sized and significant relationship ( $r = .22, p < .05$ ). Anxiety, therefore, was significantly related to HbA1c. Depression was not significantly related to HbA1c level ( $p > .05$ ).

### **3.4.3 Diabetes control and Substance Use**

The scale scores for direct alcohol and drug use were combined to produce a direct measurement of substance use (FVA & FVOD as a % of total possible score endorsed). Higher scores on this scale indicate higher and more problematic use of substances. This combined scale did not correlate significantly with HbA1c ( $p > .05$ ).

### **3.4.4 Diabetes control and Interpersonal problems**

Pearson's correlation coefficients were calculated to test the relationships between interpersonal problems, using the IIP-32 subscales ( $n=50$ ), and HbA1c. The correlation between the 'self-sacrificing' scale and HbA1c was negative and significant ( $r = -.41, p < .005$ ). Furthermore, the 'vindictive/ self-centred' scale correlated positively with HbA1c ( $r = .41, p < .005$ ). The remaining scales (Intrusive/ Needy, Overly Accommodating, Non Assertive, Socially Inhibited, Cold /Distant, Domineering) and total IIP-32 raw score were not significantly correlated with HbA1c level.

### **3.4.5 Preliminary Analyses of Relationships between Predictors**

The relationships between predictors were calculated using Pearson's correlation coefficients for attachment security (TAS on A-RQ), anxiety (HADS anxiety score), depression (HADS depression score), substance use (FVOD+FVA%) and interpersonal problems (IIP-32 total raw score). Significant correlations are reported below (Table 3.10). A full report of correlations can be found in Appendix viii.

Attachment security (TAS), as measured by the A-RQ, was shown to have a medium sized negative correlation with level of depression. Attachment security was also highly negatively correlated with anxiety levels. Interpersonal problems (with higher scores indicating a higher level of interpersonal problems) showed a medium negative correlation with attachment security. This would suggest that as levels of secure attachment increased, depression, anxiety and reporting of interpersonal problems decreased.

Both depression and anxiety scores were found to have a medium to large sized positive correlation with interpersonal problems. These findings suggest that, as depression or anxiety levels increased, interpersonal problems also increased.

Substance use, as measured by the combined scale scores for drug use (FVOD) and alcohol use (FVA), did not appear to have a significant relationship with any of the other predictors.

**Table 3.10- Pearson's r Correlation Coefficient between Key Predictors**

|                     | A-RQ TAS                   | FVA+FVOD%            | HADS Depression           | HADS Anxiety           | IIP Total Raw Score |
|---------------------|----------------------------|----------------------|---------------------------|------------------------|---------------------|
| A-RQ TAS            |                            | -                    | -                         | -                      | -                   |
| FVA+FVOD%           | <b>.141 (p=.264)</b>       |                      | -                         | -                      | -                   |
| HADS Depression     | <b>-.344 (p=.001)**</b>    | <b>.107 (p=.397)</b> |                           | -                      | -                   |
| HADS anxiety        | <b>-.440 (p&lt;.001)**</b> | <b>.032 (p=.802)</b> | <b>.442 (p&lt;.001)**</b> |                        | -                   |
| IIP Total Raw Score | <b>-.387 (p=.005)*</b>     | <b>.089 (p=.590)</b> | <b>.422 (p=.002)**</b>    | <b>.467 (p=.001)**</b> |                     |

Unrelated measures, rs in **bold**, \*= significant at p<.05, \*\* = significant at p<.005

### 3.4.6 Summary of key predictor correlations with HbA1c

As reported in Table 3.11, interpersonal problems, substance use and depression do not significantly correlate with HbA1c. Attachment security and anxiety have small to medium sized significant correlations with HbA1c.



**Table 3.11 - Summary of HbA1c correlations with Key Predictors**

| Correlate HbA1c with (n)           | Pearson's R | Significant? (p value) |
|------------------------------------|-------------|------------------------|
| FVA & FVOD % (n=65)                | +.16        | No                     |
| A-RQ Total Attachment Score (n=86) | -.19        | Yes (p<.05)            |
| HADS depression (n=86)             | +.17        | No                     |
| HADS anxiety (n=86)                | +.22        | Yes (p<.05)            |
| Total IIP Raw score (n=50)         | +.24        | No                     |

### **3.5 Hypotheses Testing**

#### **3.5.1 Multiple Regression Analysis to assess the predictive relationship of attachment security and blood glucose level**

A forced entry linear multiple regression was carried out to explore the linear combination of independent variables (attachment security, substance use, interpersonal problems, depression and anxiety) that best predict HbA1c. Attachment security (TAS) was entered into the first regression model but did not significantly predict HbA1c level ( $F(1,37) = 0.747, p = .393$ ) (Table 1, Appendix xi). When attachment security alone was entered 2.0% of the variation in HbA1c was accounted for. The non significant F ratio, i.e. the change from zero in the amount of variance explained when attachment is considered, suggests that the attachment alone did not predict HbA1c.

In addition, substance use (FVOD+FVA%), depression (HADS depression), anxiety (HADS anxiety) and interpersonal problems (IIP-32 total raw score) were entered into the model. This model was not significant ( $F(5, 33) = 0.659, p = .657$ ).

When substance use, depression, anxiety and interpersonal problems were added to this model, the variance in HbA1c explained increased to around 9.1%. Once again, the non significant F ratio, based on this change in variance from model one to model two, suggested that the linear combination of predictors produced by the multiple regression analyses did not explain a significant level of variance in HbA1c (Table 2, Appendix xi).

It is noteworthy that missing values reduced the number of complete data sets analysed to  $n=38$ , when cases were excluded 'listwise'. Therefore, the multiple regression analysis should be interpreted with caution. It was considered that the multiple regression model was not significant on the basis that many indirect relationships were occurring between predictors, as seen in the preliminary analysis (Table 3.10). Therefore, path analysis was carried out.

### **3.5.2 Path Analysis**

Based on the indication from preliminary analysis that the predictors interact separately from HbA1c (Table 3.10) and the fact that multiple regression models did not produce significant results, it was hypothesised that relationships between key predictors and HbA1c are indirect. Path analysis, in the form of structural equation

modelling, was used to further test the nature and significance of relationships between the key predictors and HbA1c (as in hypothesis 2).

Path analysis, a form of structural equation modelling whereby algorithms are developed to allow covariance modelling techniques, can be used with non-normally distributed variables, categorical data and in small samples. Klem (1995) explains that path analysis is a logical extension of a multiple regression as it has the ability to treat independent variables as dependent variables, in the context of the predictive ordering of all variables. She goes on to describe an advantage of path analysis being the ability of the model to allow the researcher to test a hypothesised interactions between all variables at one time, including the effects of mediation and moderation, while also providing information on how well each path model fits the data.

Path analysis produces information around the 'goodness of fit' of the model. These statistics include the Root Mean Square Error of Approximation (RSMEA), which is an estimate of how the model fits the data when compared to a perfect model (Ullman & Bentler, 2004). Smaller values (of less than .06) suggest a well fitting model. The Comparative Fit Index (CFI) is also provided. This statistic provides a measure of the fit of the model relative to other models (Ullman & Bentler, 2004). Values of CFI at zero indicate no fit of the model to the data, i.e. a null model whereby the variables are completely independent of each other (Olobatuyi, 2006), while values of one suggest a perfect fit. A value of over .9 is considered indicative of a good fit. Finally, a chi square statistic is provided to determine whether or not the variance left unexplained by the model is significant, i.e. variance left unexplained is much greater than zero. For data which are not normally distributed the Satorra-Bentler scale

statistic is used (Ullman & Bentler, 2004). A non significant chi square would suggest that the model is a good fit since a large proportion of the variance is explained. To be underpowered is essentially to find that the model does not fit the data when it does explain the relationships between variables, therefore in small samples one runs danger of not finding a model with sufficient explanatory power. Thus, the statistics produced allow the researcher to comment on whether or not sample size is adequate.

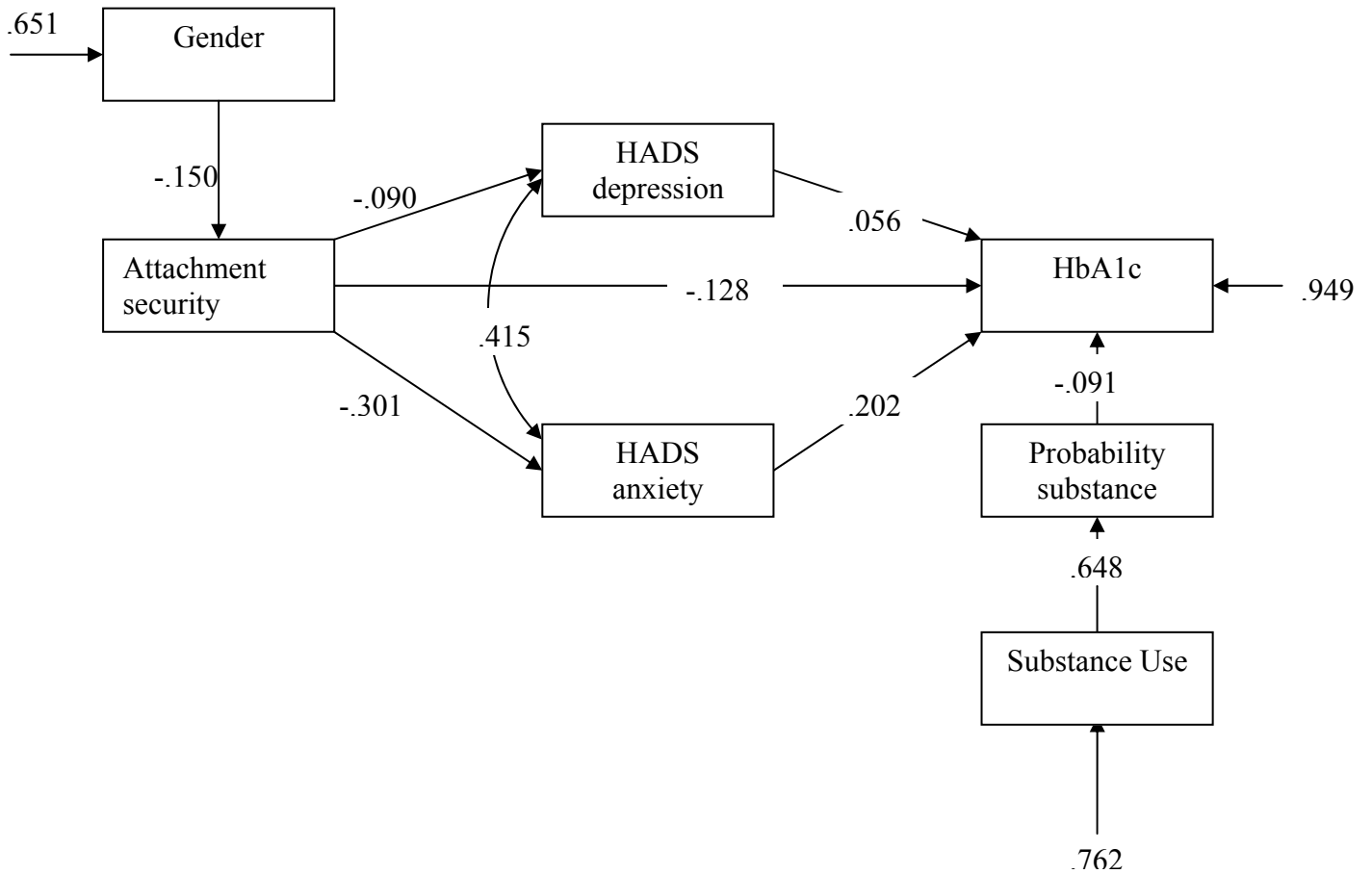
**3.5.2.1 Hypothesis 2- the relationship between attachment security and HbA1c will be affected by additional psychological factors- Path Analysis 1**

Initial path analysis, in line with hypothesis 2, tests the relationships between HbA1c, attachment security, direct substance use, probability of substance use disorder, anxiety, depression and gender. The model fit statistics for the interpretation of Figure 3.2 are reported in Table 3.12.

**Table 3.12 - SEM goodness of fit statistics- Model 1**

|   |                      |
|---|----------------------|
| Comparative Fit Index (CFI)                     | .917                 |
| Root Mean Square Error of Approximation (RSMEA) | .079                 |
| 90% confidence interval of RMSEA                | .000, .160           |
| Satorra-Bentler Scaled Chi Square               | 16.73 (df=12, p=.16) |

**Figure 3.2 – Path Diagram- Model 1**



Solid pathways indicate significant relationships. Variables in rectangular boxes represent measured variables. Gender= male or female; attachment security = TAS as measured by A-RQ; HADS depression= depression scores; HADS anxiety= anxiety scores; HbA1c = HbA1c % level; probability substance = probability of substance use disorder, high to low, four categories; substance use= FVOD+FVA% total. Peripheral figures indicate error terms.

Interpretation of the path diagram (Figure 3.2) suggests a small predictive relationship between attachment security and HbA1c level. HbA1c level is indicated to be indirectly affected by gender. The relationship between attachment security and HbA1c level is mediated by anxiety but not depression. Substance use has a very

small direct effect on HbA1c. However, when the ‘goodness of fit’ statistics are examined, the explanatory power of the model is questioned.

The path analysis 1 CFI statistic suggests that this model is a good fit for the data when other models are compared. The chi square statistic is not significant, indicating that covariance is adequately explained. However, the RMSEA figure above the .06 cut off indicates a poor fit of the data compared to a perfect model. Therefore, path analysis model one is rejected as a model that explains the relationships and covariance between each variable.

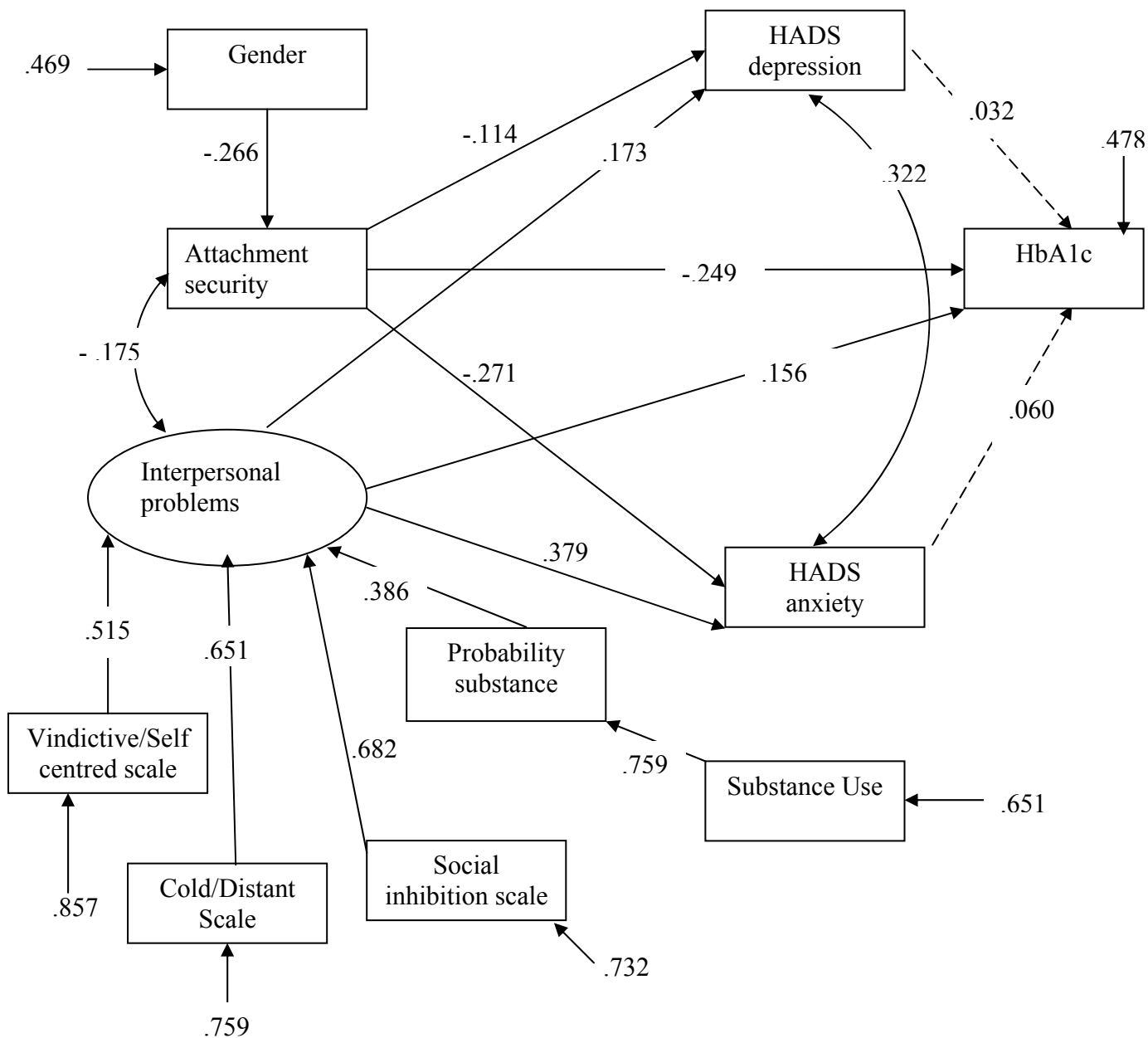
**3.5.2.2 Hypothesis 2- the relationship between attachment security and HbA1c will be affected by additional psychological factors- Exploratory Path Analysis 2**

A further path analysis was carried out to test the relationships between HbA1c, attachment security, direct substance use, probability of substance use disorder, anxiety, depression, gender and interpersonal problems sub scales. The model fit statistics for the interpretation of Figure 3.3 are reported in Table 3.13.

**Table 3.13 - SEM goodness of fit statistics- Model 2**

|   |                      |
|---|----------------------|
| Comparative Fit Index (CFI)                     | .968                 |
| Root Mean Square Error of Approximation (RSMEA) | .042                 |
| 90% confidence interval of RMSEA                | .000, .133           |
| Satorra-Bentler Scaled Chi Square               | 29.85 (df=28, p=.37) |

**Figure 3.3 - Path Diagram- Model 1**



Dashed pathways indicate non significant relationships. Solid pathways indicate significant pathways. Rectangular boxes represent measured variables. Ovals represent factors. Gender= male or female; attachment security = TAS as measured by A-RQ; HADS depression= depression scores; HADS anxiety= anxiety scores; HbA1c = HbA1c % level; probability substance = probability of substance use disorder, high to low, four categories; substance use= FVOD+FVA% total; interpersonal problems= the factor onto which IIP-32 scales load on to; vindictive/self centred scale = scale scores from this scale on IIP-32; cold/distant scale= scale scores from this scale on IIP-32; social inhibition scale= scale scores from this scale on IIP-32. Peripheral figures indicate error terms.

The second model (Figure 3.3) analysed the same variables used in the first model. However, as an exploration of further relationships, and given the shortcoming of model one in terms of the RMSEA statistic, interpersonal problems data is included. Three scales, 'vindictive/self centred', 'cold/distant' and 'socially inhibited' load onto one factor, referred to as 'interpersonal problems' in Figure 3.3. Path analysis 2 indicates many complex interactions between variables.

When hypothesis one is considered, that attachment security has a direct effect on HbA1c levels, attachment appears to have a significant medium sized, direct, inverse relationship with HbA1c level. However when hypothesis two is considered, that additional psychological factors will have an effect on the relationship, the relationship of attachment security with HbA1c level appears to be significantly affected by gender and interpersonal problems. These interactions would suggest that the relationship between attachment and HbA1c is strengthened when the variance in attachment attributed by gender and interpersonal problems is considered. In other words, a person with a low degree of attachment security (i.e. an insecurely attached individual) is likely to have worse blood glucose control (i.e. higher HbA1c), particularly when interpersonal problems exist and gender is female.

The factor representing interpersonal problems also appears to have a small, yet significant, positive, direct relationship with HbA1c level. However, this relationship is significantly contributed to by substance misuse disorder. Once again, the correlation between attachment security and the interpersonal problems factor must be considered, as attachment security indirectly influences the relationship between interpersonal problems and HbA1c level. Therefore, an individual with higher levels



of interpersonal problems, specifically in terms of behaviours endorsing vindictive or self centred, cold or distant, or socially inhibited interactions, is likely to have higher levels of HbA1c, particularly when that individual also has an increased probability of substance use disorder in the context of increased drug and alcohol use. This relationship may also be partly attributable to an interaction with attachment security.

When depression and anxiety are considered, the two scales show a high level of shared variance. Neither scale has a direct relationship with HbA1c. Attachment security is significantly, directly related to anxiety and depression in inverse relationships. In other words, the more securely attached an individual, the lower their reporting of depressive or anxious symptoms. Once again, this relationship is contributed to by gender and the intercorrelation with interpersonal problems should be considered.

Depression and anxiety are also predicted by the interpersonal problems factor. Interpersonal problems have a significant positive relationship with both anxiety and depression, which is once again compounded by substance use and the shared variance between attachment and interpersonal problems. In other words, an individual with a high level of interpersonal problems, specifically when interactions are high on vindictive or self centred behaviours, coldness and social inhibition, contributed to by substance misuse disorder, is likely to have increased levels of depression and, or, anxiety.

The explanatory power of Path Analysis model 2 is supported by strong 'goodness of fit' statistics. The path analysis 2 CFI statistic suggests that this model is a good fit for

the data when other models are compared. This figure is closer to one than the CFI for model one, indicating an improvement in model two in fitting the data. The chi square statistic is not significant, indicating that covariance is adequately explained. Finally, the RMSEA figure is well below the .06 cut off and, thus, indicates a close fit of the data compared to a perfect model. These figures also confirm that the sample size was large enough to reach power. Therefore path analysis model 2 was accepted as a model that explains the predictive relationships and covariances between each variable, i.e. hypothesis two.

## **4.0 Discussion**

### **4.1 Discussion of descriptive statistics with reference to the literature**

#### **4.1.1 HbA1c**

The average HbA1c level for the current study was 9.52%. Recalling that the recommended levels for HbA1c are below 7.50%, and that levels above 9.50% are considered ‘high risk’ for medical complication (National Collaborating Centre for Women’s and Children’s Health, 2004, NICE Guidance, 2004, Rewers *et al.*, 2007), these figures suggest overall poor blood glucose control in the Type 1 diabetic adolescent population in Lothian. Furthermore, just under 90% of all participants did not fall within the healthy range of HbA1c lower than 7.50%.

#### **4.1.2 Attachment**

Over three quarters of the sample identified themselves as being securely attached. With reference to the literature, these figures suggest an over representation of secure attachment style when compared to the insecure attachment styles. Earlier studies, which use the RQ, generally report lower levels of secure attachment. 57% of a non clinical sample of young adults aged 17 to 24 years are classified as ‘secure’ by Bartholomew and Horowitz (1991). The percentage of participants classified as ‘dismissing’ being 18%, ‘preoccupied’ 10% and ‘fearful’ 15%. Horowitz (1996) later categorised 47% of students as securely attached using the RQ. Hamilton (2000) found 30% of adolescents aged 17 to 19 years were classified as securely attached

using a different measure of attachment. When non clinical populations aged 18 to 63 are considered, secure attachment style is endorsed by 51.3% (Allen *et al.*, 2001). The figure for secure attachment falls to 33% when a clinical population of young men is considered (Troisi *et al.*, 2001).

Ciechanowski and colleagues (2006) have measured attachment style in adults with diabetes using the RQ. For those with Type 2 diabetes, attachment is as follows; 'secure' 41.8%, 'dismissing' 30.3%, 'fearful' 19.1% and 'preoccupied' 8.8% (Ciechanowski & Katon, 2006). Of those adults with Type 1 and Type 2 diabetes and depression, 29.0% classify as 'secure' attachment style (Ciechanowski, Russo, Katon, Von Korff *et al.*, 2006). Those adults with Type 1 and Type 2 diabetes who do not have depression indicate higher levels of secure attachment at 37.5% (Ciechanowski, Hirsch *et al.*, 2002).

The studies discussed estimate secure attachment at between 30% and 57%, when non clinical adult and adolescent populations are considered. 37.5% to 41.8% of a non clinical population of adults with diabetes are classified as 'securely attached'. No publications provide information on the classification of attachment in a non clinical adolescent diabetic population as measured by the RQ. Thus, it can be inferred that this population showed substantially higher levels of secure attachment than the general adult and adolescent populations. Further research to replicate these results would be required to support this suggestion.

### **4.1.3 Interpersonal Problems**

The current study of 14 to 18 year olds scored highest on the ‘self-sacrificing’, ‘overly accommodating’ and ‘non assertive’ scales. In the normative sample of 18 to 24 year olds, individuals scored highest on the ‘self-sacrificing’ scale with similar high scores on ‘overly accommodating’, ‘non assertive’ and ‘socially inhibited’ scales. The normative sample scored lowest on the ‘domineering/controlling’ scale (Horowitz *et al.*, 2000) and the current sample endorsed items on the ‘cold/distant’ scale the least. While these norms are not entirely comparable, given that participants are older in the normative sample, it can be hypothesised that adolescent diabetics experience similar levels and types of interpersonal problems. These adolescents, however, are perhaps less likely to report difficulties with social inhibition and ‘cold/distant’ type behaviours and more likely to experience difficulties along the ‘domineering/controlling’ dimension than the general population. However, before such hypotheses can be accepted, further research investigating interpersonal problems in the adolescent population is required.

### **4.1.4 Mental Health**

The figures for ‘probable’ and ‘possible’ anxiety and depression in the current study can be compared to White and colleagues’ (1999) findings. These researchers used the HADS and found similar rates of ‘probable’ anxiety and depression in a non clinical sample of non diabetic adolescents at 14% and 2% respectively. Jorngarten and colleagues (2006) collected HADS data from non clinical populations of adolescents

via mail. Using similar cut offs to the present study, (11+), more severe anxiety was found in around 12% and more severe depression in 3.5 % of adolescents.

While previous studies have suggested higher prevalence of mental health diagnoses in the diabetic population (Lustman *et al.*, 1986), the results from the present study suggest that adolescents with diabetes have comparable rates of anxiety and depression to the general population of adolescents. This would support the work by Petrak and colleagues (2003), who reported that prevalence rates of anxiety and depression in the adult diabetic and non diabetic population are similar.

#### **4.1.5 Substance Use**

When mean scale scores on each of the SASSI-A2 scales were compared to the normative sample (Miller, 1990), males and females in the current study scored lower on eight out of the ten scales, including direct measures of alcohol and drug use (FVA and FVOD). The current sample scored lower than the normative sample on the ‘defensiveness’ and ‘correctional’ scales. Lower scores for alcohol and drug use in the current study suggests lower use of substances in the adolescent diabetic population when compared to the normative adolescent population. Indeed, this finding is supported by the literature discussed in section 1.6.3 (Frey *et al.*, 1997; Kovacs *et al.*, 1997).

However, when one considers the inflated scores on the ‘defensiveness’ scale, it could be argued that these individuals are responding to the questionnaire defensively and avoiding acknowledging personal limitations and potential problems (Miller &

Lazowski, 2001). This would fit with the previously discussed findings that adolescents with diabetes can be considered ‘in denial’ of the effect their substance use may have on their blood glucose control (Gold & Gladstein, 1993). It may then be the case that adolescent diabetics misuse substances to the same degree as the general adolescent population but that they are less likely to admit this. Certainly, Martinez-Aguayo and colleagues (2007) explain that substance use in older diabetic adolescents is comparable to the general adolescent population, while Gold and Gladstein (1993) reported higher risk substance use in diabetic adolescents. Further assessment of substance use in the adolescent diabetic population is required to more fully understand the rates of use within this population.

#### **4.2 Hypotheses Testing**

The preliminary analyses between predictors and HbA1c suggested that attachment security does influence HbA1c levels, as in hypothesis one. The only other predictor to be significantly related to HbA1c was anxiety. However, there appeared to be many relationships between predictors, as tested by Pearson’s *r* analyses (Table 3.10). In order to test the nature of these relationships and the effect of combining these linear relationships on HbA1c levels, multiple regression analysis was carried out. Multiple regression did not produce significant results. Given the many significant relationships between predictors, it was considered that multiple regression analysis was not a suitable statistical analysis as a result of many hypothesised non linear, i.e. indirect, relationships with HbA1c. In order to further explore hypothesis two, that attachment security would predict HbA1c levels when the relationships of additional psychological variables are considered, path analysis was carried out as a method of

examining the nature of direct and indirect relationships between predictors and HbA1c. Based on the preliminary analyses and the literature discussed in the introductory chapter, hypothesised relationships between predictors and HbA1c were tested in path analysis until the model of best fit was produced.

Path analysis one tested the relationships between attachment security, substance use, anxiety, depression and gender. While path analysis one hypothesised a small predictive relationship between attachment security and HbA1c, mediated by anxiety, the model produced was not a statistically ‘good fit’ of the data. This model was therefore rejected as a suitable explanatory model for hypothesis two.

Given the finding that the IIP-32 seems to measure quite different constructs from the A-RQ (Section 3.3.3.2) and the earlier decision to therein include IIP-32 data in further analysis, interpersonal problems scores were included in path analysis two as an additional predictor. Path analysis two (Fig. 3.3) produced an interesting model of significant relationships that proved statistically ‘good fits’ of the data and is thus accepted as the explanatory model for hypothesis two.

### **4.3 Conclusion**

Hypothesis one, that attachment security alone would predict HbA1cs levels, was supported within this study, as tested by correlations. Multiple regression analysis did not support these findings. However, when the mediating and moderating effects of interpersonal problems, substance use, anxiety, depression and gender were considered through exploratory path analysis, there existed a direct relationship



between attachment and HbA1c. This relationship was strengthened when the effects of gender and the interaction with interpersonal problems were considered. These relationships were significantly good fits for the data, as tested by path analysis in the form of structural equation modelling.

Therefore, in testing hypothesis two, it appeared that the relationship between attachment style and HbA1c level was contributed to by gender and interpersonal problems. Interpersonal problems were directly affected by substance use. However, depression and anxiety symptom reporting did not mediate the relationship between attachment and HbA1c levels.

#### **4.4 The nature of relationships between predictors and their impact on HbA1c, with reference to the literature**

##### **4.4.1 The role of anxiety and depression in predicting HbA1c**

Preliminary analyses indicated that only anxiety predicts HbA1c level. These findings would be supported by Lustman and colleagues (1986), who found that individuals with a psychiatric diagnosis, including anxiety, are likely to have poorer HbA1c levels. However, Lustman and colleagues (1986) did not consider additional predictors in their study other than self reported symptoms of distress elicited by specific diabetes symptoms. When additional relationships were further tested using path analysis, some interesting interactions came to light. While path analysis one (Fig 3.2) holds that low attachment security in conjunction with high anxiety leads to poorly controlled HbA1c, this model is not considered to be a statistically ‘good fit’.

The more statistically robust model, path analysis two (Fig 3.3), which incorporates interpersonal problems, does not support the finding that anxiety directly affects HbA1c level. One must, therefore, consider whether it is wise to analyse theoretically complex constructs in isolation. Spurious relationships can occur when two variables appear to be correlated due to a common cause (Klem, 1995). Perhaps studies reporting interactions between anxiety or depression and HbA1c are reporting spurious relationships, created by omitting to control for important common variables and using appropriate analysis. Replication of the current results in further research would be required before this could be confirmed.

While anxiety and depression do not appear to have a direct effect on HbA1c, predictive relationships for anxiety and depression emerge when interpersonal problems and attachment are considered in analysis. These relationships fit with the theoretical relationships discussed in the introductory chapter and will be discussed in the following sections.

#### **4.4.2 The role of attachment**

##### **4.4.2.1 The role of attachment in predicting HbA1c**

Preliminary analysis supports hypothesis one, that attachment security is directly related to blood glucose control. Path analysis two (Fig 3.3) explores hypothesis two which postulates that the relationship between attachment and HbA1c will be mediated by additional psychological factors. Path analysis two supports hypothesis one, that attachment security is correlated with lower HbA1c, while also indicating

that it is attachment security that may predict blood glucose control particularly when gender and interpersonal problems are considered. For example, when an individual is female and scores highly on the combination of vindictive or self centredness, emotional coldness, social inhibition and substance misuse, then attachment security will be lower and HbA1c is more likely to be high, i.e. poorly controlled. This raises the question, have previous studies of attachment style and HbA1c wrongly concluded that poor blood glucose control is solely a product of insecure attachment? Earlier research (Ciechanowski *et al.*, 2001; Ciechanowski *et al.*, 2004) highlights the interaction between attachment security and patient provider communication as having a combined affect on blood glucose control and diabetes self care. While communication was not measured in terms of interpersonal problems, as in the current study, communication difficulties can be seen as analogous to aspects of interpersonal problems. For example, when the patient is asked about his, or her, ability to initiate communication with the care provider, this parallels interpersonal problems whereby an individual experiences difficulties in expressing his or her needs appropriately. This earlier research was perhaps then measuring the impact of attachment and aspects of interpersonal problems on blood glucose control and would support the current findings that it is the combined effect of low attachment security and high experience of interpersonal problems that can lead to poor blood glucose control.

Ciechanowski, Hirsch and Katon (2002) found dismissing attachment style to be associated with high risk for poor glycaemic control. While they controlled for marital status, income and diabetic complications, they acknowledge that their analyses were perhaps 'conservative' and allude to the fact that attachment may be a common factor in influencing the interpersonal aspects of the controlled factors (e.g. romantic

relationships, working relationships, relationships with healthcare services), which in turn may influence blood glucose control. Perhaps, then, it was the combination of insecure attachment and the influence attachment has on relationships which can lead to interpersonal problems that resulted in the association with HbA1c, as opposed to the influence of attachment insecurity alone. They also acknowledge a limitation in using only attachment measures and not directly assessing the patient provider relationship, in which case the addition of a measure of interpersonal problems may have been of benefit. Therefore, future research investigating the relationship between attachment security and HbA1c may benefit from including both attachment security and interpersonal problems in analysis. However, the results of the current study would require to be replicated before the co-joint influence of attachment security and interpersonal problems can be confidently said to impact upon HbA1c levels.

#### **4.4.2.2 The relationship between attachment and mental health**

When attachment security is considered, path analysis two (Figure 3.3) suggests that lower attachment security is predictive of higher levels of depression and anxiety. The literature would support this finding. Allen and colleagues (1996) explain how negative models of ‘self’ and ‘other’, as a result of insecure attachment, can lead to cognitive distortions and resulting maladaptive behaviour, such as avoidance and isolation. Such behaviours can perpetuate a vicious cycle as often these behaviours lead to confirmation of the negative models of self and, or, others. Similarly, based on the theory that secure attachment also drives emotion regulation and distress tolerance (Kobak & Sceery, 1988) it would fit that those individuals with less secure attachment are likely to express or inhibit emotion in a maladaptive fashion. In such cases

distress, and thus support seeking, is unhelpfully minimised and internalised, or alternatively disproportionately expressed. These responses are often observed in depressed and anxious individuals. Thus, one can follow a path of insecure attachment into a progression of maladaptive behaviours, poor emotion regulation and distress tolerance which may become a diagnosable mental health difficulty.

Many studies support the findings in the current study that attachment security is likely to lead to lower levels of negative affect and anxiety symptoms in adolescents and young adults (Buist *et al.*, 2004; Kobak & Sceery, 1988; Overbeek *et al.*, 2004; Rosenstein & Horowitz, 1996).

#### **4.4.3 The role of interpersonal problems**

##### **4.4.3.1 The role of interpersonal problems in predicting HbA1c**

To date, no studies have examined the predictive relationship between interpersonal problems and HbA1c in adolescents with diabetes. Preliminary analyses in the current study found a negative correlation between the ‘self-sacrificing’ scale and HbA1c level. This would suggest that those people who describe themselves as ‘eager to please’ and who find it difficult to set boundaries on other people (self-sacrificing; Horowitz *et al.*, 2000) are more likely to have good, i.e. lower, HbA1c levels.

Theoretically this would make sense, as these individuals are likely to be extremely keen to please healthcare providers which may involve excessive attention to diabetes treatment regimens. Analysis also found a positive correlation between ‘vindictive/self-centred’ scale and HbA1c level. Those individuals who find it hard to trust others

and who feel readily irritated and angered by others (vindictive/self-centred; Horowitz *et al.*, 2000) are more likely to have high HbA1c levels. This type of person is less likely to trust the advice of healthcare professionals and will be difficult to engage. Thus, access to, and a belief in, the information, treatment and recommendations provided by healthcare services will be low which is likely to impact upon HbA1c levels.

When interpersonal problems were analysed as a factor of ‘vindictive/ self centred’, ‘cold/distant’ and ‘socially inhibited’ scales, there existed a direct relationship between interpersonal problems and HbA1c. However, this relationship was contributed to by substance use. Thus, an individual who is more likely to have a substance use disorder (high probability of substance abuse disorder or substance dependence disorder), in the context of high levels of direct substance use, is also more likely to experience interpersonal problems. This will be discussed in section 4.4.4.2.

#### **4.4.3.2 The relationship between interpersonal problems and mental health**

Interpersonal problems as a factor of ‘vindictive/ self centred’, ‘cold/distant’ and ‘socially inhibited’ can also be theoretically linked to anxiety and depression.

Horowitz and colleagues (2000) describe those scoring highly on the vindictive/ self centred scale as being highly suspicious of others which leads to anger and grudges.

As a result of these ways of relating to others, these people are presumably less likely to maintain supportive friendships and more likely to remain hypervigilant for signs of exploitation or deceit. The product of such behaviours may well be depression, due

to isolation or anxiety around social interaction. Similarly, those participants who scored highly on the cold/distant scale may find it hard to stay close to others and are often aware that they lack ‘warmth’ and ‘forgiveness’ (Horowitz *et al.*, 2000). Isolating oneself and negatively appraising this isolation are realistic precipitants of depression. Finally, those individuals endorsing socially inhibited type behaviours are also likely to avoid social interaction, this time for fear of humiliation or rejection. Once again, the isolation may precipitate depression but most likely the fear of rejection would lead to depressive views of the self and anticipatory anxiety around future interactions. Thus, an endorsement of one or all of these factors may well contribute to anxiety or depression, as is suggested by path analysis two in the current study. This finding is supported by Burns and colleagues (1994). Using structural equation modelling, they found that low level chronic depression was a direct result of high level interpersonal problems.

However, additional studies do not support the current findings, instead reporting that depression predicts interpersonal problems (Joiner, 1999). It is notable that Joiner (1999) assessed a clinical population of inpatient youths, thus it is possible that less severe depression was not included. Given that the strongest association found by Burns and colleagues (1994) was for high level interpersonal problems to low level depression, it is possible that Joiner (1999) would not have been assessing the same populations. Therefore, further research looking more specifically at severity of mental health problems and the predictive influence of interpersonal problems would be of benefit in clarifying these issues.

#### **4.4.4 The role of Substance Use**

##### **4.4.4.1 The role of substance use in predicting HbA1c**

Substance use can be considered to have an indirect relationship with HbA1c. As discussed, there is the possibility that substance use is under reported in this study. Thus, it is possible that individuals with poor HbA1c levels also have high levels of substance use, but that relationship has been missed in path analysis as a result of reported low levels of substance use. Further assessment of substance use would therefore be required before the indirect relationship in path analysis two can be confirmed.

The following sections will address the relationship between substance use and HbA1c based on the findings of the current study, whereby the effect of substance use on HbA1c appears to be strengthened by the presence of interpersonal problems.

##### **4.4.4.2 The role of substance use and interpersonal problems in predicting HbA1c**

Ahmed and colleagues (2006) discuss the impact of substance use on an individual's ability to monitor and manage his, or her, blood glucose. They measured the use of exercise, diet, adherence to oral medication, adherence to recommendations for testing HbA1c, self monitoring blood glucose and not smoking as methods of managing diabetes. The authors concluded that patients are less likely to adhere to diabetes self



care behaviours, thus potentially impacting upon HbA1c, if they consume alcohol. This would suggest a direct affect of alcohol on blood glucose management.

However, when one considers the difficulties those persons with interpersonal problems may have in adhering to the aforementioned diabetes self care behaviours, it is clear that interpersonal problems may also interfere with an individual's diabetes self care, which increases the likelihood of unhealthy HbA1c levels. To expand, those individuals experiencing interpersonal problems may have difficulty in accessing medical advice and treatment recommendations as a result of maladaptive communication styles and engagement. In addition, such individuals may find it difficult to engage in social activities which, for example, often include sporting pursuits and more recently may dissuade smoking. In other words, interpersonal problems can interfere with the aforementioned diabetes self care behaviours. This raises the question, have previous studies reporting the relationship between substance use and HbA1c been reporting the effect of interpersonal problems, attributed to by substance use, on HbA1c? This is suggested by the second path model and is discussed below.

There is a lack of literature around the contribution of substance use disorder, in the context of high drug and alcohol use, to interpersonal problems, in adolescents with and without diabetes. However, theoretically, the relationship can be hypothesised. Often individuals who use alcohol and, or, drugs to excess find themselves in dysfunctional peer groups where substance misuse is commonplace. Under the influence of substances, an individual is less likely to be able to communicate needs appropriately and less likely to have needs met by other intoxicated individuals.

Excessive substance use impairs judgement and can, in turn, create inappropriate responses to perceived difficult situations. This can lead to frustration and misinterpretation, or a sense that one is not being heard. As discussed previously, very often the conflict between desired and actual behaviour is at the root of a perceived interpersonal problem. Therefore, perhaps substance use, in terms of the effect it has on communication, perception of others and peer affiliation, may cause or contribute to interpersonal problems. When studies identify substance use as a cause of the medical complications, and even fatality, associated with diabetes (Lee *et al.*, 2005; Saunders *et al.*, 2004), perhaps what they are truly identifying are patients dropping out of services and treatment regimes which occur as a product of interpersonal problems partly attributed to by substance use. Indeed, Saunders and colleagues (2004) allude to this fact when they describe the difficulty engaging substance using populations due to temporary accommodation and involvement in judicial systems. Similarly, Lee and colleagues (2005) acknowledge that substance misuse can often reflect the ‘underlying dysfunctional social architecture’ (p.360) of an individual. With reference to Ahmed and colleagues’ study (2006), it is a consideration that low HbA1c as a product of interpersonal problems influenced by substance use was being measured, as opposed to the direct effects of substance use on HbA1c. This hypothesis would support the findings of Wakabayashi and colleagues (2002) and Howard and colleagues (2004) who report no direct effect of alcohol consumption on HbA1c levels. It would, perhaps, also explain why path analysis one (Fig 3.2), which suggests a direct effect of substance use disorder on HbA1c, was not a good fit for the data. Data in the current study was better explained when interpersonal problems were considered.

However, it is noteworthy that Kumpulainen and Roine (2002) found a predictive relationship between specific interpersonal problems and later heavy alcohol use in an adolescent population. Thus, further research on the relationship between interpersonal problems and substance use is required to clarify the direction of the relationship.

#### **4.4.4.3 The role of substance use and interpersonal problems in explaining mental health**

In terms of the relationship between substance use and mental health, up to two thirds of a population of young adults with a substance use disorder are found to have a co-morbid mental health diagnosis (Chan *et al.*, 2008). Deas (2006) acknowledges the role of substance use disorder in exacerbating pre existing psychiatric disorders.

While Palosaari and Aro (1994) found that interpersonal problems, as an adolescent, also have a causal relationship with depression in early adulthood. These studies suggest individual contributions of both substance use and interpersonal problems to mental health diagnoses. This suggestion is not supported by the current study and the recent study by Goodwin and colleagues (2004) further explores these relationships.

Goodwin and colleagues (2004) initially found that anxiety and substance dependence were significantly associated. However, when additional factors were adjusted for, the direct association no longer existed. Substance using individuals were found to be more susceptible to anxiety disorders if they also experienced interpersonal difficulties with family and peer affiliation. With reference to peers, specifically deviant or substance misusing peers were a contributing factor. Difficulties in having

needs met and communicated effectively in a dysfunctional, substance abusing peer group, i.e. an experience of interpersonal problems, which then contribute to mental health difficulties, can be said to parallel the pathway on path analysis two (Fig 3.3). It would seem that substance use does indeed contribute to anxiety and depression, as supported by Deas (2006), but that this relationship is explained by the contribution of substance use to interpersonal problems, which then impact directly upon anxiety and depression, as suggested by Goodwin and colleagues (2006).

#### **4.4.5 The interaction between attachment and interpersonal problems in predicting HbA1c**

Horowitz and colleagues (1993) explain how interpersonal problems arise as a result of conflict between desired behaviour and internal working models of the 'self' and 'other' that are incongruent to this behaviour or interaction. As discussed previously, Bartholomew and Horowitz (1991) and Horowitz and colleagues (1993) recognised a relationship between attachment and interpersonal problems. While the current study did not find the same significant relationships between specific attachment style and specific dimensions of interpersonal problems, there remains a degree of association between certain scales and an overarching relationship between models seen in the preliminary correlations and path model two. Horowitz and colleagues (1978) discuss interpersonal interactions in the context of avoidant or involved behaviour towards others, the latter being either positive or negative. Interacting in an avoidant or negatively involved way is analogous to the avoidant and anxious ambivalent attachment style behaviours discussed previously. There is clearly a similarity in presenting behaviours resulting from one of the two theoretical models. Therefore,

studies that attribute HbA1c level to either attachment style or interpersonal problems independently would benefit from exploring the relationship between attachment and interpersonal problems, in order to accurately state how much of the observed effect on HbA1c level is caused by attachment or interpersonal problems alone.

#### **4.5 Methodological Considerations**

It is important to consider the findings of the current study in the context of any methodological shortcomings. While all participants were given the option of completing the questionnaire packs in a side room, separate from the clinic and any person who accompanied them to the clinic, only one participant took this opportunity. The remaining participants completed the questionnaires in the clinic waiting room, the majority of whom arrived accompanied by a parent or guardian. While the patient information sheet (Appendix v) asks patients to complete the questionnaires without the help of a parent or carer, it was observable during the clinics that some participants were completing measures under the watchful eye of a significant other and, on occasion, consulting with a parent or guardian on their answers. These factors may account for the high levels of ‘defensive’ style reporting of substance use and further supports the hypothesis that participants under reported substance use in this study. Perhaps participants were responding in a socially desirable fashion in the presence of a parent or guardian. It may also be a factor contributing to the high levels of reported secure attachment in this sample. However, Leak and Chad (2001) found that the RQ was free from subconscious socially desirable responding. Nevertheless, in future research, it may be advisable to ensure that participants complete the questionnaire packs, unaided, in a separate room.

A shortfall on the behalf of the researcher was to present the questionnaires in the same order to all participants. This meant that the longest questionnaire, the SASSI-A2, was the last questionnaire that all participants were asked to complete. Perhaps by this stage participants were becoming fatigued and weary of completing many questionnaires, and may explain why 23.9% of the sample did not complete one side of the SASSI-A2 satisfactorily. While this may also be a result of the design of the questionnaire, one cannot conclude that this is the case without first trialling the use of the SASSI-A2 in counterbalanced questionnaire packs.

The IIP-32 was added to the design to act as a validating measure for the A-RQ and was thus given to a subsample of the population assessed. However, it was later decided that the IIP-32 should be analysed as a predictor in its own right. As has been discussed, the addition of the IIP-32 has been revelatory in providing the model which best explains hypothesis two. Thus, future designs may be altered to include the completion of a measure of interpersonal problems by all participants. Furthermore, Ciechanowski and Katon (2006), although successful in their use of the RQ as a measure of attachment, recommend the use of more psychometrically robust measures of attachment and additional qualitative measures. While the current study did employ the use of an additional measure (A-RSQ) which correlated highly with shared constructs on the RQ, future researchers may wish to include additional measures of attachment.

#### **4.6 Uncontrolled Variables**

The current study excluded patients above the age of 18 years. However, given that some patients were in full time secondary education, some were at college or university and others were working or unemployed, future research may wish to control for education or working status. Adolescents are likely to be exposed to different social issues within these different contexts, which may themselves have an impact upon interpersonal problems, substance use and mental health. Furthermore, Dashiff and colleagues (2008) discuss the need to explore the conflict that arises between parents and adolescents as they struggle for autonomy and how these interactions may mediate or interact with the relationship between attachment and HbA1c level. The current relationships between parents or guardians and each participant were not controlled for in this study.

#### **4.7 Strengths of the Study**

The design, protocols and measures used allowed access to a broad range of data that has not previously been collected in this way. The population appeared to be interested in participating and furthering knowledge around their medical diagnosis, as reflected in the high response rate. The Diabetes Clinic teams were particularly supportive and interested in the study, which made access to this interesting population relatively easy.

Preliminary analysis in the current study did not reveal the significant associations between variables that emerged when path analysis was conducted. The path analysis

produced a statistically robust model of the causal relationships between variables. Therefore, a further strength of the study was the use of path analysis to explore further, and potentially elucidate further, the complex relationships between predictors and glucose control.

#### **4.8 Theoretical Implications**

The current study supports the literature which suggests a link between attachment and HbA1c (Ciechanoski *et al.*, 2001; Ciechanowski *et al.*, 2004; Ciechanowski, Hirsch *et al.*, 2002). However, this theory is expanded by the findings that gender and the common variance in attachment and interpersonal problems should be considered in the interpretation of the relationship between attachment and HbA1c. The theory that attachment and mood are related (Buist *et al.*, 2004; Kobak & Sceery, 1988; Overbeek *et al.*, 2004; Suchman *et al.*, 2006) was also supported by the findings of this study.

Previous literature suggesting that attachment and interpersonal problems share constructs was not supported in the current study. However, there did exist a shared variance between the two concepts. The current study also suggests that attachment and interpersonal problems are inversely related, supporting earlier work by Horowitz (1996), amongst others (Bartholomew and Horowitz, 1991; Haggerty *et al.*, 2009), who found an over arching relationship between interpersonal problems and attachment style.



Previous studies of the relationship between interpersonal problems and mood have suggested that low mood is predictive of high levels of interpersonal problem (Joiner, 1999). The findings of the current study do not support this theory and instead suggest a predictive value to interpersonal problems in terms of contributing to subsequent anxiety or depression.

While previous studies have assessed interpersonal problems in the diabetic population, no study has investigated the direction of the relationship between the two. The current study introduces the concept that interpersonal problems are predictive of HbA1c level. Furthermore, the current study also suggests that the shared relationship between interpersonal problems and attachment is integral to the relationship between interpersonal problems and HbA1c.

The findings of the current study do not support suggestions that interpersonal problems go on to predict substance misuse (Kumpulainen & Roine, 2002). Instead the findings suggest that substance use contributes to the experience of interpersonal problems.

#### **4.9 Clinical Implications**

Based on previous research findings, that increased symptoms of mental ill health predict HbA1c levels (Lustman *et al.*, 1986), it has been suggested that diabetic patients should be routinely screened for mental health difficulties and treated at the earliest convenience, with a view to improving blood glucose control and thus reducing the likelihood of further serious health complications (Kovacs *et al.*, 1995,

Stewart *et al.*, 2005). Findings from the current study would suggest that mental health intervention and screening will have little impact upon an individual's overall blood glucose control and metabolic complications thereafter. While children and adolescents with mental health difficulties are entitled to appropriate and timely intervention, the focus should not necessarily be on only those individuals with an additional diagnosis of diabetes.

What this study can support is early routine screening of diabetic individuals' attachment security and perceived interpersonal problems. Those children and adolescents with less secure attachment and, or, higher rates of interpersonal problems would then be identified as 'at risk' of poor blood glucose control, and consequent health complications. To reduce this risk, clinical intervention should be tailored to that individual's attachment and interpersonal problems profile.

Firstly, it should be considered how insecurely attached individuals can be managed in a fashion that reduces their risk of poor blood glucose control. Given that many of these individuals are likely to endorse a negative sense of 'others' (fearful attachment and dismissive attachment), it is important for healthcare providers to foster a safe relationship in which the patient feels able to trust and rely on others (Ciechanowski & Katon, 2006). Dozier and Tyrell (1998) recommend challenging the individual's internal model of attachment, for example, by offering to help the avoidant patient before they experience the internal conflict around requesting support. Challenging these internal models may also be facilitated by providing adolescents with a named 'key worker' in the diabetes clinic, who will utilise their role to build rapport and model consistent and supportive engagement. This member of staff could accompany

hesitant patients in consultation and offer outreach between appointments. For those individuals with a strong sense of independence and positive sense of self (e.g. those with a dismissive attachment style), it will be important not to smother this individual with support. What may be useful in these instances is for the key worker or consultant to promote a more 'self help' type of approach, perhaps including motivational work. The individual would be encouraged to draw upon his, or her, strong sense of self and independent mind to make informed decisions on which treatment goals and recommendations they should adhere to, as opposed to taking instruction from 'untrustworthy' others (Ciechanowski & Katon, 2006). Similarly, Hunter and Maunder (2001) recommend a care plan with clearly identified, consistent, punctual and time limited sessions for those individuals who display anxious (i.e. preoccupied) attachments. This would allow patients to experience consistent, boundaried support. This should go some way to containing the patients' anxieties around the withdrawal of support, thereby reducing their need to persistently and inappropriately try to engage services.

While tailoring the nature of intervention according to attachment style may be useful, it will also be important to educate staff on the theoretical basis of attachment and how important their responses to, and perceptions of, insecurely attached individuals may be in maintaining engagement (Ciechanowski & Katon, 2006). For example, for those patients with a 'dismissive' style of relating, some education on attachment styles to healthcare staff may be necessary to pre-empt any perception that the patient is simply being difficult. In fact, this patient is likely to be finding it extremely difficult to form and maintain a relationship with healthcare providers and therefore the perceived rejection by healthcare providers of 'difficult' individuals will only

serve to compound these difficulties in interacting. For those who are likely to be avoidant and prone to feeling controlled and rejected, it is important for the healthcare provider to be aware of the perceived power differential and to ease that patient's sense of feeling 'small' and vulnerable. Similarly, for those individuals who anxiously engage with, and often over use, services, it is important for healthcare providers to be aware of the importance of consistent management and boundaries in the treatment relationship, whilst containing those anxieties.

This knowledge and understanding of how best to promote engagement with insecurely attached individuals, along with active steps to tailor engagement, would presumably promote engagement with services. This engagement could then have a positive impact upon the health outcomes for that individual, whilst also saving healthcare services expenditure on costly treatment and procedures required to address metabolic complications.

Similar strategies can be used to engage those individuals experiencing specific interpersonal problems at a high level. Educating staff on the presentation of interpersonal problems, and how they often mask actual emotion and intention, may promote relationships in which individuals feel safe enough to convey their actual needs. For example, those individuals who score highly on the 'vindictive/self centred' scale are likely to present in an aggressive manner whilst maintaining a hypervigilance for signs of being deceived or exploited (Horowitz *et al.*, 2000). This prior knowledge would perhaps be helpful for healthcare providers. They can then ensure that they are trained in the skills required to de-escalate angry or irritable patients and that communication is open and clear, allowing no space for suspicion to

arise. Similarly, those patients who score highly on the need to please others, for example 'self-sacrificing', would perhaps benefit from a treatment approach that focuses the individual on him, or her, self, and the benefits that following treatment will have for that individual alone. These factors would inevitably facilitate more effective engagement with diabetes services and thus adherence to medical and treatment recommendations.

Lovaglia and Matano (1994) found that those participants with a high level of interpersonal problems were more likely to drop out of substance abuse treatment. One can hypothesise that the same may apply to engagement in diabetes treatment services. Therefore, whilst working around the presenting interpersonal problem itself, it is also a consideration that psychological therapy, aimed at adopting more adaptive interpersonal styles, will be of benefit to those experiencing a high level of interpersonal problems. Indeed, Borkovec and colleagues (2002) recommend the inclusion of interpersonal treatment for patients with mental health diagnoses. Given that interpersonal problems are seen to directly relate to both mental health and blood glucose control in the present study, perhaps the inclusion of interpersonal treatment can be applied to diabetic patients who also experience interpersonal problems.

Finally, given that the results from the present study suggest that substance use contributes to interpersonal problems, which in turn predict high levels of HbA1c, it would perhaps be of benefit to promote substance misuse prevention and education work with diabetic adolescents. If the likelihood of substance misuse can be minimised, then experience of interpersonal problems may be less severe, which would reduce the likelihood of poor blood glucose control and the resulting dangerous

metabolic complications. By the same token, substance misuse intervention for those who have a pre-existing substance use disorder may reduce the risk of those individuals developing further physical health problems, in the context of high levels of interpersonal problems contributing to high HbA1c levels.

#### **4.10 Health Service Implications**

These clinical recommendations have implications for the structuring and provision of diabetes healthcare. The employment of key workers, the requirement for staff training on the psychological factors affecting engagement, the increase in outreach work, increases in psychological therapy and the implied increase in time invested in doing all of the above, all have implications for financial cost in the short term.

However, when one considers the long term cost to the healthcare system, incurred as a result of poor engagement in services and poor adherence to treatment, these costs are also high. Missed appointments cost the healthcare system money and time (Stone *et al.*, 1999), and inadequate engagement ultimately results in increased metabolic complications, which lead to more intensive and long term use of additional healthcare services (National Diabetes Support Team, 2008 as cited in Smallwood, 2008). Thus, short term expenditure on restructuring and furthering education of diabetes healthcare teams may outweigh the long term costs.

It is most important not to lose sight of the reduction in cost to each individual adolescent patient with diabetes. That is, a reduction of cost in terms of quality of life. If services are able to increase engagement in treatment by screening for attachment insecurity and interpersonal problems, and consequently responding in a specific

fashion to engage each unique individual, these individuals would then have an increased probability of managing blood glucose within safe and healthy limits. It would follow that such individuals are less likely to develop complex, and sometimes disabling or even fatal, health problems; thus the saving here is in health.

## **5.0 Concluding remarks**

The current study identified attachment security as a predictor of blood glucose. The nature of this relationship is further understood when additional psychological factors are considered. Attachment security also predicts HbA1c when interpersonal problems, in the context of substance use, are considered. Gender is also a contributing factor.

Whilst, as indicated, this study has limitations, the author considers the achievements and contributions to include the following. Firstly, exploring the role of attachment as a predictor of blood glucose control in adolescents with Type 1 diabetes. To date, no published research has examined these factors in this population.

In addition, the use of path analysis to further interpretation of preliminary analysis has transformed the author's hypotheses around the role of anxiety as a predictor of blood glucose control. By advancing preliminary analysis to include path analysis, the current study has reduced the likelihood of reporting spurious relationships. Similarly, the importance of including interpersonal problems as a psychological factor in analysis is realised, as the explanatory power of the model of best fit was significantly enhanced by this addition.

Finally, implications for clinical practice can be made on the basis that attachment security and interpersonal problems, in the context of substance use, can greatly impact upon an individual's ability to engage with, and follow treatment recommendations from, specialist healthcare providers. With this knowledge, the dedicated diabetes healthcare force may be able to maximise the impact their hard work and treatment has on this at risk group of adolescents with diabetes. With these changes, it is the author's hope that these vulnerable individuals may make valuable gains in their quality of life.



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